

Comparison between Work Related Musculoskeletal Wrist Pain and Carpal Tunnel Syndrome among Students of Figurative Painting and Calligraphy

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Author's Contribution

²Conception and design, ³Collection and assembly of data, ^{1,2,3}Analysis and interpretation of the data, Statistical expertise, drafting of article, ⁴Critical revision of the article for important intellectual content, ²Final approval and guarantor of the article.

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A B S T R A C T

Objective: To compare painting related variables for carpal tunnel syndrome (CTS) and musculoskeletal wrist pain among students of calligraphy and figurative painting.

Methodology: A comparative cross-sectional study was conducted on 212 participants from 21 January to 25 May 2023. The data was collected from the fine arts departments of public and private universities in Sialkot, Pakistan. Phalen's clinical test was used to screen the CTS and Boston carpal tunnel questionnaire was used as an outcome measuring tool. SPSS version 22 was used to analyze the data. Mean, Standard deviation and Independent-t-test was used to compare the groups at significance level (p=0.05).

Results: Out of 212, (N=148, 69.81%) were participants in figurative painting (group A) and (N=64, 30.18%) were in calligraphy (group B) with positive Phalen test. The total mean score of symptom severity scale for CTS was (26.49 ± 6.25) and functional status (21.26±7.58) which determines moderate difficulty with routine tasks. The symptom severity scale for CTS among groups A and B had mean scores (27.83 ± 6.20) and (23.40, ± 5.20) whereas the functional status scale among group A; had mean scores (23.20 ± 7.67) and B (16.79, ± 5.13) respectively. Factors that showed significant difference between painters and calligraphers BCTQ were working hours, medium of paints, size of paint brushes and types of paint brushes (p-value= 0.00).

Conclusion: The results of this study showed an overall 'moderate' symptom severity and functional difficulty level among participants with CTS but figurative painters were more affected in some factors than calligraphers.

Keywords: Calligrapher, Carpal tunnel syndrome, Figurative, Painters.

Introduction

The art of visually appealing, beautiful and readable handwriting was known as calligraphy. Calligrapher was defined as a person who was skilled in such handwriting.¹ The painting was a two-dimensional visual language used to express thoughts and feelings while also achieving specific aesthetic attributes. A painter was able to put down his feelings and thoughts in the form of visual pictures with paints; a

professional group that requires a comprehensive understanding of how to manipulate the structures.² The majority of work-related musculoskeletal disorder progresses gradually with time as continuously getting exposed to risk factors at the workplace. The physical and emotional facets and the quality of life got affected by work related musculoskeletal pain and disorders.³ Painters had exposure associated with the risk factor of musculoskeletal wrist pain which could be the forceful and repetitive movements during detailing and refined

work of painting and calligraphy. Despite this mechanism of injury, many internal and external factors could result in pain, which may be the continuous noxious stimulus, repetitive strain on musculoskeletal structures compressing the nerves, blunt injury or trauma or any other systemic disease (out of which the carpal tunnel syndrome most reported).⁴ Globally the prevalence of Carpal tunnel syndrome was found as 150-276 people per 100,000 people.⁵ Among them, females were most affected by artistry work than men with performance-related musculoskeletal disorders, with (64.0%) prevalence.⁶ Carpal tunnel syndrome (CTS) was median nerve compression. The entrapment of the median nerve or compression due to any reason, which passes through the wrist, causes pain; numbness and tingling sensation in the distribution of the median nerve in the hand. The symptoms could appear in the thumb, index, middle finger or the lateral half of the ring finger. Mechanical injury, elevated pressure and ischemia pressure all play an important role in the pathophysiology of carpal tunnel syndrome.⁷ That ultimately leads to sensory as well as motor function loss in the affected areas. At advanced and chronic stages of the disorder, the hand muscles become weakened or atrophied and it became too late to effectively control and manage the carpal tunnel syndrome. Typically, the origin of carpal tunnel syndrome was unknown.⁸ Prolonged exposure to the force causing high strain on the wrist with higher repetitions was associated with the work-related risk components contributing to CTS.⁹ It was believed that awkward wrist postures were also associated with carpal tunnel syndrome.¹⁰ Continuous pushing of the paint brushes on the canvas causes a force to be generated by different wrist muscles.¹¹ The painting was a common do-it-yourself home improvement task. Different paint brushes handle types require wrist positions that had been shown to increase the activity of the hand muscles. The standard paint brush was held in the same position adding up to the severity of CTS and wrist pain.¹² Artists in general, work longer than many other occupations. Brush strokes were very common among painters. Consistent breakdown of the muscle fibres can lead to deformities as artistry requires the use of one hand to accomplish their work. Repetitive instrumentation shrinks the carpal tunnel around the median nerve creating numbness, tingling and pain in the hand, wrist and arm. The gripping of tools and different sizes of the brushes were the contributing factors to carpal tunnel syndrome. The majority of the painters felt pain and discomfort during their artistry work.¹³ Wrist pain had a significant association with ergonomic risk factors such as sitting hours, sitting with and without support, standing hours and type of work. Wrist becomes more prone to musculoskeletal problems and limits the work capacity of individuals with fine arts as a profession and therefore creates a hindrance in their work.¹⁴

