

## Work-Related Upper Extremity Musculoskeletal Pain Korean Baristas

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### 한국의 바리스타들의 업무 관련 상지 근골격계 통증

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**Abstract** The purpose of this study was to investigate the current status of work-related upper extremity musculoskeletal pain in baristas and to identify the elements that are related to pain. The questionnaires were distributed to 100 workers in 63 cafes on Jeonju city in Korea. As a result of investigating work related pain, 65.3% (n=64) answered "yes" to the question that had pain at least once a week, month, or year, or 34.7% (n=34) answered "no". Most of the workers were right-handed, and when they felt pain, they felt 25 to 50% of time per day. Especially, baristas reported that the use of porter filters during work and the tamping operation were the most painful. In conclusion, our study indicated that necessary to introduce and develop a program to prevent cafe worker disease, as well as need to future research to improve work environment and posture according to the characteristics of the cafe works.

**Key Words** : Barista, Work, Musculoskeletal Pain, Wrist flexion, Posture

**요약** 이 연구의 목적은 바리스타에게서 나타나는 작업 관련한 상지 근골격계 통증 상태를 조사하고 통증과 관련된 요소를 확인하는 것이었다. 연구대상은 전주시의 카페 근무자로 하여 통증 현황을 조사하였고 그 중 통증 고위험군을 대상으로 통증 영향 변수를 조사하였다. 업무 관련 통증을 조사한 결과, 65.3%에서 적어도 1주일, 1개월 또는 1년 내에 통증이 있었다고 응답하였다. 대부분의 근로자는 오른손잡이였고 하루의 25~50%의 시간 동안 통증을 느꼈다고 하였다. 특히 일하는 중 포터 필터를 사용하는 것이 가장 고통스럽다고 보고하였다. 향후에 카페 작업자의 질병을 예방하기 위한 프로그램을 도입하고 개발하는 것이 필요하고, 카페 작업의 특성에 따라 작업 환경과 자세를 개선하기 위한 향후 연구가 필요하다.

**주제어** : 바리스타, 작업, 근골격계 통증, 손목 굽힘, 자세

### 1. Introduction

The musculoskeletal pain is commonly issue in the field of barista coffee maker job. One of the most common problems is repeated strain injury

by intensive movement. Many baristas reported that increased the problem of joints due to the repeated stresses in the process to prepare espresso-based beverages such as cappuccinos and lattes[1].

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In fact, the coffee making processes not be required for the heavy work burden, but it is not free to musculoskeletal problems. Workstations is not fit the height of the barista, is narrow workspaces, repetitive work environments, and the shifting of loads of various shapes, are problems in the well-known barista working environment. One of the toughest tasks to many baristas is tamping and removing portafilter during the process of preparing espresso. Especially, tamping is the process of compressing coffee into a filter to make a coffee puck. Most are caused to awkward hand movement and lead to excessive stress in wrists, forearms, elbows, and back. Some studies have been reported that repetitive wrist bending and extension and repeatedly hand squeeze could be lead to compression on the middle nerve and damage the central nervous system[2].

According to the Korea Occupational Safety and Health Agency, occupational disease recognition standards include burden in musculoskeletal system such as duration and time of work, amount and strength of work, work attitude and speed, structure of work place. These are defined as burdensome work. If workers were experienced in one or more tasks that require many repetitive motions, excessive force, improper posture, vibration, or any other burden on body part, they could suffered a musculoskeletal disorder that is like worsened in the arm, leg or waist in work-related disorder. It is defined as work-related musculoskeletal disorders(WRMSDs)[3].

In the past, the musculoskeletal diseases of the cafe workers have been mentioned with the term 'Espresso Maker's Wrist' in the United States[4]. As the coffee industry expands and the number of barista grows in the industry, it is important to identify the degree of work-related pain and prevent potential hazards. However, most of the researches on the musculoskeletal diseases have been studied about nail polishers, hoteliers, farmers, or assembler[5-8]. The purpose of this

study was to investigate the status of musculoskeletal pain in barista and to investigate the variables related to pain affecting them.

