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Exploring Risk Perception among Paragliding Pilots at Bir-Billing, Himachal Pradesh: Insights and Perspectives

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Keywords

- Paragliding
- Risk Perception
- Flight Techniques
- Weather Assessment

Abstract

Paragliding has emerged as a rapidly expanding segment of adventure tourism, with Bir-Billing in Himachal Pradesh recognized as one of the world's premier paragliding destinations. Despite its popularity, paragliding remains a high-risk aerial sport where pilots must continuously evaluate weather, equipment, flight techniques, and safety norms. Hence, the current study examines the risk perception of paragliding practitioners visiting Bir-Billing and explores whether demographic characteristics influence their perceptions or not. Primary data were collected from 100 pilots through a structured questionnaire administered between February and April 2024. The study assessed five dimensions of risk perception: (1) overall risk, (2) importance of flight techniques, (3) equipment verification, (4) weather assessment, and (5) adherence to safety norms. Later, descriptive statistical tests (mean value, frequency, and percentage analysis), t-test, ANOVA, and Post Hoc analyses were used to interpret the data. Findings reveals that pilots unanimously perceive paragliding as a risky activity and place strong emphasis on flight skills, weather evaluation, and equipment checks. Gender, marital status, and experience showed no influence (very limited) on risk perception, while age demonstrated minor variations in safety-related attitudes. The study highlights the need for improved weather communication, mandatory equipment inspections, structured pilot training, and enhanced safety monitoring. These insights can support destination managers, policymakers, and operators in strengthening safety standards and promoting sustainable adventure tourism in Bir-Billing.

1. Introduction

In recent years, Paragliding has emerged as a flourishing segment of tourism, with various destinations around the world capitalizing on the potential of this adventure sport to attract visitors. Paragliding is mostly practiced for leisure purposes, tandem joy rides, cross-country flying, accuracy, and 'hike & fly' competitions. But in modern times, people are taking up adventure activities like paragliding for several other reasons, such as overcoming fear, releasing stress, self-expression, discovering nature, and overcoming their physical limits. It is not only a recreational and competitive adventure sport that offers a rewarding experience, but also carries high risk **(Cross Country Magazine, 2022).** The level of the risk depends upon the perception of the pilots based on their skill levels, such as beginner, intermediate, and advanced levels. Further, it also varies among the pilots undertaking Solo paragliding, Tandem paragliding, and paragliding Competitions. In a nutshell, Paraglider having less experience has a higher risk perception and vice versa **(Paixã & Tucher, 2012; Wilkes et al., 2022).** Hence, paragliding pilot learns and upgrade their skills gradually and also understand the micro-meteorology of the paragliding sites, because different paragliding sites have different weather conditions and site metrology, which again varies throughout the day. Before taking off the flights, the pilots access the micro-metrology of the flying sites along with the overall weather conditions as a part of risk assessment. In order to be able to do so, Paragliding pilots are trained in the skills needed to handle their glider and understand weather conditions. This training helps them make safer decisions and enjoy their safe flights. However, accidents can still occur when pilots are careless, get distracted, lose control, or face equipment problems, and these incidents can sometimes cause serious injury or even death. (Abdalad et al., 2011). Hence, the Destination Management Organizations (DMOs) must take necessary efforts to promote safety, address regional disparity, and capitalize on the sport's appeal to adventure travelers for the overall development of adventure tourism (Normandy Tourism, 2020).

In this regard various researchers have tried to measure the risk perception among the adventure enthusiasts across the globe (Teng et al., 2025; Cater, 2006) But there is hardly any research that has concentrated on studying the 'risk perception among the Paragliders' visiting the state of Himachal Pradesh in India, despite the fact that, H.P. lies in 2nd position immediately after Uttarakhand in terms of adventure tourist visits (Nielsen, 2016). Further, Paragliding World Cup Association (PWCA) and Federation of Aeronautique International (FAI) organized the Pre-paragliding World Cup-2013 here at Bir-Billing and later the Paragliding World Cup-2015 in association with the Paragliding Association of Bir and the local administration (Kumar & Kumar, 2024). In 1994- 95, there were few flying enthusiasts in Bir, which has now grown to 306 pilots and two dozen operators in 2022. Hotel, restaurant, cafes, and trainers, guides, and certification schools were introduced gradually, and now

paragliding has become a thriving business. Therefore, this study focuses on how paragliding pilots perceive and assess risks at Bir-Billing, a prominent paragliding location in Himachal Pradesh, India. The literature review section includes relevant studies that discuss the various risks and perception linked to paragliding.