Limited evidence of research interrogates the interaction effect between work related wrist pain and exposure (working hours, gripping of painting tools, size of painting tools, the shape of brushes) that could lead to carpal tunnel syndrome affecting the functional status and symptom severity among different domains of painters and fine arts. The current study aimed to compare carpal tunnel syndrome and musculoskeletal wrist pain-related painting variables among calligraphers and figurative painters.

Methodology

The comparative cross-sectional study design was used. The study was conducted from January to May 2023 in Sialkot, Pakistan after the approval from the ethical review committee of 'Imran Idrees Institute of Rehabilitation Sciences, Sialkot' (IERC), IIIRS/DPT/IRB-601. The sample size was calculated from epi-tool software with estimated proportion (0.5%), desired precision of estimate (0.05%), confidence level (0.95%) and the sample size was computed as $n = 212$.¹⁵ The study was conducted on students of figurative painting and calligraphy. The study sample was raised using a convenient sampling technique from fine arts departments (3rd and 4th-year students) of government and private universities in Sialkot (Government College Women University Sialkot, Leather products development institute Sialkot, University of Sialkot and University of Management and Technology Sialkot). The inclusion criteria were set as fine arts students with positive Phalen test and carpal compression sign of musculoskeletal wrist pain, age (18 to 28 years), working hours (minimum 6 hours in a day) and tools (paint brushes and palette knives). Participants with structural deformities (cleft hand), Erb's palsy, rheumatoid arthritis, and traumatic injuries (fractures of the wrist) were excluded from the study.

Written informed consent was obtained before data collection from the study participants. The confidentiality of the data was maintained and the participants were being informed that they can abort at any stage of study. The carpal compression test was assessed to screen for wrist pain by applying pressure on wrist in flexion and holding it for 30 seconds and the Phalen's test was used for the screening of Carpal Tunnel Syndrome in phase I. The specificity and sensitivity of carpal compression test was found as (0.71) and (0.22) furthermore for Phalen's test were found as (0.50) and (0.33) respectively.¹⁶ The test was performed by instructing the participant to flex both wrists and elbows at 90 degrees for 30-60 seconds. The test was observed for the symptoms of CTS; pain, numbness and tingling in the thumb, index and middle finger. In the second phase, the self-structured demographic section and painting characteristics including the size of paint

brushes, size of palette knives, medium of the canvas (linen, cotton, muslin, silk), medium of paints (oil, acrylic, poster), types of brushes (hard, soft, natural, synthetic, detailing), the shape of brushes (flat, comb, fan, rigor) were recorded from the responses.

