

Original Research

Occupational Safety and Health (OSH) Risk Perception Among Adventure Tourism Workers in Yogyakarta

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ABSTRACT

The adventure tourism sector is characterized by innate risks, making the Occupational Safety and Health (OSH) risk perception of its workers a critical element in preventing accidents. Understanding what workers perceive as high-risk is fundamental to elaborating effective safety management systems. This study aimed to identify and analyze the OSH risk perceptions among workers in the adventure tourism sector in Yogyakarta, Indonesia. A semi-quantitative, cross-sectional survey was conducted with 68 adventure tourism workers. Participants rated the consequences and likelihood of 43 specific hazards related to their work environment, equipment, and human factors. The data was analyzed using descriptive statistics to identify the highest and lowest perceived risks. Preliminary findings indicate the highest overall risks perceived by workers involve human factors and equipment deficiencies. These include dealing with inexperienced tourists, the presence of untrained seasonal workers, poor physical condition of participants, slips, trips, and falls from height, and the use of improper or substandard equipment. Hazards perceived to have the most severe consequences are primarily systemic failures, such as the failure to provide for extreme conditions, the use of substandard equipment, the absence of required safety equipment, and the failure to inspect and maintain equipment. In terms of frequency, workers most often reported experiencing business pressure to operate under any circumstances and dealing with inexperienced tourists. These results highlight a pressing need for focused interventions, including comprehensive tourist briefings, mandatory training for all staff, rigorous equipment safety protocols, and the establishment of a stronger safety culture to mitigate the most prominent risks in the adventure tourism industry.

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Introduction

Tourism stands as a cornerstone of the Indonesian economy, acting as a significant catalyst for national and regional economic growth. The sector's high multiplier effect accelerates economic development, establishing it as a national priority (Magalhães, 2023). In regions like Yogyakarta, tourism is pivotal, supporting the local economy by attracting a substantial number of domestic and international visitors to its diverse array of over 200 attractions and increasing regional income (Nurainina & Asmara, 2022). This landscape is increasingly characterized by a growing demand for adventure tourism, with activities such as hiking, rafting, and mountain biking gaining significant popularity (Oentoro & Wiyatiningsih, 2022). However, this expansion is not without its challenges.

The inherent nature of adventure tourism involves exposure to environments and activities with elevated levels of risk, leading to a corresponding increase in the potential for accidents and injuries (Jenkins, 2019).

Fatalities and serious injuries within the adventure tourism sector are a growing global concern, highlighting the critical need for robust safety management (Wang et al., 2019). Incidents are often linked to the unique and unpredictable environments in which these activities take place, from treacherous mountain terrains to turbulent river currents (Hanna et al., 2019). The problem is often compounded in settings where the industry includes many informal operators who may lack access to formal OSH training and resources, making their workers particularly vulnerable (Sukismanto et al., 2023). This underscores a critical gap between the sector's rapid growth and the implementation of adequate safety protocols.

At the heart of effective safety management lies the concept of risk perception, defined as an individual's subjective assessment of the probability and severity of a potential negative event (Mangifesta et al., 2021; Mufidah & Tejamaya, 2019). Literature consistently demonstrates a strong correlation between risk perception and safety behavior; workers who perceive higher levels of risk are significantly more likely to adhere to safety procedures and engage in protective behaviors (Arezes & Miguel, 2008; Jafari et al., 2019). Conversely, an underestimation of risk can lead to complacency and an increase in unsafe acts (Qiu et al., 2024). This subjective judgment is influenced by a complex interplay of sociodemographic factors (e.g., age, experience), psychosocial elements (e.g., stress, prior experience with injury), and organizational context (e.g., safety climate, management commitment) (Ahamad et al., 2022; Ghimire et al., 2023). While these relationships are well-documented in high-risk industries such as construction and manufacturing, there is a notable scarcity of research examining OSH risk perception specifically within the unique context of Indonesia's adventure tourism sector. This sector is distinct due to its blend of formal and informal operations, its direct interface with unpredictable natural environments, and its fundamental reliance on managing the safety of paying clients.

