
ENHANCING RECREATIONAL SPORTS EXPERIENCE: A STUDY ON ERGONOMICS IN LUMINTANG FIELD, DENPASAR

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ABSTRACT

Lumintang Field is utilized as a recreational sports facility. An ergonomic assessment is necessary to ensure that individuals can engage in recreational sports activities in a healthy, safe, comfortable, effective, and efficient. The objective of this study is to evaluate the ergonomic aspects of the recreational sports facilities at Lumintang Field. The data was collected through observations, measurements, and interviews carried out with users, vendors, and staff members. Lumintang Field offers a sufficient supply of drinking water and a canteen. Recreational sports participants have limited knowledge concerning the appropriate exercise load, which can result in adverse consequences such as sports injuries. Regarding body posture aspects, attention should be given to the compatibility of anthropometric dimensions of gymnastic equipment to ensure safe usage for all age groups. In terms of environmental conditions, Lumintang Field offers a comfortable environment for exercising during the day, with good air circulation and shade provided by trees. Lumintang Field can be used throughout the day, but sports activities tend to be carried out in the morning and evening. Some rule violations were also identified, such as bringing dogs and smoking. The research recommendations include improving the anthropometric dimensions of gymnastic equipment and enhancing lighting in specific areas. In order to achieve optimal utilization, ergonomic research and practices are highly necessary for the design and maintenance of recreational sports facilities.

Keywords : *Ergonomics, Recreational Sports, Lumintang Field*

INTRODUCTION

The awareness of health is increasing in society today. Many people are beginning to realize the importance of maintaining physical fitness and overall well-being. As a result, more and more individuals are becoming actively engaged in sports and recreational activities as part of their healthy lifestyle. Recreational sports have become a popular choice among various age groups, ranging from children to adults and the elderly. These activities provide opportunities for fun, socialization, and overall improvement in quality of life ¹.

The government has also recognized the significance of recreational sports in society and has provided several sports facilities to meet these needs. These facilities include parks, fields, bike paths, swimming pools, and other amenities that enable the community to participate in recreational sports activities easily. These activities not only offer physical benefits but also provide opportunities for socializing and enjoying leisure time with family and friends.

Denpasar city is one of the cities actively promoting recreational sports among its residents. One prominent sports facility that has garnered attention is Lapangan Lumintang, which has become a primary destination for the community to engage in various recreational sports activities. This field holds great potential in supporting recreational sports activities in the city ².

In optimizing the use of Lapangan Lumintang, it is important to consider ergonomic aspects in the design and arrangement of the existing infrastructure. The ergonomic aspects include task, organization,

and environment. In the task aspect, the analysis focuses on work posture, workload, and the compatibility between the tools and the anthropometry of the users. The organizational aspect covers nutrition, information, and facility arrangement. The environmental aspect includes lighting, noise, temperature, humidity, and biological environment.³

Ergonomics plays a crucial role in ensuring that sports facilities meet user needs and create a safe, comfortable, and efficient environment^{4,5}. Although some sports facilities may have been provided by the local government, a detailed study on the ergonomic aspects of the infrastructure in Lapangan Lumintang is still needed.

Through this research, it is expected to gain a deep understanding of the conditions and user needs related to sports infrastructure in Lapangan Lumintang. Furthermore, this study aims to provide concrete recommendations that can enhance the design and arrangement of sports infrastructure, considering ergonomic factors related to safety, comfort, and effectiveness of facility utilization.

METHODS

The purpose of this research is to examine the ergonomic aspects of recreational sports activities at Lapangan Lumintang and provide appropriate improvement recommendations. The research was conducted using observation, interviews, and environmental condition measurements. Interviews were conducted with 15 users, 2 vendors, and a field officer. The research instruments used included observation sheets, interview questionnaires, a lux meter, a sound level meter, and a sling thermometer. Data collection took place on Wednesday, April 5, 2023, from 6 AM to 7 PM (during that time, Lumintang Field is used for recreational sports activities). Data analysis was conducted both quantitatively for environmental condition measurements and qualitatively for interview and observation results. During the interviews, respondents were asked for verbal consent, and the confidentiality of respondents' identities was ensured. The ergonomic study in this research covers several important aspects, including nutritional needs (energy), muscle exertion, body posture, environmental conditions, time conditions, social conditions, information conditions, and human-machine interactions⁶.

RESULTS

Lapangan Lumintang is intended as a recreational facility for the community. The provided amenities include a water fountain show, picnic areas, a stage for performances, and several sports facilities such as a jogging track, yoga or aerobics areas, and various gymnastic equipment (refer to Figure 1 and Figure 2). This field has become a popular spot for individuals seeking a healthy and active lifestyle. There are several types of recreational sports commonly practiced by the community at Lapangan Lumintang, including jogging, yoga, aerobics, rotary torso exercise, push-ups, pull-ups, dips, and other body weight exercises. People can be seen engaging in these activities at the field from 6 a.m. to 7 p.m.