Furthermore, Boston carpal tunnel questionnaire was used to measure the symptom severity and functional status of the participants with CTS. The BCQT was found to be a reliable and valid tool.¹⁷ It had 11 items (for the symptom severity scale) and 8 items (for the functional status scale) measuring on 5 items Likert scale, 'normal/no pain/without difficulty' to 'very difficult'. The sum of 11 scores was found to give a total out of 55 for the symptom severity scale. Scoring was interpreted as 1-11 (Normal), 12-22 (Mild), 23-33 (moderate), 34-44 (severe), and 45-55 (very severe). And the sum of 8 scores was found to give a total out of 40 for the functional status scale. Scoring was interpreted as 1-8 (No difficulty), 9-16 (little difficulty), 17-24 (moderate difficulty), 25-32 (intense difficulty) and 33-40 (unable to perform activity).

The data were analyzed using SPSS software 22. The reliability analysis was performed using Crohn's Bach alpha for the outcome measuring tool. Variables were computed for the average scoring of scales. Descriptive statistics were used to represent the data. Independent-t-test, means and standard deviations were used to compare the painting related variables among two groups (painters and calligraphers) with p-value of 0.05 taken as a significant level.

Results

The reliability analysis showed that Crohn's Bach's alpha for the outcome measuring tool BCTQ (symptom severity

of calligraphy 'group B'. (N= 99, 46.69%) were from the 3rd year and (N=113, 53.30%) were from the 4th year of fine arts departments; whereas (N= 138, 65.09%) were from public institutes and (N=82,38.67%) of participants from private institutes. The demographics of the participants were presented in (Table I).

Table No II represents the painting characteristics for

DEMOGRAPHICS	Group A (figurative) (N=148)		Group B (Calligraphers) (N=64)	
	Age of participants (mean, S.D)	21.20yr	± 1.48	20.65yr
BMI (mean, S.D)	22.61kg/m ²	± 2.19	22.22 kg/m ²	±2.80
Gender of participants (N, %)	Male	Female	Male	Female
	9,6 (1%)	139 (93.9%)	0(0%)	64 (100%)
Academic Year (N%)	3rd year	4th year	3rd year	4th year
	60,40%	88 (59.5%)	39 (69.9%)	25. (39.1%)
Sector (N%)	Public	Private	Public	Private
	111,75.0%	37 (25.0%)	19 (29.7%)	45 (5.3%)

both groups and the statistical difference in working hours, size of paint brushes, medium of paints and type of brushes with P-value 0.00 at (significance level 0.05) respectively.

The total mean score of symptom severity scale for CTS was (26.49 ± S.D 6.25) and functional status (21.26± S.D 7.58) which determines 'moderate' difficulty with routine tasks (Table II). Comparing the means, figurative painters were more affected as (Independent-t-test) the symptom severity scale for CTS among groups A and B had mean scores (27.83 ± 6.20) and (23.40, ± 5.20), (p=0.00 < 0.05) whereas the functional

Table II: Painting characteristics of the participants

PAINTING CHARACTERISTICS	Group A (figurative) (N=148)		Group B (Calligraphers) (N=64)		P-value*
	Working hours (mean, S.D)	10.06hr	±2.75	11.67hr	
Size of paint brushes	5.85mm	±2.75	7.54mm	±3.22	0.00≤0.05
Size of palette knives (mean, S.D)	6.20cm	±1.93	6.62cm	±2.46	0.18 >0.05
Medium of canvas (mean, S.D)	1.97	±0.34	2.03	±0.47	0.31 > 0.05
Medium of paints (mean, S.D)	1.41	±0.74	1.90	±0.88	0.00≤0.05
Types of brushes (mean, S.D)	2.88	±1.21	2.29	±1.06	0.00≤ 0.05
Shape of brushes (mean, S.D)	1.20	±0.65	1.32	±0.71	0.23 > 0.05
BOSTON CARPAL TUNNEL SCORE	Symptom severity (mean, S.D)		Functional status (mean, S.D)		0.00≤0.05
	27.83	±6.20	23.40	±5.20	
Total (mean, S.D)	23.20	±7.67	16.79	±5.13	
	26.49 ± 6.25		21.26± 7.58		

scale) was (0.71 > 0.67) and for functional status scale (0.90 > 0.67) respectively. Out of 212, (N=148, 69.81%, mean aged:21.20yr ±1.48) were participants of figurative painting 'group A' and (N=64, 30.18%, mean aged: 20.65yr ±1.29) were

status scale among group A; mean score (23.20 ± 7.67) and B (16.79, ± 5.13), (p=0.00 < 0.05) respectively.