## 2. Methods

### 2.1 participants

This study had conducted a self-report questionnaire survey on the status of upper extremity pain in 100 baristas on Jeonju city in Korea. All the participants were informed of the study and agreed upon. As a result, 98 participants were selected as participants of this investigation (excepted two non-responders). Table 1. First, we invested their working type and working period. Second, we used the modified PQRST-test which consist of eight items to confirm their pain aggravation and relief, pain pattern, pain severity, duration of pain. Last, the 42 high-risk participants with a Visual Analogue Scale(VAS) score of 5 or higher point in general condition carried out a Job Strain Index(JSI) assessment and the 'Angulus' evaluation to

Table 1. General characteristic of participants (N=98)

	Classification	Number (N)	Percent (%)
Gender	Female	70	71.43
	Male	28	28.57
Age group	10s	7	7.14
	20s	67	68.37
	30s	14	14.29
	40s	8	8.16
	50s	1	1.02
	N/A	2	2.04
Working type	Everyday	33	33.67
	Weekday	33	33.67
	Weekend	29	29.59
	Fifth day of the week	1	1.02
	N/A	2	2.04
Working period	1-6 Months	41	41.84
	7-12 Months	28	28.57
	13-18 Months	6	6.12
	24-30 Months	8	8.16
	31-36 Months	3	3.06
	42-48 Months	3	3.06
	More than 72 months	5	5.1
	N/A	4	4.08

confirm more specific pain-influencing variables. However, 34 people dropped out due to store discipline and personal reasons, and eight people participated. They received an explanation about the purpose and methods of the study and provided informed consent prior to participation in accordance with the ethical principles of the Declaration of Helsinki.

## 2.2 Instruments

### 2.2.1 Questionnaire in barista's upper extremity pain

The modified PQRST-test was based on the Nordic-style questionnaire and the questionnaires were added the VAS concept to confirm the intensity of pain. The self-report questionnaire consisted of eight items. The modified PQRST-test consists of pain aggravation and relief, pain pattern, pain severity, duration of pain. Fig. 1[9].

### 2.2.2 Job Strain Index; JSI

JSI is evaluation tool which is developed by Moore and Garg(1995) that this study used to evaluate the risk factors of work-related musculoskeletal disorders at upper extremities (hands, wrists, and elbows) for baristas[10]. The JSI items are consisted of intensity of exertion, duration of exertion, efforts per minute, hand / wrist posture, speed of work, and duration of task per day. The JSI score is calculated by multiplying all six coefficients. If the score is less than 3, the job is probably safe, 3 to 7 are considered to be hazardous (Job is probably hazardous), 7 or more considered the risk of developing upper extremity upper extremity disorders[9].

### 2.2.3 Angulus (DPP)

'Angulus' is an application that measures the angle of the body based on images or videos. In this study, we confirmed the exact wrist angle

through the application. It was developed in cooperation with a physical therapist to replace the goniometer and is an application that can measure and record joint range of motion. 3.1.5version had used, and can be downloaded from Google play store.

- ※ The following items are the questions that were related to upper extremity pain of baristas.  
Please read the following questions and answer to the corresponding items.
1. Do you have pain for at least the past year, or recently more than a week or more than once a month? <Yes/No>
  2. Please check your favorite hand during your work. <Right/Left>
  3. How long does the pain last when I feel pain? (No pain/25% of day/50% of day/75% of day/100% of day)
  4. Are there any factors that cause or aggravate your thinking? What do you think pain is when you take a posture? (Using a porter filter/cleaning up inventory/Using a blinder/Washing dishes/others)
  5. Please check the degree of pain you currently feel. (VAS, 0 to 10)
  6. Please check the extent that your pain affects your daily life. (VAS, 0 to 10)
  7. Please check the degree of pain you feel most severe. (VAS, 0 to 10)
  8. Please check the degree of pain you feel most comfortable with. (VAS, 0 to 10)

Fig. 1. The modified PQRST-test (8 items)

## 2.3 Research design

A survey of 100 employees working in 63 cafes in Jeonju area examined the pain risk of baristas. After fully explaining the questionnaire to all participants, I asked them to complete the questionnaires themselves. After completing the questionnaire, we made a reward and collected the questionnaire on the same day. The participants with VAS score of 5 or higher were selected as the high risk group to identify the pain influencing variables. JSI evaluation consent was sent to 42 high risk groups, but 34 people were dropped due to the discipline of the store and personal reasons. Only eight baristas participated in high risk group survey. And, a researcher evaluated the motion of using the porter filter and the motion of tamping for espresso extraction. The wrist angle axis was

measured in the radial styloid process on the anatomical snuffbox. The static bar was positioned parallel to the radius and the moving bar was positioned parallel to the index finger. The survey and evaluation were conducted for a total of 30 minutes and two researchers participated[11].