Figure 1. Jogging Track



Figure 2. Gymnastic Equipment

a. Nutritional needs

At Lapangan Lumintang, a clean drinking water source has been provided for visitors. Additionally, there is a canteen that offers a variety of food and beverages to meet the nutritional needs of recreational sports participants. The canteen provides a range of options, including natural foods such as fruits as well as packaged preserved foods.

b. Muscle strength

Based on interviews conducted with recreational sports participants at Lapangan Lumintang, it was found that they have limited knowledge about the principles of proper exercise dosage. Physical activities are performed based on estimation and personal feelings. Unfortunately, this lack of knowledge can have negative consequences, such as injuries during exercise. Five respondents (30%) have even experienced knee injuries believed to be caused by pushing themselves to run without adequate warm-up.

c. Body posture

Recreational sports at Lapangan Lumintang involve people of all ages, from children to the elderly. One popular activity is running or walking on the available jogging track. In this regard, it was found that the body postures of users are in line with their anthropometry, providing comfort and safety during exercise.

Regarding the provided gymnastic equipment, there are issues related to anthropometry. The equipment is designed based on adult anthropometry, making it unsafe for use by children. Nevertheless, curious children often try to play with the gym equipment without considering the suitability of anthropometry (refer to Figure 2). This can pose safety problems during the use of such equipment.

d. Environmental conditions

Sports activities at Lapangan Lumintang are conducted outdoors and rely on natural lighting. During the nighttime, there are limited lighting fixtures primarily intended for illuminating the paths, making it preferable to engage in sports activities during the morning to afternoon. Further information regarding light intensity and environmental conditions can be found in Table 1 and Table 2.

Table 1. Environmental Conditions in the Gymnastic Area

Time	Light Intensity (Lux)	Air temperature (°C)	Humidity (%)	Sound intensity (dBA)
06.00	34	23	89	68
07.00	780	24	87	68
08.00	1243	26	83	69
12.00	1335	29	71	67
17.00	965	28	79	71
18.00	198	27	81	69
19.00	26	27	84	72

Table 2. Environmental Conditions in the Jogging Track

Time	Light Intensity (Lux)		Air temperature (°C)	Humidity (%)	Sound intensity (dBA)
	Shaded Area	Open Area			
06.00	56	302	23	89	75
07.00	1205	4856	24	87	78
08.00	3478	54086	26	83	78
12.00	5487	78567	29	71	78
17.00	1127	4584	28	79	79
18.00	203	535	27	81	78
19.00	16	24	27	84	78

Air temperature at Lapangan Lumintang is perceived as comfortable by visitors, even during daytime (refer to Table 1 and Table 2). This is due to the presence of large shade trees that provide protection from the sun and ensure good air circulation. These trees help maintain a comfortable and healthy environment for sports activities during the day.

The main source of noise around Lapangan Lumintang comes from vehicles on the nearby highway. The sound intensity by the roadside can reach up to 86 dBA. The presence of trees surrounding the field

helps to mitigate the noise, resulting in a maximum sound intensity of 79 dBA on the jogging track adjacent to the highway (refer to Table 2). Additionally, there is noise caused by a visitor's dog while exercising on the jogging track. When the dog barks, the sound intensity can reach 96 dBA. Furthermore, the presence of cigarette smoke from cleaning personnel or visitors around the jogging track can also disturb the comfort of the sports activities.

In terms of biological environment, there are mosquitoes at Lapangan Lumintang that have the potential to spread diseases such as dengue fever and chikungunya. Therefore, it is important to take preventive measures, such as regular fogging or mosquito breeding site elimination, to maintain environmental cleanliness and health.

e. Time conditions

Lapangan Lumintang can be used throughout the day, both during the day and at night. However, sports activities are usually conducted in the morning and afternoon. Individuals participating in sports independently manage their activity and rest schedules.

f. Social conditions

Despite written prohibitions, there are still violations of rules, such as bringing dogs and smoking. These habitual violations can negatively affect other users.

g. Information conditions

There are several signboards displaying the applicable regulations at Lapangan Lumintang to maintain cleanliness, safety, and comfort for all users. The prohibitions include no smoking, damaging facilities, skateboarding, damaging plants, sleeping on benches, littering, selling goods, bringing pets, driving vehicles, consuming alcoholic beverages, and shooting birds.