2. Literature Review

In this section, literatures were presented under three major sections, i.e., (1) Paragliding at Bir-Billing, (2) Risk perception of the paragliding practitioners, and (3) Risk perception of the Paragliders from their demographic characteristics.

2.1 Paragliding at Bir-Billing:

Bir-Billing is recognized as India's top destination for paragliding, known as the "paragliding capital of India." Bir- Billing unique geographical location influences pilots and adventure sports enthusiasts from across the globe and has hosted major competitions, including the Cross-Country Paragliding Pre-World Cup, World Cup Asian Tour, and Accuracy Pre-World Cup (Molnár & Müller, 2025). The site features an ideal setup with take-off at 2,500 meters in Billing and landing at 1,400 meters in Bir, offering favorable geography and climate for pilots of all skill levels (Kumar & Kumar, 2024). Despite its popularity, Canadian young female 27 years old pilot Megan Roberts' was died in mountains while flying in mountains and her body was recovered from close to 4,000m, and a well-known and very experienced pilot also encountered accidents during the peak season from September to November 2025. Experienced Philipp Zellner, pilots note that many of these incidents occur because visiting pilots try to fly beyond their skill level. The Dhauladhar mountains in Bir-Billing offer great flying conditions, but they can be dangerous if you push your limits without proper skills or a safe margin. Beginner pilots should avoid the crowded "house thermals." Those pilots who want to experience high-mountain flying should avoid going too deep into the mountains during their first few flights and give themselves time to adjust to the conditions. It is important to visiting pilots to understand that mountains rescue system in Bir is not efficient due to high mountains as compared to European countries and rescue efforts can take 24 hours or even more (Cross Country, 2025).

Summary & Research Gap- Hence, it is necessary to make a comprehensive analysis of the demographic characteristics of the participants. This led to our Objective-1.

2.2 Risk perception of the paragliding practitioners:

a) Discourses on risk and risk perception:

What is Risk?

The word 'adventure-risk' is mostly used to highlight an important shift in the modern understanding of risk, which retrieves adventure as a positive dimension of risk management. Physical adventure activities/practices can be commercial, leisure, or competition-based in nature.

However, people will be considered adventure risks if the practitioner is involved in considerable and/or extreme challenges to his/her skills in unpredictable environments, such as air, water, forests, and deserts, leading to serious personal consequences, such as death, in case of failure and/or error, as it occurs in free flight, parachuting, climbing, surfing, and in many other adventure activities (Beck, 1993; Spink, 2001; Spink & Menegon, 2004).The popular risk discourses theory given by Spink (2001) elaborated three specific glossaries related to different types of risks, which are 'Danger-risk' (first tradition), 'Probability-risk' (second tradition), and 'Adventure-risk' (third tradition) (Figure 1). These discursive traditions were later pointed out by Spink (2004) who attempted to explain risks in specific forms.

Figure 1: Meanings attributed to risk (Different types of risk)

Danger-Risk	Probability - risk	Adventure-risk
Threat	Risk	Adventure
Loss	Bet	Adrenaline
Luck	Chance	Emotion
Danger (dangerous)	Secure (security)	Radical
Bad luck	Probability	Extreme
Good fortune (fortunate)	Preventing (prevention)	Challenge
Fatality	Risky	Boldness
Obstacle		
Adventure		
Fate		

Risk perception:

Activities, involved with real or perceived risk such as rock-climbing, surfing, paragliding, mountaineering, etc., known adventure tourism activities, and tourists do these activities to experience and seek out the excitement, thrill, challenge, and risk associated with it (Cater, 2006; Wang, 2019). In paragliding, pilots perceive risk as a form of adventure, with their confidence in technique and equipment quality influencing their perception (Paixão, 2012). Some of the research suggested that perceived risk, rather than actual risk, is the main driving force for tourists to undertake adventure activities. For example, adventure travel operators can manage and mitigate actual risk through safety measures and equipment, yet tourists may still experience heightened excitement due to their subjective perceptions (Cater, 2006)

b) Risk in paragliding:

Paragliding is recognized internationally as a high-risk adventure activity, putting participants in direct engagement with hazardous environments and requiring complex risk management strategies. Hence, Schulze et al. (2000) recommend that advancements in both equipment and

understanding of injury patterns are essential for mitigating these risks and improving safety. Among the major areas that are highly vulnerable to injuries in paragliding include: spinal cord, ankle, leg, arm & head etc., (Exadaktylos, 2003), whereas the major reasons behind such injuries are pilot error, equipment failure, environmental hazards, varying skill levels among pilots, and adherence to safety practices, etc.

