

The body mapping of musculoskeletal complaints for surfers



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ABSTRACT

Background: Surfing is an extreme water sport that consists of various movements, including paddling, popping-up, and wave riding, and has a risk of musculoskeletal complaints. This study aimed to determine the description of musculoskeletal complaints in surfers.

Methods: The study used a descriptive observational design with a cross-sectional approach. This study was conducted from February to May 2023 at the halfway club in Kuta Beach, Sanur Beach, and Canggu Beach using the total sampling technique with a total available population of 60 surfers. We included the sample with inclusion criteria and excluded the sample with exclusion criteria. Fifty-one surfers were eligible for the study. Data collection was carried out by interviews using the Nordic Body Map questionnaire.

Results: Based on the Nordic Body Map questionnaire, musculoskeletal complaints in surfing players in Bali were a score of 2 (somewhat painful); most of them experienced complaints in the right knee (45.10%) and upper neck (39.22%). The risk level for musculoskeletal complaints in surfers in Bali was 46 people (90.2%) with a low-risk level and five people (9.8%) with a moderate risk level.

Conclusion: The most musculoskeletal complaints in surfers in Bali are in the right knee, upper neck, right shoulder, left shoulder, waist, and ankle areas. The risk level for musculoskeletal complaints among surfers in Bali was mainly low, and some had a moderate risk level.

Keywords: musculoskeletal complaints, nordic body map questionnaire, musculoskeletal pain, surfing players.

Cite This Article: Laksmi, P.S.P., Wibawa, A., Widnyana, W., Kinandana, G.P., Vittala, G. 2024. The body mapping of musculoskeletal complaints for surfers. *Physical Therapy Journal of Indonesia* 5(1): 47-51. DOI: 10.51559/ptji.v5i1.187

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Received: 2024-01-22

Accepted: 2024-04-19

Published: 2024-05-27

INTRODUCTION

Surfing is an extreme water sport categorized as an achievement and recreational sport. This sport can also be used as cardiovascular exercise because almost all the muscles in the body are used, from the upper body muscles to the lower body muscles.^{1,2} Surfing includes various activities, namely paddling, popping-up, and wave riding, so this causes surfers to be at risk of musculoskeletal complaints.^{3,4}

Musculoskeletal complaints are disorders or damage to the joints, muscles, ligaments, or other skeletal systems due to improper body position carried out over a long period.⁵⁻⁷ Musculoskeletal complaints also have different terms, namely Musculoskeletal Disorder (MSD), Cumulative Trauma Disorders (CTD), Repetitive Strain Injuries (RSI), and Repetitive Motion Injury (RM). Musculoskeletal complaints are influenced by two factors, namely internal factors

(exercise habits, age, length of service, smoking habits, and body mass index). In contrast, external factors (workload and work position) and musculoskeletal complaints are also caused by excessive muscle contractions and trauma to joints and ligaments.^{5,8}

Surfing players are at risk of experiencing musculoskeletal complaints due to trauma or injury due to excessive and repetitive muscle use. Injuries suffered by surfers include head and neck injuries to lower extremity injuries. According to Nathanson et al., who conducted research with 1348 participants, 447 experienced chronic and 1237 acute injuries. Of the injuries suffered, 13% had bruises, 8% had fractures, 12% had strains or sprains, and 42% had scratches from acute injury. Injuries to the lower extremities, which include dislocations, sprains, and torn meniscus, account for 37%. Injuries to the upper extremities include 37% of injuries

to the head and neck, 35% to the shoulders, such as dislocations and strains, 22% to the hands, such as fractures and dislocations of the fingers, and musculoskeletal strains to the back. 55% of these injuries were caused by contact with one's surfboard, 12% by contact with another surfer's board, and 17% by sea conditions.⁹

Several studies have been conducted abroad regarding the description of musculoskeletal complaints in surfers, but there are differences in the results of these studies. This research has also never been conducted in Bali or Indonesia. Therefore, researchers want to know the description of musculoskeletal complaints in surfers in Bali. Hopefully, this research will help physiotherapists increase their insight. Physiotherapists are also expected to be able to determine appropriate preventive measures and interventions for surfers who experience musculoskeletal complaints so that they remain optimal when surfing.