In addition, Lapangan Lumintang provides information about the availability of drinking water facilities to meet the hydration needs of users. However, there is currently no information available on how to use the provided gymnastic equipment at the field. As a result, the use of such equipment relies on instinct and personal skills.

h. Human-machine interaction

Human-machine interaction is found in the use of gymnastic equipment (refer to Figure 2). The size of the equipment is designed according to adult anthropometry. Some equipment lacks adequate handles, making them slippery when used with wet or sweaty hands.

DISCUSSION

a. Nutritional needs

Sports activities require an adequate intake of energy and fluids. During exercise, the body loses fluids through sweat to help regulate body temperature. The availability of readily accessible drinking water at Lumintang field plays a crucial role in meeting the hydration needs of active visitors. With easy access to drinking water, athletes can maintain their body fluid balance and avoid dehydration. Dehydration can disrupt normal body functions, reduce performance during exercise, and increase the risk of injury. A 2% loss of body weight in fluids can affect physical performance. Dehydration can reduce muscle strength, endurance, concentration, and reaction time. It can also lead to faster fatigue during exercise. When the body loses fluids, muscle work becomes more challenging and requires more energy to function properly. Sufficient hydration after exercise aids in the body's recovery process. Replacing lost fluids and electrolytes through sweat helps restore the body's balance and accelerates muscle recovery^{7,8}. In addition, the presence of a canteen providing food and beverages at Lumintang field significantly contributes to meeting the nutritional needs of visitors. During exercise, the body requires an adequate amount of energy to perform physical activities optimally⁹. A canteen that offers healthy food and drinks can help meet these energy and fluid needs. It is important to remember that each individual has different nutritional requirements

depending on factors such as age, gender, activity level, and the goals of their sports activities¹⁰. Therefore, it would be better if the food and drinks sold at the canteen include information about their energy content. Visitors are afforded the opportunity to select food and beverage options that are in line with their specific nutritional requirements. In conjunction with offering wholesome food and drinks, it is imperative to provide education on nutritional needs. The administrators of Lumintang Field possess the capacity to disseminate information pertaining to the energy and nutrient intake necessary for different types of sports activities. With a good understanding of nutritional needs, athletes can plan their diets effectively to achieve their sports goals.

b. Muscle Strength

Sports activities require significant muscle strength, and the level of training load can vary depending on the type of activity⁹. Without proper knowledge of the appropriate exercise dosage, athletes may not be able to engage in their sports activities effectively and increase the risk of injury. Therefore, it is important to accurately measure the level of physical load applied during training to help achieve sports targets related to fitness improvement while avoiding injuries caused by excessive training loads¹¹. Education on effective sports practices for improving fitness needs to be conducted. The managers of Lumintang field can organize educational sessions involving recreational athletes or create posters placed around the field. This education can include explanations about the importance of understanding healthy training loads, adequate warm-up before exercise, as well as effective and safe training techniques. With better knowledge, athletes can engage in sports activities more effectively, achieve their fitness goals, and reduce the risk of unwanted injuries.

c. Body Posture

The presence of gymnastic equipment at Lumintang field attracts visitors, including curious children who want to try them. It is important to understand that the designed gymnastic equipment is based on adult anthropometry and may not be suitable or safe for children with different anthropometric measurements. Differences in body size, arm length, and height can affect comfort and safety when using the equipment¹¹. Adjustments and redesigns of the existing gymnastic equipment at Lumintang field need to be made. In the redesign process, special attention should be given to safety aspects and suitability with children's anthropometry. This way, children can participate in sports activities safely and get the maximum benefits.

Furthermore, it is important to provide understanding to visitors of Lumintang Field, especially children, regarding the proper use of gymnastic equipment according to their size and anthropometry. Educating them about the importance of safety during sports activities and the use of appropriate equipment can help reduce the risk of injuries or accidents that may occur¹¹.

d. Environmental conditions

The illumination at Lumintang Field is insufficient at 6 a.m. due to low light intensity, which can pose a risk of accidents during sports activities¹¹. However, the lighting conditions are adequate if activities are conducted from 7 a.m. until 6 p.m. Therefore, it is recommended to engage in sports activities on the field during that time range. Activities are not recommended during the evening due to inadequate lighting.

The ideal temperature for exercising is within the range of 18°C to 24°C¹¹. Therefore, sports activities at Lumintang Field should preferably be carried out in the morning until 7 a.m. As the time progresses past 7 a.m., the air temperature increases and reaches its peak during the midday with a temperature of up to 29°C. In the afternoon, the air temperature is higher than the ideal temperature for exercising, so it is advised to avoid overly intensive physical activities during that time¹².