Further studies indicated that the majority of incidents in paragliding—such as serious injuries or near misses—are attributed to pilot error rather than equipment failure (Wilkes et al., 2022). A large-scale survey in the UK revealed that 26% of pilots reported experiencing at least one "near miss" per year, and only a small number of accidents were linked to gear malfunction. Pilot errors, particularly skill-based and decision-based mistakes, accounted for most reported incidents. Logistic regression analysis found that the odds of experiencing an incident increased with greater flying exposure and higher self-perceived risk, while longer intervals between flights reduced incident likelihood. Hence, there is a need for strict vigilance, comprehensive training, and preparedness to address various flying conditions and avoid potential accidents.

c) Risk perception in Paragliding

Research indicates that paragliding practitioners commonly view risk not as an obstacle but as an essential part of the sport, contributing to personal challenge and the enjoyment of flight. Paixã and Tucher (2012) demonstrated that pilots often perceive risk as a genuine form of adventure, with their experience of risk closely tied to confidence in technical mastery and the reliability of their equipment. Moreover, their study found a "selfish" dimension to risk perception: while pilots were aware of their own vulnerabilities, they often underestimated the risks that their decisions and behaviors might pose to others, such as when disregarding established safety rules.

Although procedures to guarantee the physical integrity of adventure sports practitioners are necessary, it is important to recognize that total risk control could remove the very attractiveness and thrills that participants seek (Morgan & Fluker, 2006). Therefore, risk control procedures should take into account variables such as the activity level and the practitioner's skill (Wilks & Atherton, 1994). Numerous studies have analyzed risk-taking behaviour and sensation-seeking in extreme athletes, including Paragliders (Agilonu et al., 2017). In the video "What's The Real Risk of Paragliding?" (Fly With Greg, 2020), the narrator discusses the associated risks and common mistakes made by the average pilots, stressing the importance of risk awareness and strategies to ensure a safe flying experience.

Summary and research gap: Hence, it is crucial to assess risk perceptions among pilots (visiting Bir-Billing) in various segments of paragliding, including their views on overall activity risk, the importance of flight techniques, equipment, weather, and safety norms, which lead to our Objective-2.

2.3 Risk perception of the Paragliders from their demographic characteristics

Many research has studied the risk perception and demographic characteristics of sports events, paragliding participants and practitioners in continuation to this Watson et al. (2004) studied the difference in risk perception among the 21 amateurs and experienced 20 instructors in which male & female are assessed using the Eysenck Personality Questionnaire-Revised and found that amateurs perceive a higher risk compared to the experienced ones, in high-risk sports, such as paragliding. Similarly, novice and veteran pilots displayed varied risk appraisals rooted in their own experiences, exposure rates, and psychological dispositions. The social dimension of risk perception is highlighted in studies focusing on adventure tourists and tandem pilots, where professionalism of operators, environmental conditions, and communication practices all significantly influenced perceived safety (Paixã & Tucher, 2012)

Summary and research gap: Based on the above literature review, understanding whether these factors or risk perceptions differ significantly according to demographic characteristics can offer valuable insights. Hence, the risk perception of the paragliding practitioners visiting Bir-Billing was analysed from their demographic characteristics. (Objective no. 3)

2.4 Theoretical Framework

The theoretical background of this research paper is based on the psychometric paradigm of 'risk perception' given by the Slovic P., which define risk as subjective construct rather than objective reality. According to the theory of the 'risk perception', people judge the risk based on psychological and situational factors such as familiarity, control over the situation, weather the risk is taken voluntarily and how serious the consequences are (Slovic, 1987). Adventure activities like paragliding involve high-risk in this risk perception of the individual varies significantly depending upon their experience, skill level and exposure to similar environments of the adventure activity. In addition to this, the present study is also supported by the 'Adventure Tourism Framework' which explains that people take part in high-risk adventure activities depending upon how much perceived risk they are willing to take and how strongly they seek thrill and sensation-seeking motivation. Further adventure tourism literature also suggests that people are attracting/prefer to the activities that include uncertainty, challenge of controlled risk. In adventure activities, perception of risk/danger increases enjoyment and satisfaction rather than discouraging the participation (Cater, C., 2006; Wang, K.,

2019). This framework suggests that adventure activities like paragliding, participant do not simply accept risk but seek it as enjoyment, an essential part of their experience.