Table III: Boston Carpal Tunnel Questionnaire (Group A)

SYMPTOM SEVERITY SCALE	Group A (Figurative painters) N=148					Mean	±S.D
	1* (N,%)	2(N,%)	3(N,%)	4(N,%)	5(N,%)		
1. How severe is the hand or wrist pain that you have at night?	26, 17.6%	20,13.5%	86,58.1%	11,7.4%	5,3.4%	2.65	±0.96
2. How often did hand or wrist pain wake you up during a typical night in past 2 weeks?	109,73.6%	18,12.2%	16,10.8%	5,3.4%	0,0%	1.43	±0.81
3. Do you typically have pain in your hand or wrist during daytime?	12,8.1%	90,60.8%	37,25.0%	8,5.4%	1,0.7%	2.29	±0.72
4. How often do you have hand or wrist pain during daytime?	24,16.2%	33,22.3%	77,52.0%	13,8.8%	1,0.7%	2.55	±0.89
5. How long on average does an episode of pain last during the daytime?	24,16.2%	100,67.6%	19,12.8%	2,1.4%	3,2.0%	2.05	±0.72
6. Do you have numbness in your hand?	20,13.5%	84,56.8%	28,18.9%	13,8.8%	3,2.0%	2.29	±0.88
7. Do you have weakness in your hand or wrist?	18,12.2%	24,16.2%	90,60.8%	14,9.5%	2,1.4%	2.71	±0.84
8. Do you have tingling sensation in your hand?	15,10.1%	31,20.9%	19,12.8%	76,51.4%	7,4.7%	3.19	±1.13
9. How severe is numbness or tingling at night?	31,20.9%	18,12.2%	23,15.5%	71,48.0%	5,3.4%	3.00	±1.25
10. How often did hand numbness or tingling wakes you up during a typical night during the past two weeks?	44,29.7%	22,14.9%	16,10.8%	65,43.9%	1,0.7%	2.70	±1.31
11. Do you have difficulty with the grasping and use of small objects such as keys or pens?	93,62.8%	28,18.9%	18,12.2%	7,4.7%	2,1.4%	1.62	±0.96
Total Raw scoring	27.83 ± S.D 6.20						
FUNCTIONAL STATUS SCALE							
1. Writing	18,12.2%	33,22.3%	18,12.2%	76,51.4%	3,2.0%	3.08	±1.14
2. Buttoning of clothes	51,34.5%	21,14.2%	74,50.0%	2,1.4%	0,0%	2.18	±0.93
3. Holding a book while reading	25,16.9%	32,21.6%	20,13.5%	71,48.0%	0,0%	2.92	±1.17
4. Gripping of a telephone handle	25,16.9%	29,19.6%	22,14.9%	70,47.3%	2,1.4%	2.96	±1.18
5. Opening of Jars	26,17.6%	36,24.3%	77,52.0%	8,5.4%	1,0.7%	2.47	±0.86
6. Household chores	17,11.5%	21,14.2%	27,18.2%	73,49.3%	10,6.8%	3.25	±1.14
7. Carrying of grocery basket	18,12.2%	23,15.5%	22,14.9%	80,54.1%	5,3.4%	3.20	±1.13
8. Bathing & dressing	42,28.4%	29,19.6%	9,6.1%	4,2.7%	64,43.2%	3.12	±1.75
Total Raw scoring	23.20 ± S.D 7.67						