Therefore, understanding how adventure tourism workers perceive the risks inherent in their profession is not merely an academic exercise but a crucial first step toward developing targeted, effective safety interventions. By identifying the hazards that workers themselves deem most significant, stakeholders can move beyond generic safety guidelines to address the specific, on-the-ground realities of the industry. The purpose of this study is to identify and analyze the OSH risk perceptions among workers in the adventure tourism sector in Yogyakarta, focusing on what they perceive as the most significant hazards in terms of consequence and likelihood.

Method

This study used a cross-sectional, semi-quantitative survey design to explore the OSH risk perceptions of adventure tourism workers. This method was chosen because it captures perceptions, attitudes, and demographic details of a sample from the target population at a single point in time. This approach allowed for a descriptive analysis of key variables (Kumar, 2019).

The study included individuals working in the adventure tourism sector in the Special Region of Yogyakarta, Indonesia. A total of 68 respondents (N=68) participated in the study. Participants were chosen through a non-probabilistic, accidental sampling method. Researchers approached potential respondents at various adventure tourism sites, operational hubs, and industry-related events (Kumar, 2019). To qualify, participants needed to be currently employed in the adventure tourism sector and aged between 17 and 58 years.

Data were collected with a structured questionnaire designed based on existing literature and specific industry hazards. The questionnaire had two main sections. The first section collected sociodemographic details from respondents, including age, highest level of education, and years of experience in the adventure tourism field. The second section contained a risk perception matrix with 43 specific hazards related to adventure tourism operations. This list was based on a foundational study by Bentley et al. (2001). For each hazard, respondents rated two aspects on Likert-type scales: their view of the potential consequences (severity) and their view of its likelihood (frequency). The consequence scale ranged from 'Tidak ada' (None) to 'Sangat Besar' (Very Large), while the likelihood scale went from 'Tidak Pernah' (Never) to 'Sangat sering' (Very Often).

The quantitative data from the questionnaires were analyzed using descriptive statistical methods. Frequencies and percentages summarized the sample's demographic profile. For the risk perception data, the responses for both consequence and likelihood of each of the 43 hazards were tabulated. The analysis focused on identifying hazards that had the highest frequency counts in the upper categories of the rating scales. This included consequences rated as 'Besar' (Large) or 'Sangat Besar' (Very Large), likelihoods rated as 'Sering' (Often) or 'Sangat sering' (Very Often), and overall risk levels rated as 'Tinggi' (High). This method enabled a systematic identification and ranking of the most significant perceived risks among the surveyed workers.

The research followed established ethical principles. All participants received a clear explanation of the study's purpose and procedures before agreeing to participate. Informed consent was collected from each respondent, who was assured that their responses would remain anonymous and confidential. The collected data were used solely for this research (Kumar, 2019).

Results

The analysis of the survey data provides a detailed profile of the respondent cohort and reveals distinct patterns in their perception of occupational risks. The findings are presented in four parts: a description of the sample's demographic characteristics, an analysis of the hazards perceived as most dominant, a review of hazards considered peripheral, and an exploratory discussion on the influence of demographic factors on risk perception.

Discussion

1.1 Characteristics of the Respondent

The 68 adventure tourism professionals participating in this study represent a diverse range of age cohorts, educational qualifications, and professional experiences. Table 1 provides a comprehensive overview of these characteristics within the workforce.

The age distribution indicates a mature workforce, with the largest proportion of respondents, 41.2%, falling within the 35 to 45 age range. This is followed by individuals aged 25 to 35, who constitute 26.5% of the sample. The majority of workers possess considerable life and professional experience, while those under the age of 25 account for 7.4%, and workers over the age of 55 represent 4.4%.

In terms of educational attainment, the sample demonstrates a high level of education. Exactly 50.0% of respondents hold a bachelor's degree or an applied bachelor's degree (S1/D4). The subsequent largest group comprises high school graduates at 32.4%. The remaining respondents possess postgraduate degrees (Master's/Professional or Doctorate) as well as diplomas. This elevated level of formal education enhances the workforce's capacity to comprehend and manage complex information, including safety protocols.