In the context of the present research study, paragliding activities at Bir-Billing involve changing environmental conditions, different technical skill requirements, and varying levels of pilot flying experiences. Therefore, paragliding pilot risk perception related to their flight technique, weather conditions, equipment quality, and safety practices may differ among pilots depending upon their demographic background and experiential characteristics. Combining these two frameworks helps to explain how both the psychological evaluation of risk and motivational aspects of adventure influence pilot behavior and safety perception.

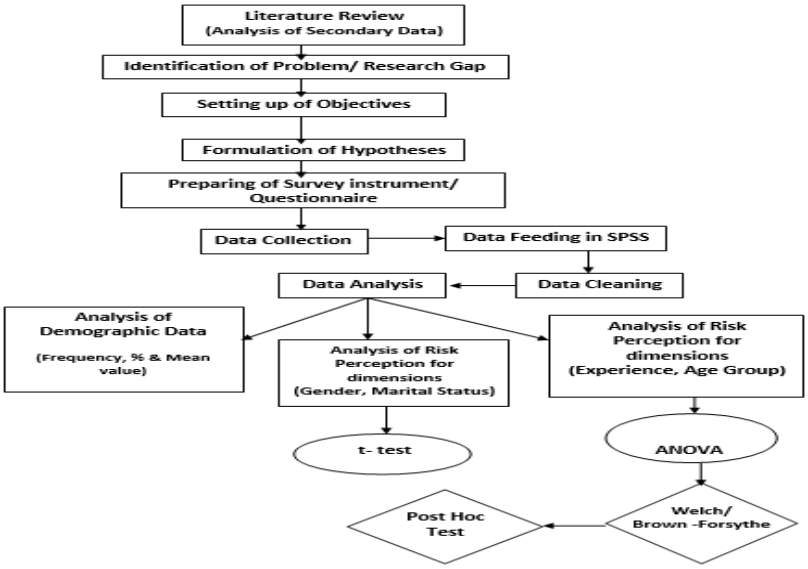
3. Objectives

1. To analyze the demographic characteristics of the paragliding practitioners visiting Bir Billing in Himachal Pradesh.
2. To analyze the risk perception of the paragliding practitioners regarding the activity.
3. To analyze the risk perception of the paragliding practitioners from their demographic characteristics.
4. To provide suggestive measures based on the findings of the research for future course of action.

4. Research Methodology:

Initially, an extensive review of literature was carried out from the journal articles, books, websites, etc., to identify the problem and research gap.

Figure-2: Flow chart of the research methodology adopted for the study



Later, a questionnaire was developed for collecting the primary data from the paragliding practitioners at Bir-Billing in Himachal Pradesh between February 2025 to April 2025. The questionnaire had two

sections; the first section consisted of the demographic profile of the respondents, such as Age, Gender, Marital Status, Experience, Level of Participation, Annual income, and their country of origin. The second section was designed to collect information about the risk perception of paragliding practitioners through a total of 10 questions/statements. These statements were divided into five dimensions, i.e., Overall Risk Perception, Importance of Flight Techniques, Importance of Equipment, Importance of Weather, and Importance of Safety Norms. The data were collected through a five-point Likert Scale ('Strongly Disagree-1, Disagree-2, Neutral-3, Agree-4, Strongly Agree-5') from 100 paragliding pilots via convenience sampling because paragliding pilots constitute a small target group in Bir-Billing area. Therefore, respondents were selected based on their availability and willingness to participate. Later, the data were analysed by using SPSS to achieve the objectives of the study and the internal consistency of scale was checked by Cronbach's alpha ($\alpha = 0.691$). Further this is marginal below the conventional cutoff 0.70, however, value above 0.60 is still acceptable in exploratory research (Hair et al., 2010).

Demographic characteristics of the practitioners were analysed using frequency & percentage analysis, while the rest of the data were analysed through the use of various statistical tools & techniques like Mean value analyses, Levene statistics, *t*-tests, ANOVA, and Post Hoc test. As far as the formulations of the hypothesis were concerned, they were framed for the third objective, which were as follows;

H11: The risk perception of the paragliding practitioners significantly varies with their gender.
H12: The risk perception of the paragliding practitioners significantly varies with their Marital status.
H13: The risk perception of the paragliding practitioners significantly varies with their experience.
H14: The risk perception of the paragliding practitioners significantly varies with their Age group.