## 2.4 Data analysis

Descriptive statistics are used to describe the basic features of the data in this study. Statistical analysis was performed with SPSS 24.0 and statistical significance was defined as  $p < .05$ .

## 3. Results

Participants consisted of 70 female and 28 male baristas. They were mainly make up 20s to 30s young people, and had mostly working on weekends or weekdays. Also, their work experience has not exceeded one year. Table 1 As a result of investigating work related pain, 65.3% ( $n=64$ ) answered "yes" to the question that had pain at least once a week, month, or year, or 34.7% ( $n=34$ ) answered "no". Most of the workers were right-handed, and when they felt pain, they felt 25 to 50% of time per day. Especially, baristas reported that the use of porter filters during work and the tamping operation were the most painful. In the items asking the degree of pain, the current pain level was 2.71( $SD=2.07$ ), the impact of daily life level was 2.44( $SD=2.24$ ), the worst pain level was 3.78( $SD=2.81$ ), and the weakest pain level was 1.13( $SD=1.14$ ). Table 2.

The scores of the JSI items of the eight high-risk participants were as follows. Table 3. The JSI score of the high risk group of pain was more than 7 points and classified results that job is probably hazardous. All high risk participants had exposing to one or more of the risks during barista work. These risk factor can be possible to

increase the risk of musculoskeletal disorders at work. In particular, the average flexion angle of the wrist was  $40.43^\circ \pm 15.0$  ( $n = 8$ ) when use of porter filters during work and the tamping operation. Six participants were evaluated as poor and very poor level except two persons. The duration of the 1-day task was confirmed to over 8 hours. Table 4. There were individual differences in duration of power, frequency of power per minute, and work speed, but did not significantly affect SI results. The upper extremity load is mainly due to weight loading and wrist bending when tamping and steam feature hits the surface to break in milk foam, and had confirmed ulnar deviation when using a coffee machine.

Table 2. The descriptive statistics in the modified PQRST-test

Items	Classification	Percentage(%)	Number(N)
Q 1	Yes	65.3	64
	No	34.7	34
Q 2	Left hand	10.2	10
	Right hand	89.8	88
Q 3	No pain	27.5	27
	25% of day	42.9	42
	50% of day	15.3	15
	75% of day	10.2	10
	100% of day	4.1	2
Q 4	Using a porter filter/Tamping	59.1	58
	Cleaning up inventory	8.2	8
	Using a blinder	3.1	3
	Washing dishes	21.4	21
	others	8.2	8
VAS (Mean $\pm$ SD)			
Q 5	Current pain level	2.71 $\pm$ 2.07	
Q 6	Impact on daily life	2.44 $\pm$ 2.24	
Q 7	Worst degree of pain	3.78 $\pm$ 2.81	
Q 8	Weakest degree of pain	1.13 $\pm$ 1.14	

Table 3. The descriptive statistics in JSI

	M	SD	Min	Max
Intensity of Exertion	7.00	3.93	3	13
Duration of Exertion	2.18	.70	1.5	3.0
Efforts per Minute	2.88	.35	2	3
Hand/Wrist Posture	2.13	.58	1.5	3.0
Speed of Work	1.44	.32	1.0	2.0
Duration of task per day	1.00	.00	1.0	1.0
SI Score	125.15	94.74	61	527

Note. M = Mean, SD = Standard Deviation, Min = Minimum value, Max = Maximum value

Table 4. Wrist bend angle when inserting the porter filter (N=8)

Participants	Wrist flexion	Evaluation criteria	Posture	M±SD
A	34.2	Bad	Maked Deviation	40.43 (±15.0)
B	27.5	Fair	Non-Neutral	
C	38.1	Bad	Maked Deviation	
D	62.8	Very Bad	Near Extreme	
E	39.9	Bad	Maked Deviation	
F	23.6	Fair	Non-Neutral	
G	63.8	Very Bad	Near Extreme	
H	33.5	Bad	Maked Deviation	