METHODS

The study used a descriptive observational design with a cross-sectional approach. This research was conducted in February-May 2023. This research was conducted at the halfway club in Kuta Beach, Sanur Beach, and Canggu Beach. The inclusion criteria are male surfers aged 17-40 years, have joined a surf club for at least one year (not in the learning/training process), have experienced complaints of musculoskeletal pain for a maximum of the last month, and can understand research instructions and willing to be a research subject and fill out an informed consent as approval to be a research sample. The exclusion criteria are samples suffering from comorbidities (gout, high cholesterol), samples suffering from joint instability, and samples not participating in or coming during the research.

In this study, the research subjects were surfers aged 17-40 years who belonged to the halfway surfing club located on Kuta Beach, surfers on Sanur Beach, and surfers on Canggu Beach with samples taken using a total sampling technique, namely the entire population was used. The total population of surfing players in Bali is 60 people, and the sample in the study was 51 people who met the inclusion and exclusion criteria.

Quantitative descriptive analysis used an explanation per variable from the surfer, expressed in numbers as a table. The variables collected for the analysis include age, surfing intensity, body mass index, smoking habits, and musculoskeletal complaints. This study was assessed by the Research Ethics Commission of the Faculty of Medicine, Universitas Udayana/ Sanglah Hospital Denpasar, under the number 1682/UN14.2.2.VII.14/LT/2023 and passed the ethical feasibility test. This study obtained informed consent from each sample, and all participants agreed to participate.

RESULTS

Table 1 shows that the age range of surf players with an age range of 17-25 years is 45.1%, an age range of 26-35 is 33.3%, and an age range of 36-45 is 21.6. Then, for the body mass index variable, the skinny category is 0%, the thin category is 2%, the

Table 1. Characteristics of the 51 Surfers

| Characteristics | Category | N | % |
|-----------------------------|------------------|----|-------|
| Age | 17-25 Years | 23 | 45.1 |
| | 26-35 Years | 17 | 33.3 |
| | 36-45 Years | 11 | 21.6 |
| Total | | 51 | 100.0 |
| Body Mass Index | Very underweight | 0 | 0 |
| | Underweight | 1 | 2.0 |
| | Normal | 43 | 84.3 |
| | Overweight | 5 | 9.8 |
| | Obesity | 2 | 3.9 |
| Total | | 51 | 100.0 |
| Surfing intensity hours/day | 1 hour | 8 | 15.7 |
| | 2 hours | 31 | 60.8 |
| | 3 hours | 1 | 2.0 |
| | 4 hours | 10 | 19.6 |
| | 6 hours | 1 | 2.0 |
| | Total | | 51 |
| Average | 2.33 hours | | |
| Surfing Intensity days/week | One day | 7 | 13.7 |
| | Two days | 6 | 11.8 |
| | Three days | 4 | 7.8 |
| | Four days | 5 | 9.8 |
| | Five days | 4 | 7.8 |
| | Six days | 8 | 15.7 |
| | Seven days | 17 | 33.3 |
| | Total | | 51 |
| Average | 4.67 days/week | | |
| Smoking | Yes | 19 | 37.3 |
| | No | 32 | 62.7 |
| Total | | 51 | 100.0 |

normal category is 84.3%, the fat category is 9.8%, and the obesity category is 3.9%. The variable intensity of playing surfing hours/day is 1 hour/day at 15.7%, 2 hours/day at 60.8%, 3 hours/day at 2%, 4 hours/day at 19.6%, 6 hours/day at 2%, and the average intensity of Surfing hours/day is 2.33 hours. Furthermore, for the surfing intensity variable days/week, namely one day/week at 13.7%, two days/week at 11.8%, three days/week at 7.8%, four days/week at 9.8%, five days/week was 7.8%, six days/week was 15.7%, seven days/week was 33.3%, and the average intensity of surfing days/week was 4.67 days. Fifty-one surfers smoke and don't smoke, of which 19 people smoke and 32 don't.