The comfortable air humidity for sports activities ranges from 40% to 60%. Humidity above 60% can disrupt the sweat evaporation process and body thermoregulation. High humidity also increases the risk of fatigue and heat exhaustion. Therefore, in humid conditions, it is important to ensure adequate fluid intake and avoid overly intense exercises. Temperature and air flow are also crucial factors in exercise comfort. The ideal combination of temperature and humidity may vary depending on individual preferences and the

type of activity being performed ¹¹. The interview results indicating that all respondents feel comfortable while exercising at Lumintang Field indicate that the combination of temperature, humidity, and air flow is satisfactory.

The noise level at Lumintang Field is acceptable. With a maximum intensity of 79 dBA, people can exercise without worrying about hearing impairments. Activities are allowed for up to 8 hours in an environment with a noise intensity of up to 85 dBA ¹¹.

The presence of cigarette smoke at Lumintang Field requires attention. Cigarette smoke can be detrimental to health, especially during physical activities when the body's respiration increases ¹⁰. Therefore, it is recommended to avoid cigarette smoke in the surrounding area of the sports facility to minimize its adverse effects.

During the course of the study, dengue fever cases in Denpasar were increasing ¹³. The presence of mosquitoes as vectors of dengue fever increases the risk of infection for recreational sports participants at Lumintang Field. Therefore, it is advisable to regularly carry out fogging or mosquito breeding site eradication as a preventive measure to maintain cleanliness and prevent the spread of diseases

e. Time conditions

In the previous discussion, it was mentioned that the illumination at Lumintang Field is inadequate during the nighttime, making sports activities in the evening less advisable. Although there is no official prohibition, individuals who engage in sports activities independently regulate their activity and rest time.

In relation to this, it is recommended to provide warnings to those who intend to engage in sports activities in the evening about the higher risks due to insufficient lighting. Moreover, it is recommended to take measures to ensure sufficient lighting during nighttime hours, including the installation of supplementary lights that can enhance visibility and promote the safety.

f. Social conditions

It is imperative to take decisive actions in response. The authorities or officials at Lumintang Field should directly address individuals who breach these rules. Direct reprimands can effectively raise awareness among the violators regarding the consequences of their actions and the significance of adhering to the established regulations. These officials can provide explanations regarding the adverse impacts associated with bringing dogs or smoking in the sports area, encompassing concerns related to safety and health.

Furthermore, alongside direct reprimands, it is crucial to implement sanctions or repercussions for those who violate the rules. This may involve imposing bans or restrictions on entry or facility usage for individuals who consistently disregard the regulations. Additionally, stricter monitoring should be enforced to proactively prevent such infractions.

The collective efforts are aimed at establishing a secure, pleasant, and healthy environment for all users of Lumintang Field. By consistently enforcing reprimands and sanctions, it is anticipated that the frequency of violations will be minimized, enabling users to fully enjoy the sports facilities without disruptions caused by non-compliant behavior.

g. Information conditions

The gymnastic equipment available at Lumintang Field serves as a means to complement the users' sports activities. However, without clear information regarding the proper use of these tools, users may rely on instinct or try them out without understanding the correct techniques. This can pose risks of injuries or ineffective use ¹¹.

By providing complete and clear information about the use of gymnastic equipment, users can utilize the facilities optimally and safely. The information provided may include proper usage techniques, instructions for safe and effective use, as well as maintenance and safety guidelines for the equipment. It will lead to optimal benefits of their workouts and avoid the risk of injuries.

Information about the use of gymnastic equipment can be provided in the form of written guides,

posters, or information boards placed near each gymnastic tool. The information should be strategically placed and easily visible to users. The content of the information should be clear, and easily understood.

h. Human-machine interaction

The use of gymnastic equipment should be comfortable and safe. It is important to align the sizes of gymnastic equipment with the anthropometric measurements or body dimensions of the users. Equipment that is either too large or too small can lead to difficulties during usage and potentially increase the risk of injuries ¹¹. A good grip ensures that users can maintain stability and avoid slipping when using the equipment, especially when hands are wet or sweaty. It is important to ensure that gymnastic equipment is equipped with adequate and moisture-resistant grips. By considering ergonomic aspects, human-machine interaction in the use of gymnastic equipment can be enhanced, allowing users to experience a more comfortable, safe, and efficient sports activity ¹¹.

CONCLUSION

Based on this research, it can be concluded that ergonomic assessment of recreational sports facilities at Lapangan Lumintang plays a significant role in enhancing user experience and safety. In order to optimize the utilization of Lapangan Lumintang, it is recommended to make improvements and adjustments to the design and arrangement of sports facilities based on ergonomic aspects. Concrete recommendations such as improving the anthropometry of gymnastic equipment, enhancing lighting in specific areas, managing noise, and implementing mosquito prevention measures can enhance the quality of recreational sports experience at Lapangan Lumintang.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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