The professional experience among this group is varied, contributing to a dynamic work environment. The largest segment, 29.4%, has less than five years of industry experience, indicating a consistent influx of new talent. Conversely, nearly half of the

respondents, 48.5%, boast more than ten years of experience. This combination of newcomers and seasoned professionals cultivates a vibrant atmosphere with diverse levels of practical knowledge. Overall, the demographic profile reflects a stable, educated, and experienced cohort of professionals rather than a transient or unskilled labor force.

This background plays a significant role in shaping their perceptions of risk, as these views are influenced by both their educational experiences and extensive real-world exposure.

Tabel 1. Demographic Characteristics of Respondents (N=68)

Characteristic	Category	Results	
		Frequency	Percentage (%)
Age Group		5	7.4
	<25 years	18	26.5
	25-35 years	28	41.2
	35-45 years	13	19.1
	45-55 years	3	4.4
	55+ years	1	1.5
	Missing/Not specified		
Education Level	Junior High School	1	1.5
	Senior High School	22	32.4
	Certificate/Associate Degree	2	2.9
	Advance Associate Degree	4	5.9
	Bachelor/Applied Bachelor Degree	34	50.0
	Graduate	4	5.9
	Post Graduate	1	1.5
Experience	<5 years	20	29.4
	5-10 years	15	22.1
	10-15 years	14	20.6
	15-20 years	8	11.8
	20+ years	10	14.7
	Missing/Not specified	1	1.5

Source: Compiled from Primary Research Survey Data

In this study, we found that participants are involved in a wide range of adventure tourism activities, showcasing what Yogyakarta has to offer. Like we see in Figure 1, most activities focus on land and water adventures. The workers reported popular activities like 'Panjat Tebing' (Rock Climbing), 'Mendaki Gunung' (Mountain Climbing), 'Diving,' and 'Rafting' or 'Arung Jeram' (White Water Rafting). Other common activities mentioned include hiking, trekking, and exploring caves ('Susur Gua').

This variety is a significant feature of the workforce. A lot of these workers, especially guides, don't stick to just one activity; they jump between different ones based on what clients want and what's in season. This general approach means that an individual worker can face all sorts of risks in a short time—from falling or equipment malfunctions in rock climbing to potential drowning and strong currents in rafting, plus the challenges that come with altitude and weather when mountaineering. This situation highlights how complicated managing occupational safety and health (OSH) can be in this field. Workers need to have a wide-ranging understanding of risk

assessment and how to manage different hazards, rather than just being skilled in one area (Jenkins, 2019).



Figure 1. Word Cloud of Adventure Tourism Activities Engaged in by Respondents

2.1 Dominant Perceptions of OSH Hazards

The primary findings of this study focus on determining the hazards that workers perceive as the most critical. An analysis of the survey data reveals a consensus among respondents that risks associated with human factors and equipment failures are prioritized over environmental threats. For further details, please refer to Table 2, which outlines the top hazards ranked according to potential consequences, likelihood, and overall risk.

In evaluating the severity of potential outcomes, workers identify systemic and equipment failures as the most significant threats. The hazard receiving the highest rating of 'Sangat Besar' (Very Large) for potential consequences is the "Failure to provide for extreme conditions," closely followed by concerns regarding the "Use of substandard equipment" and the "Absence of required safety equipment (PPE)." These apprehensions underscore that workers are acutely aware that the gravest issues are not merely random accidents; they frequently stem from inadequate planning and resources that could mitigate such risks.

Conversely, the hazards that workers perceive as most likely to occur are often related to everyday pressures and human interactions. Issues such as "Business pressure to operate under any circumstances" and challenges involving "Tourists with no prior experience" were identified as common risks ('Sangat sering'). This highlights the daily challenges faced by workers, where organizational demands and clients' skill levels create a constantly evolving risk landscape.