Table 2 shows the distribution of musculoskeletal complaints among surfers in Bali. The majority of surfers with a score of 2 (somewhat sick) experienced complaints on the right knee (45.10%) and upper neck (39.22%). In contrast, surfers with a score of 3 (sick) experienced

complaints on the right shoulder (21, 57%) and left shoulder (19.61%), and surfers with a score of 4 (very painful) experienced complaints in the waist (9.80%), and left ankle (5.88%).

Table 3 shows the risk level of musculoskeletal complaints experienced by surfing players in Bali. Most of the surfing players had a low-risk level of musculoskeletal complaints of 46 people (90.2%), and there were only five people (9.8%) with a moderate risk level.

DISCUSSION

Age is one of the factors that influence the occurrence of musculoskeletal complaints. In general, skeletal muscle complaints begin to be felt at 30 years and continue to increase at 40 years and above. This is due to scientific biological changes. Muscle strength and endurance begin to decline due to increasing age, for example, degenerative tendons, muscles, joints, and

Table 2. Distribution of musculoskeletal complaints in 51 surfers

| No | Questions | Level of pain in percentage (%) | | | |
|----|----------------------------------|---------------------------------|------|------|-----|
| | | 1 | 2 | 3 | 4 |
| 0 | Pain/stiffness in the upper neck | 43.1 | 39.2 | 13.7 | 3.9 |
| 1 | Pain/stiffness in the lower neck | 80.4 | 15.7 | 2 | 2 |
| 2 | Pain in the left shoulder | 47.1 | 31.4 | 19.6 | 2 |
| 3 | Pain in the right shoulder | 52.9 | 23.5 | 21.6 | 2 |
| 4 | Pain in the left upper arm | 92.2 | 3.9 | 3.9 | 0 |
| 5 | Back pain | 86.3 | 11.8 | 0 | 2 |
| 6 | Pain in the right upper arm | 94.1 | 3.9 | 2 | 0 |
| 7 | Back pain | 49 | 23.5 | 17.6 | 9.8 |
| 8 | Pain in the buttocks | 94.1 | 0 | 3.9 | 2 |
| 9 | Buttock pain | 100 | 0 | 0 | 0 |
| 10 | Pain in the left elbow | 82.3 | 17.6 | 0 | 0 |
| 11 | Pain in the right elbow | 88.2 | 9.8 | 0 | 2 |
| 12 | Pain in the left forearm | 78.4 | 11.8 | 7.8 | 2 |
| 13 | Pain in the right forearm | 76.5 | 13.7 | 7.8 | 2 |
| 14 | Pain in the left wrist | 70.6 | 25.5 | 3.9 | 0 |
| 15 | Pain in the right wrist | 70.6 | 21.6 | 7.8 | 0 |
| 16 | Pain in the left hand | 84.3 | 15.7 | 0 | 0 |
| 17 | Pain in the right hand | 84.3 | 15.7 | 0 | 0 |
| 18 | Pain in the left thigh | 98 | 2 | 0 | 0 |
| 19 | Pain in the right thigh | 98 | 2 | 0 | 0 |
| 20 | Pain in the left knee | 51 | 29.4 | 17.6 | 2 |
| 21 | Pain in the right knee | 43.1 | 45.1 | 7.8 | 3.9 |
| 22 | Pain in the left calf | 94.1 | 5.9 | 0 | 0 |
| 23 | Pain in the right calf | 98 | 2 | 0 | 0 |
| 24 | Pain in the left ankle | 60.8 | 21.6 | 11.8 | 5.9 |
| 25 | Pain in the right ankle | 52.9 | 29.4 | 13.7 | 3.9 |
| 26 | Pain in the left leg | 88.2 | 11.8 | 0 | 0 |
| 27 | Pain in the right leg | 84.3 | 15.7 | 0 | 0 |