Furthermore, comparing, participants among (group A: N=10,6.8%; group B: N=4,6.3%) linen, (group A: N=133,89.9%; group B: N= 56, 87.5%) responded cotton, (group A: N=4,2.7%; group B: N=2,2.0%) muslin and (group A: N=1,0.7%; group B: N=2,2.0%) used silk as the medium of canvas. Participants among (group A: N= 110,74.3%; group B: N= 28,43.8%) responded on using oils as the medium of paints, (group A: N= 15,10.1%; group B: N= 14,21.9%) responded acrylics whereas (group A: N=23,15.5%; group B: N= 22,34.4%) used poster paints respectively. Participants in (group A: N= 24,16.2%; group B: N= 14,21.9%) responded hard type of brushes, (group A: N=44, 29.7%; group B: N= 28, 43.8%) soft, (group A: N= 7,4.7%; group B: N= 15,23.4%) natural, (group A: N= 71,48.0%; group B: N= 3,4.7%) synthetics and (group A: N= 2,1.4%; group B: N= 4, 6.3%) detailing brush respectively.

The BCTQ; symptom severity scale showed out of 148 participants in group A, participants (N=103,69.6%) had

moderate, (N=35,23.6) mild and (N=10,6.8) severe levels of CTS whereas the functional status scale showed (N=71,48.0%) intense difficulty, (N=43,29.1%) moderate difficulty, (N=31,29.1%) little difficulty and (N=3, 2.0%) no difficulty with CTS (Table III).

The BCTQ; symptom severity scale showed out of 64 among group B, participants (N=31,48.4%) had moderate, (N=29, 45.3%) mild and (N=4, 6.3%) had severe levels of CTS whereas the functional status scale showed (N=36, 56.3%) no difficulty, (N=23,35.9%) moderate difficulty and (N=5, 7.8%) had intense difficulty with CTS (Table IV).

Discussion

In this study, results showed that the mean age of participants in group A out of 148 participants was (21.20 ±1.48 years) and out of 64 participants in group B aged (20.65±1.29 years) with

Table IV. Boston Carpal Tunnel Questionnaire (Group B)							
SYMPTOM SEVERITY SCALE	Group B (Calligraphers)N=64					Mean	±S.D
	1 (N,%)	2 (N,%)	3 (N,%)	4(N,%)	5(N,%)		
1. How severe is the hand or wrist pain that you have at night?	15,23.4%	19,29.7%	19,29.7%	8,12.5%	3,4.7%	2.45	±1.12
2. How often did hand or wrist pain wake you up during a typical night in past 2 weeks?	37,57.8%	17,26.6%	9,14.1%	1,1.6%	0,0%	1.59	±0.79
3. Do you typically have pain in your hand or wrist during daytime?	11,17.2%	26,40.6%	22,34.4%	4,6.3%	1,1.6%	2.34	±0.89
4. How often do you have hand or wrist pain during daytime?	23,35.9%	30,46.9%	6,9.4%	3,4.7%	2,3.1%	1.92	±0.96
5. How long on average does an episode of pain last during the daytime?	18,28.1%	27,42.2%	12,18.8%	5,7.8%	2,3.1%	2.15	±1.02
6. Do you have numbness in your hand?	10,15.6%	22,34.4%	28,43.8%	3,4.7%	1,1.6%	2.42	±0.86
7. Do you have weakness in your hand or wrist?	11,17.2%	26,40.6%	20,31.3%	5,7.8%	2,3.1%	2.39	±0.96
8. Do you have tingling sensation in your hand?	18,28.1%	19,29.7%	19,29.7%	5,7.8%	3,4.7%	2.31	±1.11
9. How severe is numbness or tingling at night?	15,23.4%	24,37.5%	21,32.8%	4,6.3%	0,0%	2.21	±0.88
10. How often did hand numbness or tingling wakes you up during a typical night during the past two weeks?	36,56.3%	21,32.8%	7,10.9%	0,0%	0,0%	1.54	±0.68
11. Do you have difficulty with the grasping and use of small objects such as keys or pens?	25,39.1%	28,43.8%	4,6.3%	6,9.4%	1,1.6%	1.90	±0.98
Total Raw scoring	23.40, ± S.D 5.20						
FUNCTIONAL STATUS SCALE							
1. Writing	15,23.4%	28,43.8%	14,21.9%	1,1.6%	6,9.4%	2.29	±1.13
2. Buttoning of clothes	37,57.8%	19,29.7%	7,10.9%	0,0%	1,1.6%	1.57	±0.81
3. Holding a book while reading	23,35.9%	19,29.7%	13,20.3%	9,14.1%	0,0%	2.12	±1.06
4. Gripping of a telephone handle	29,45.3%	18,28.1%	13,20.3%	3,4.7%	1,1.6%	1.89	±0.99
5. Opening of Jars	15,23.4%	26,40.6%	13,20.3%	7,10.9%	3,4.7%	2.32	±1.09
6. Household chores	13,20.3%	30,46.9%	10,15.6%	7,10.9%	4,6.3%	2.35	±1.11
7. Carrying of grocery basket	13,20.3%	21,32.8%	21,32.8%	6,9.4%	3,4.7%	2.45	±1.06
8. Bathing & dressing	33,51.6%	18,28.1%	6,9.4%	7,10.9%	0,0%	1.79	±1.01
Total Raw scoring	16.79, ±S.D 5.13						