The influence of these perceptions can be seen in the overall risk ratings. Hazards classified as 'Tinggi' (High) risk are predominantly driven by human factors. For instance, "Tourists with no prior experience" tops the list for overall risk, succeeded by physical dangers like "slips, trips, and falls from height," along with human-related issues such as "poorly trained seasonal workers" and the "poor physical condition of participants." The consistent focus on individuals—be they clients, colleagues, or even personal behavior—as the primary source of risk is noteworthy. It indicates that for these professionals, the real challenge lies not only in managing natural risks but also in navigating the unpredictable and often uncontrollable behaviors of individuals in those situations. Consequently, the role of adventure guides evolves from being merely technical experts to also managing human risks. They must assess fitness levels, communicate effectively with novices, and compensate for clients' lack of skills or awareness. Thus, occupational safety and health (OSH) training in this field should encompass more than just technical skills; it must also emphasize soft skills such as client assessment, instructional techniques, and assertive communication (Leiter et al., 2009).

Moreover, there exists a concerning disparity in the data regarding the types of risks that occur most frequently compared to those that could result in the most severe consequences. Events that occur often are primarily operational and behavioral (such as business pressure), whereas those with high-stakes consequences arise from systemic and equipment failures (such as the absence of PPE). The true risk manifests at the intersection of these two categories. A worker who frequently feels compelled to expedite a trip may forgo a pre-use equipment check. Although this pressure reflects a common, low-consequence event, a significant equipment failure, though infrequent, could lead to serious repercussions. This situation underscores the urgent need for a strong safety culture at all organizational levels, as emphasized in the literature (Cahill et al., 2022). Management must cultivate an environment where workers are empowered to resist operational pressures when safety is at risk. Merely providing safety equipment is insufficient; the organizational climate must actively support and enforce its proper use, inspection, and maintenance (Savadori & Avanzi, 2017).

Tabel 2. Top 5 Perceived Hazards by Consequence, Likelihood, and Overall Risk

Highest Perceived Consequence ('Sangat Besar')	Highest Perceived Likelihood ('Sangat sering')	Highest Overall Risk ('Tinggi')
1. Failure to provide for extreme conditions	1. Business pressure to operate in any condition	1. Tourists with no prior experience
2. Use of substandard equipment	2. Tourists with no prior experience	2. Danger of slips, trips, and falls from height
3. Absence of PPE or safety equipment	3. Failure to provide for extreme conditions	3. Poorly trained seasonal workers
4. Violation of safety practices or rules	4. Danger of slips, trips, and falls	4. Use of substandard equipment
5. Failure to inspect and maintain equipment	5. Slips, trips, and falls from height	5. Poor physical condition of participants

Source: Compiled from Primary Research Survey Data

3.1 Peripherally Perceived OSH Hazards

To fully understand how individuals perceive risk, it is essential to examine the hazards that workers often regard as less serious. These risks are typically viewed as manageable or so infrequent that they do not elicit concern in daily operations.

For instance, risks designated with a 'Rendah' (Low) risk rating included factors such as 'Not checking the weather' (36 mentions), 'Showing off' (35 mentions), 'Old injury recurring' (35 mentions), and 'Being struck by a flying object' (35 mentions). Workers appeared to consider 'Showing off' and 'Being struck by a flying object' among the least likely occurrences, as indicated by numerous 'Tidak Pernah' (Never) and 'Sangat Jarang' (Very Rarely) ratings.

The disparity between the perceived severity of a hazard and its overall risk rating is noteworthy. For example, the 'Possibility of drowning' is widely recognized as a serious risk, as evidenced by the significant number of 'Besar' (Large) consequence ratings (18 mentions). However, when considering the overall risk assessment, this same hazard received a considerable number of 'Rendah' (Low) ratings (34 mentions). This inconsistency highlights a phenomenon known as risk normalization. As these workers frequently operate near water, they have developed skills, adhered to protocols, and implemented safety measures that foster a strong sense of control over this risk. This perceived sense of control appears to diminish their likelihood of believing that drowning could occur, thereby altering their perception of the overall risk, even while acknowledging the potential danger. This observation is vital for safety management, indicating that a high level of skill and comfort may sometimes

lead to an underestimation of risks (Haas & Mattson, 2016). Therefore, safety programs should be structured to combat this complacency, consistently reminding individuals that even familiar hazards can become lethal if safety protocols are neglected or compromised.