5. Data analysis and interpretation:

The data collected for the study was analysed and interpreted under the three sections, i.e.

(a) Socio-Demographic Characteristics of the practitioners, (b) Risk perception of the paragliding practitioners about the activity, and (c) Analysis of risk perception from their demographic characteristics.

5.1 Socio-demographic characteristics of the paragliding practitioners:

The analysis of demographic characteristics of the paragliding practitioners was presented in **(Table-1)** which showed that approximately 29% of pilots fall between the age group of 18-33 &the age group of 34-43 years. The majority of the portion falls in the range of 44 and above, constituting 42% of the total sample. As far as gender is concerned, it was observed that 92% of the paragliding practitioners were male, while the rest 7% were female and 1% was from other gender. From the marital status point of view, 63% of respondents were married and 37% were unmarried.

Table-1: - Demographic Characteristics of Paragliding Practitioners

Demography Variables		Frequency (N)	Percentage (%)	Cumulative Percentage (%)
Age	18-33	29	29.0	29.0
	34-43	29	29.0	58.0
	44 and above	42	42.0	100.0
	Total	100	100.0	
Gender	Male	92	92	92.0
	Female	7	7	99.0
	Other	1	1	100.0
	Total	100	100	
Marital Status	Married	63	63.0	63.0
	Unmarried	37	37.0	100.0
	Total	100	100	
Paragliding Practitioners' Experience	0-50 months	37	37	37.0
	51-100 months	14	14	51.0
	101-200 months	23	23	74.0
	201 months and above	26	26	100.0
	Total	100	100.0	
Pilot Level of Participation	Solo Paragliding practitioners	62	62.0	62.0
	Solo and Tandem paragliding practitioner	11	11.0	73.0
	Paragliding Competition Pilot	18	18.0	91.0
	Solo, Tandem & Competition Paragliding Practitioners	9	9.0	100.0
	Total	100	100.0	
Annual income in (USD)	0-25000 USD	34	34.0	34.0
	25001-50000 USD	22	22.0	56.2
	50001-100000 USD	29	29.0	85.0
	100001USD and above	15	15.0	100.0
	Total	94	94.0	

(Source: Primary Survey Data)

From the paragliding practitioners' experience point of view (Table-1) the distribution of experience shows that a 37% considerable portion of practitioners have 0-50 months of experience, while 14% of pilots had 51-100 months of experience, 23% of the pilots having the 101-200 months experience, while 26 % pilots were having the 201 months and above experience level.

Paragliding practitioners were asked about the Pilot Level of Participation. The majority of practitioners 62% engage in 'solo paragliding', 18% of the pilots consider themselves as 'Paragliding competition Pilot', a significant portion11% participate in 'solo &Tandem paragliding practitioners', whereas 9% of the practitioners engage themselves in 'Solo, Tandem & Competition Paragliding Practitioners' activities.

Paragliding respondents were asked about their annual income in (USD), and it was revealed that the largest segment of practitioners 31% falls in between 0-25000 USD, 19% fall in the group range

between 25001-50000 USD,29% falls between the group ranging from 50001-100000 USD, &15% falls within the range of 100001USD and above category.

Country-wise distribution of paragliding practitioners:

After analysis of the country-wise distribution, it indicates a diverse representation of paragliding practitioners from various countries. While India contributes to the largest portion of 17%, the USA & Germany 10%, Italy 8%, UK 7% stands out as the most represented countries. There was also participation from a wide range of other countries like Switzerland, Romania, Netherlands, Sweden, Australia, Belgium, Slovenia, Spain, Portugal, Thailand, and Brazil, representing 2% to 6%in the data set. Each country, like Serbia, China, Denmark, Norway, Cyprus, Argentina, South Korea, Malaysia, Canada, France& Czech Republic, represents 1% of the sample in the data. This diversity in geographical representation suggests a global interest and engagement in the sport of paragliding.

5.2. Risk perception of the paragliding practitioners about the activity:

In this section, the data was analysed in the following 5 sections i.e. Overall risk Perception and the importance of mastering flight Techniques, equipment, weather assessment& adherence to safety norms for avoiding risk in paragliding.