BMI (22.61 ±2.19 kg/m²) and (22.22 ±2.80 kg/m²) respectively. Independent-t-test showed significant difference between painters and calligraphers for the variables including working hours, medium of paints, size of paint brushes and types of paint brushes with (p-value= 0.00 at significance level 0.05).

In the study findings reported by Ahsan Ilyas et.al to determine the association between work exposure-related wrist pain and CTS among painters, the mean aged (37.73 ±12.3 years); visual analogue scale (VAS) measuring the severity level of wrist pain showed a mean of 3.43±2.8. That concludes mild to 'moderate' pain levels among the (N=93,49.7%) of participants out of 187. Numbness and tingling were present among (N=24,12.8%) of participants.¹⁸ Likewise, the results of this study showed that participants with minimum age 18 years among group A participant's responded numbness on symptom severity scale with mean score (2.29±0.88); (N=109,69.6%) and similarly group B (2.42±0.86); (N=31,48.4%) had moderate intensities and tingling due to wrist pain and CTS were responded also as moderate with mean score (3.19±1.13) among group A and (2.31±1.11) as slight among group B respondents.

The study documented by Israa Anwar et.al concluded that (N=19, 46.3%) of CTS patients out of 41 had

moderate symptom severity measured on the Boston Carpal tunnel outcome measuring tool and none of the patients was asymptomatic among the participants of the study. These symptoms of CTS were associated with limiting the activities of daily living among participants including the tasks of writing, buttoning the shirt, grasping and gripping tasks.¹⁹ The study findings were congruent with the results of this current study which also showed that the total mean scoring of the symptom severity scale of BCTQ was 26.49 ± 6.25; participants were moderately affected by CTS.

The study findings by Adekunle E. Omole et.al, reported that in the United Kingdom, the prevalence of carpal tunnel syndrome was more among females (193 per 100,000 individuals) as compared to males (88 per 100,000 individuals). They also identified several risk factors for CTS and wrist pain among which obesity, prolonged hours of working and occupational factors such as repetitive wrist movements, manual work and usage of vibratory tools putting strain on the wrist.²⁰ The female gender who adopt more hand-intensive occupations were also reported as prone to develop CTS severity.²¹ Comparing their findings with this current study we found that in both groups female painters (group A:139, 93.9%); (group B: 64,100%) were more affected as compared to males with carpal tunnel syndrome and had positive Phalen's test as

compared to males in (group A: N=9,6.1%; group B: N=0,0%). The functional status scale showed that among group A; mean score (23.20 ±7.67) and B (16.79±5.13) had moderate levels of difficulty with working hours (group A: 10.06± 2.75 hr); (group B: 11.67± 2.96 hr) with significant association p-value=0.00 concluding high exposure to CTS was task related to figurative painting and calligraphy requiring more hand and wrist forces. The study by Dyandarasmi Larasati et.al reported that daily 8 working hours and 40 hrs weekly (p=0.020) could be associated with occupational aggravating factors to carpal tunnel syndrome and musculoskeletal symptoms among the workers of furniture manufacturing who also had painting division of work performing manually.²²