4.1 Influence of Demographic Factors on Risk Perception

The limited scope of this study presents challenges in drawing definitive conclusions; however, the preliminary data indicates noteworthy variations in risk perception among different demographic groups. These initial findings lay the groundwork for more comprehensive research in the future.

Upon analyzing the risk assessments based on age, we observed several fascinating patterns. Participants under the age of 25 appeared to perceive serious consequences, labeled as 'Besar' and 'Sangat Besar', as more likely compared to their older counterparts. In contrast, individuals aged 55 and above tended to categorize certain hazards as 'Sangat sering' (Very Often). This may suggest an experience-perception paradox, where younger, less experienced workers—who may not yet be accustomed to workplace risks—visualize potential negative outcomes from accidents with greater clarity and anxiety. This aligns with prior research indicating that younger workers frequently experience higher accident rates (Hanvold et al., 2019), as their perceptions have not been dulled through exposure to managing incidents.

Conversely, older workers, who have encountered various incidents and near-misses throughout their careers, may adopt a more pragmatic, albeit somewhat skeptical, perspective regarding the actual frequency of adverse events. This could elucidate their inclination to assign higher likelihood ratings (Alexopoulos et al., 2009).

This observation suggests that experience influences risk perception in a more nuanced manner. It appears to shift the emphasis from the severity of outcomes for newcomers to the frequency of occurrences for those with greater tenure. Should this trend be corroborated by larger studies, it may significantly affect our approach to safety training and communication. A uniform strategy may not be effective. For new hires, safety messaging could capitalize on their heightened awareness of consequences to help them establish sound safety habits from the outset. In contrast, training for more seasoned employees could address the normalization of risk, empowering them to share their extensive experiences with incidents and contribute to the ongoing enhancement of safety practices (Rasmussen, 2012).

Conclusion

This study investigates the perceptions of adventure tourism workers in Yogyakarta regarding the risks associated with Occupational Safety and Health (OSH). Their primary concerns revolve around human factors, including inexperienced tourists and seasonal staff lacking adequate training, as well as equipment safety. This marks a departure from the previous focus on environmental risks. The current emphasis is on the intricate challenges of managing both personnel and equipment, along with the pressures of operating a business. Contemporary adventure tourism professionals frequently identify their greatest threats as stemming from the skill levels of their clients and the reliability of their equipment, rather than from natural hazards such as rivers or cliffs.

The practical implications of this research are noteworthy. For individuals engaged in adventure tourism, the findings underscore the necessity for enhancing safety management systems. This entails prioritizing mandatory training for all staff, encompassing not only technical skills but also client assessment, effective communication, and an understanding of group dynamics. Furthermore, operators should establish robust procedures for inspecting and maintaining their equipment, ensuring that any items failing to meet safety

standards are taken out of service, particularly in light of increasing concerns regarding equipment malfunctions. Adhering to international safety guidelines is equally crucial (ISO, 2014b, 2014a). For policymakers and regulatory bodies, this study highlights the importance of establishing clear certification standards for guides and operators to facilitate effective management of human factors. Moreover, implementing a non-punitive reporting system for incidents within the industry would be a prudent measure for enhancing data collection and learning from near-misses, ultimately contributing to the prevention of future accidents.

However, this study is not without its limitations. Given that a non-probabilistic, accidental sampling method was employed, the findings cannot be generalized to all adventure tourism workers in Indonesia. The small sample size (N=68) necessitates caution in the interpretation of the results, particularly with respect to demographic variables. A significant limitation is the reliance on semi-quantitative survey data, which provides insights into the risks recognized by workers but fails to elucidate the reasons behind their perceptions. To address this gap, qualitative data was collected through in-depth interviews and focus groups as part of this broader research initiative. We intend to analyze and present this valuable data in a forthcoming publication, offering additional context and insights into the perceptions disclosed in this survey, with the goal of enhancing our understanding of the safety culture within this expanding industry.

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