0-5°: Very Good, 5-15°: Good, 16-30°: Fair, 31-50°: Bad, >50°: Very Bad

#### 4. Discussion

The purpose of this study was to investigate the current status of work-related musculoskeletal pain in baristas and to identify the elements that are related to pain. As a result of analyzing questionnaire data, they were mainly make up 20s to 30s young people, and had mostly working on weekends or weekdays. Also, their work experience has not exceeded one year. As a result of investigating work related pain, 65.3%(n=64) answered "yes" to the question that had pain at least once a week, month, or year, or 34.7%(n=34) answered "no". This suggests that pain had occurred in the joints of the wrists due to the unfamiliar task. In particular, it is that worked of porter filters, tamping, and inventory clearance task involving repetitive and unnecessary forces can increase the incidence of musculoskeletal disorders[12]. Also, the SI score of the high risk group(n=8) of pain was more than 7 points and classified results that job is probably hazardous. In particular, the average flexion angle of the wrist was  $40.43^{\circ} \pm 15.0$  (n = 8) when use of porter filters during work and the tamping operation, and the duration of the 1-day task was confirmed to over 8 hours. Generally, baristas are reported suffering to Low Back

Pain(LBP) overuse in shoulder and neck. These problems cause to non-neutral shoulder and minimize neck postures while making the beverages[13]. Especially, manual tamping is the process of compressing espresso to lead the most awkward spine and upper limb postures. One study also showed problems that were occupational related in 59 baristas, they analyzed in baristas's questionnaires which were related to work duties which is included LBP and shoulder pain caused by their work duties. The results were nearly 73% baristas reported LBP and they said which this pain related in work duties. Also nearly 68% baristas reported shoulder pain, and said to cause by their work duties[1]. As well as, manual tamping task could cause awkward body posture which is vertically pressure about average of 230N in wrist. Previous study indicated that tamping task lead to possibility higher LBP of baristas, and other musculoskeletal problems also reported having shoulder and neck pain but this problem also related to LBP of baristas[14]. Gregory and Romero presented that baristas use porter filter and tamper to make espresso, which caused a lot of pain especially in the wrist. They tried to change from the traditional tamper to a flat-shaped tamper. Tamping using a tamper with a traditional shaped handle had a higher risk of injury than tamping using a specially designed flat-shaped tamper. This suggests that the traditional tamper gripping action results in a change of anatomic posture and a stressful stance on the upper extremity. The findings of this study also show the highest frequency of pain when using the porter filter and tamper[15]. The participants work level was consistent with the Occupational Safety and Health Act (OSH) selection criteria for musculoskeletal burdens, and the baristas had high possible the risks of musculoskeletal diseases[16].

The results of this study confirmed the severity of the pain of baristas and the possibility of high connection to future diseases[17]. Currently, the

number of workers is low compared to the number of coffee users, and the workload is large, which is seriously exposed to risk factors that can cause musculoskeletal pain. In order to solve these problems, it is necessary to provide the work activity guidelines for workers, and propose an appropriate resting time and stretching method[18]. In addition, it is necessary to analyze the work process to understand the problem of work operation and to think about various methods to solve it. Recently, there have been various studies on the methods for preventing musculoskeletal diseases of workers[19–22]. However, there are not many studies on the current status and problems of baristas, so there is a limit to finding fundamental solutions to the problems. This study will be the basic data to support the related research in the future. Our study had some limitations. First, there were a lot of dropouts due to the problem of discipline in business. Second, the method of working was different for each subject even in the same work, and it was difficult to deal with the external variables of the workplace environment. Third, self-report questionnaires and JSI research may have a subjective view. Further study will be necessary to provide work environment and conditions that can work in a more comfortable environment by reducing the incidence of workers' diseases by studying not only musculoskeletal problems experienced by baristas but also psychological problems.

## 5. Result

This study examined the present status of Espresso Maker's Wrist among 100 people in 63 coffee shops. The ratio of 20 workers was high and there were more women than men. The pain complaint rate was the highest in less than one year according to work experience. There was statistically significant correlation between age,

current working period, cumulative working period, daily working time and pain( $p < .05$ ). The greater the intensity and duration of exertion, the more exertion of force per minute, the faster the hand/wrist posture, the faster the work speed, the longer the duration of work per day, the greater the risk of WRMSDs. It was found that the posture, activity load and frequency during the work such as repetitive porter filter use of the worker, dishwashing, inventory clearance, and tamping were in agreement with the risk factors of WRMSDs.

Therefore, it is necessary to develop and introduce a program to prevent disease, as well as future research for improvement of physical working environment and attitude, in accordance with the characteristics of cafe workers working in different working environments.

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