The findings of this study found a strong association between the handling of different types of paint brushes, size of paint brushes and palette knives with CTS and musculoskeletal wrist pain ($0.00 \leq 0.05$) respectively moreover, the symptom severity scale among groups A and B had mean scores (27.83±6.20) and (23.40±5.20); showing moderately affected compared with the findings of the study conducted by Jeremy Laurence Mendoza Banez et.al who found selection of inappropriate tools for painters made them discomfort with their tasks. The selection includes grip handles of tools; their sizes and make-up material as they should be chosen focusing on anthropometric measurements especially related to in-hand holding by the painters like paint scraping tools. The scope of the job for painters includes repetitive movements building strain on wrist tendons, overuse with tools leads to decreased strength in hands and dexterity along with chronic pain; presented as repetitive strain injury or CTS.²³ Another study by James Agostinucci and John Mc Linden concluded that the posture had an emphasis on reducing the risk of overuse injuries among painters when they grip the brushes handle whereas painting with right angle style brush handles had no statistical difference over commonly used brush handles (p-value >0.05) in modifying the response of upper limb muscles to fatigue, but the findings of this study were not subjected to individuals with prior history of overuse injuries.¹²

This was the first study in Pakistan done on two subfields participants from fine arts (figurative painting and calligraphy), the painting characteristics which were explored with musculoskeletal wrist pain and CTS were barely studied together in previous literature. A few prevention strategies for CTS and wrist pain were identified for painters including short rest intervals between long projects of art which could also be swapped with recreational activities such as their break slots, wrist flexors and extensors stretching, adjusting the working station (height of chair; placing hips slightly higher than knees), (height of drawing table; placing shoulder in relaxed posture

without hunching), drawing arm should be fully supported and modifying the art tools such as brushes, palette knives with rubber grips to enhance the base of support.²⁴ The limitations of this study were that it was conducted on the students of fine arts department in the universities of 'Sialkot' only which could affect the generalizability of the results, furthermore, workload due to sector differences of universities on the students of fine art's subfields were not explored with overuse syndrome and associated wrist pain.

For future studies, it has been recommended to investigate the ergonomic factors and awkward postures leading to CTS in contrast to the time frame consumed to create the artworks among home-based painters and psychological factors including perceived stress, quality of sleep to determine their relevant contributions to the development of these conditions among professional painters in different fields of work too such as doodling and graffiti artwork.

Conclusion

The results of this study showed an overall 'moderate' symptom severity and functional difficulty level among participants with CTS but figurative painters were more affected by factors including the medium of paints, size of paint brushes, types of paint brushes and working hours than calligraphers.