Table 3. Overview of the risk level of musculoskeletal complaints in 51 surfers

| Risk Level | N | % |
|------------|----|-------|
| Low | 46 | 90.2 |
| Moderate | 5 | 9.8 |
| High | 0 | 0 |
| Very high | 0 | 0 |
| Total | 51 | 100.0 |

ligaments, so the risk of muscle complaints increases.¹⁰⁻¹²

This study was supported by research conducted by De Moraes et al. (2013), where in this study, the frequency of Surfing was 2-4 times a week, and the time or duration of Surfing was 2-4 hours per day. In this study, 19 subjects smoked with a percentage of 37.3%, and 32 people who did not smoke with a rate of 62.7%.¹³ According to Tjahayingtyas (2019), he explains that smoking is one of the factors in musculoskeletal complaints because the nicotine content in cigarettes causes reduced blood flow to the tissues and can also cause a reduction in mineral

content in the bones, thus causing pain due to cracks or damage to the bones. The chemicals in cigarettes also interfere with muscle metabolism, which can cause muscles to become weak and susceptible to injury. Smoking can also cause increased production of free radicals, damaging muscle cells.⁵

This research was conducted on surfers in Bali with an average surfing intensity of \pm 3 hours per day. Based on musculoskeletal complaints in this study, the results showed that most subjects experienced complaints in the right knee area, upper neck, right shoulder, left shoulder, waist, and ankles. Surfing for a long time can

cause musculoskeletal complaints. This is supported by research conducted by Barbosa-Sequeira et al. (2023), which discusses musculoskeletal complaints experienced by surfers, mainly in the shoulders, head and neck, trunk, elbows, wrists, ankles, lower legs, knees, hands, and forearms.¹⁴ According to Remnant (2017), musculoskeletal complaints in surfers are caused by several movements, including paddling or rowing, popping up, and wave riding. Paddling or paddling surfers spend around 44-54% of their time. This movement requires alternating trunk extension, shoulder flexion, and extension positions, and a slight elbow flexion, neutral wrist, and finger extension accompany it.^{15,16}

According to Furness et al. (2015), paddling movements also involve muscle groups, with abduction, adduction, and internal rotation movements. During this movement, there may be an asymmetry of muscle strength in the shoulder between

the internal and posterior external rotators. So, this paddling movement can cause musculoskeletal complaints in surfers' upper neck, waist, right shoulder, and left shoulder in Bali. Popping up is from a prone position to a standing position, which starts with the surfer pushing his legs and lifting his thighs so that he is in a plank position. After that, the surfer swings his legs quickly to a stand-up position; this movement is combined into one in a matter of seconds, so this is risky and causes complaints about ankles and knees in surfers in Bali. When riding waves, Wave riding or standing position requires dynamic postural control that alternates quickly between trunk flexion, extension, and lateral twisting and rotation with lower limb movement.^{17,18}

In wave riding, surfing players need alternating isometric and concentric contractions of the leg muscles to achieve standing balance, muscle power, and joint flexibility. Balance components included visual input, vestibular, and proprioceptive. Balance and coordination are crucial for sports and other physical activities.¹⁹ Controlling a surfboard requires joint motions and ankle strength in isolation and combination with plantarflexion, dorsiflexion, inversion, and eversion. In maintaining a surfing board over the waves, the ankle also experiences excessive pressure; this pressure can cause tension in the muscles and ligaments around the ankle. So, this wave-riding movement can cause musculoskeletal complaints in surfers' ankles in Bali.^{20,21} If work activities with poor work postures are repeated continuously, it will cause strain on the muscles that can reduce circulation in the tissues.²²

This study has significant research limitations. First, the sample size was small. Second, the difficulty of controlling factors affecting measurement results in surfers, such as gender, nutritional factors, socioeconomic factors, and type of physical activity, can affect the condition of surfers. As a result, it is proposed that future studies be undertaken with a bigger sample size.

CONCLUSION

Musculoskeletal complaints in surfers in Bali are the most common complaints in

the areas of the right knee, upper neck, right shoulder, left shoulder, waist, and ankles. The risk level for musculoskeletal complaints in surfers in Bali was primarily low, and some had a moderate risk level.

ETHICAL CLEARANCE

This study received approval from Universitas Udayana/ Sanglah Hospital Denpasar under registration number 254/UN14.2.2.VII.14/LT/2023 Informed agreement from the respondents to the survey was also provided, which approved the use of sampling.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

FUNDING

No organization has provided funding for or sponsorship of this study.

AUTHOR CONTRIBUTIONS

PSPL prepared the research design concept, wrote the manuscript, and analyzed the data. AW, MW and PK directed data collection and revised the manuscript. GV helped find samples and assisted with data collection.

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