References

1. Alshagga, M.A., et al., *PREVALENCE AND ASSOCIATED FACTORS OF MUSCOSKELETAL DISORDERS AMONG ARABIC CALLIGRAPHERS LIVING IN SAUDI ARABIA: A CROSS-SECTIONAL STUDY*.
2. Cialone, C., T. Tenbrink, and H.J. Spiers, *Sculptors, architects, and painters conceive of depicted spaces differently*. *Cognitive Science*, 2018. 42(2): p. 524-553.
3. Korhan, O. and A.A. Memon, *Introductory chapter: work-related musculoskeletal disorders*, in *Work-related musculoskeletal disorders*. 2019, IntechOpen.
4. Lund, C.B., et al., *Movements of the wrist and the risk of carpal tunnel syndrome: a nationwide cohort study using objective exposure measurements*. *Occupational and environmental medicine*, 2019. 76(8): p. 519-526.
5. Peshin, S., et al., *Carpal Tunnel Syndrome in Terms of Biomechanics*. Literature Review. *Russ. J. Biomech*, 2022. 26: p. 9-13.
6. Sur Unal, U. and S.S. Cifcili, *The prevalence of performance-related musculoskeletal disorders in fine arts faculty students and academics*. *Work*, 2020. 66(1): p. 125-133.
7. Genova, A., et al., *Carpal tunnel syndrome: a review of literature*. *Cureus*, 2020. 12(3).
8. Roghani, R.S., *Neuropathic Pain in an Elderly Population of an Urban Area of Iran with a Special Focus on Carpal Tunnel Syndrome: Epidemiological Aspects, Clinical Characteristics, and Non-Surgical Therapy*. 2022: Karolinska Institutet (Sweden).
9. Hassan, A., et al., *Work-relatedness of carpal tunnel syndrome: Systematic review including meta-analysis and GRADE*. *Health Science Reports*, 2022. 5(6): p. e888.

10. Keir, P.J., et al., *Relationships and mechanisms between occupational risk factors and distal upper extremity disorders*. Human Factors, 2021. 63(1): p. 5-31.
11. JK, S. and J. AG, *Nerve conduction studies of clinically diagnosed carpal tunnel syndrome patients of different professions*. Pravara Medical Review, 2020. 12(3).
12. Agostinucci, J. and J. McLinden, *Ergonomic comparison between a 'right angle' handle style and standard style paint brush: An electromyographic analysis*. International Journal of Industrial Ergonomics, 2016. 56: p. 130-137.
13. Getchell, C., *Experience and Awareness of Musculoskeletal Disorders among ETSU Student and Faculty Visual Artists*. 2019.
14. Mahmood, T., et al., *Instrument soft tissue mobilization integrated with exercise for musculoskeletal disorders*. Rawal Medical Journal, 2021. 46(3): p. 749-749.
15. Toor, K., Alam, M. M., Akhtar, M. W., Saeed, S., Burhan, M., & Ghaffar, A. (2024). Prevalence of Wrist Pain among Painters . Journal of Health and Rehabilitation Research, 4(1), 618–622. <https://doi.org/10.61919/jhrr.v4i1.449>
16. Zhang, D., et al., *Accuracy of provocative tests for carpal tunnel syndrome*. Journal of Hand Surgery Global Online, 2020. 2(3): p. 121-125.
17. Vladeva, E., *The Boston Carpal Tunnel Questionnaire/Bctq/- a Reliable Method for Diagnosis and Assessment of the Treatment of Carpal Tunnel Syndrome*. International Academy Journal Web of Scholar, 2020(2 (44)): p. 58-63.
18. DIN, M.U., *Association of Work Related Musculoskeletal Wrist Pain and Carpel Tunnel Syndrome among Painters in Lahore*.
19. Anwar, I., et al., *Hand Function among Patients with Carpal Tunnel Syndrome*. Open Journal of Therapy and Rehabilitation, 2019. 7(04); p. 170.
20. Omole, A.E., et al., *An Integrated Review of Carpal Tunnel Syndrome: New Insights to an Old Problem*. Cureus, 2023. 15(6).
21. Mathew, A.E. and T. John, *A clinical and neurophysiological analysis of idiopathic carpal tunnel syndrome with respect to gender and occupation*. Annals of Indian Academy of Neurology, 2021. 24(6): p. 865.
22. Larasati, D. and A.T.D. Sulistiawati, *Original Research Work Period as one of The Risk Factors of Suspected Carpal Tunnel Syndrome (CTS) among Worker in the "X" Furniture Manufacturing, Gresik-East Java 2018*. 2022.
23. Bañez, J.L.M., et al., *Ergonomically Redesigning Paint Spatula Scraper to Reduce Risks Associated to Work-Related Disorders: A Case of Calumpit, Bulacan*.
24. Lozanski, L., *Ergonomics for Fine Arts*.

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