Overall risk perception of the paragliding practitioners regarding the activity:

After analyzing the Paragliders' perception regarding the risks involved in paragliding activity, it was found that most of the practitioners agree with the fact that paragliding is a risky activity (mean=4.07), with a moderate level of Standard Deviation i.e. σ =0.977. (Table no-2) While in the other statement regarding, whether the sensation of freedom and strong emotions outweigh the risks or not, the practitioners were found between neutral to agree (mean=3.56).

Practitioner's perception of the importance of the equipment to avoid risk in paragliding:

According to the initial statement, most of the practitioners strongly agreed that mastering take-off and landing techniques is important for avoiding risk in paragliding (mean = 4.92), with a low level of variability (Standard Deviation σ 0.273). Similarly, practitioners also strongly agreed that mastering flight techniques is also important (mean = 4.79) to avoid risk.

Table-2: Perception regarding the risks involved in paragliding activity

S. No.	Variable	Mean	Standard Deviation
Overall risk perception of the paragliding practitioners regarding the activity			
1	Paragliding is a risky activity.	4.07	.977
2	The sensation of freedom and strong emotions outweigh (surpass)the risks	3.56	1.209
Practitioner's perception of the importance of mastering paragliding fly techniques to avoid risk			

3	I feel important to master the take-off and landing techniques to avoid risk in paragliding.	4.92	.273
4	I feel important to master flight techniques in paragliding.	4.79	.478
Practitioner's perception of the importance of the equipment to avoid risk in paragliding			
5	I feel important for the Verification of the safety level of the equipment.	4.55	.730
6	I feel the Importance of checking the equipment before the flight.	4.62	.693
Practitioner's perception of the importance of weather assessment to avoid risk in paragliding			
7	I feel Prior consideration of meteorology is very important to avoid risk in paragliding.	4.69	.563
8	I feel Prior knowledge of the natural environment is necessary before paragliding to avoid risk.	4.49	.674
Practitioner's perception of the importance of safety norms to avoid risk in paragliding			
9	I am at risk when I do not follow safety norms.	4.60	.603
10	I put other people at risk, if I ignore/do not follow safety norms	3.83	1.138

(Source: Primary Survey Data)

Practitioner's perception of the importance of the equipment to avoid risk in paragliding:

On the other hand, practitioners' responses on the importance of verifying the safety level of equipment were between agree to strongly agree (mean = 4.55). Similarly, practitioners responded that checking the equipment before the flight is important to avoid risk (mean = 4.62). (Table no-2)

Practitioner's perception of the importance of weather assessment to avoid risk in paragliding:

Analysing the practitioners' perceptions, agree to strongly agreed on the importance of considering meteorology for paragliding (mean = 4.69) to avoid risk in paragliding, While in another statement practitioners' response lies between the agree to strongly agree on the importance of having prior knowledge of the natural environment before paragliding (mean = 4.49) (Table no-2)

Practitioner's perception of the importance of safety norms to avoid risk in paragliding: Most of the practitioners agree to strongly agree to the fact that their life is at risk while they are not following safety norms (mean=4.60), with Standard Deviation σ 0.603. While on other statements on safety norms practitioners are neutral to agree regarding whether they put other people's lives at risk if they do not follow safety norms (mean=3.83)(Table no -2).

Concluding the above results (Table no -2) most of the practitioners generally agree to strongly agree on the importance of mastering skills, assessing weather conditions, checking equipment, and adhering to safety norms in paragliding. However, in two statements practitioners are neutral to agree regarding the 'sensation of freedom outweighing (surpass) risks' and the 'impact on other people's lives when safety norms' are not followed.

5.3 Analysis of risk perception from their demographic characteristics:

In this section the risk perception of the participants were analysed from their demographic characteristics like Gender, Marital Status, Practitioners' experience and Age group.

Analysis of the risk perception dimensions from gender:

From Table no-3, it can be observed that the value of Levene statistics is significant for two out of the five dimensions i.e. for the 'importance of flight techniques' and the 'importance of safety norms. Hence accordingly the values of the t-test were interpreted.

Table no -3: *t-test* on 'Risk Perception' dimensions for Gender

Dimensions	Levene Sig.	t-test Sig. (2-tailed)	Mean Values	
			Male	Female
Overall Risk Perception	.615	.560	Non Significant (3.82)	
Importance of Flight Techniques	.002	.000	4.85	5.00
Importance of Equipment	.459	.592	Non Significant (4.59)	
Importance of Weather	.169	.328	Non Significant (4.59)	
Importance of Safety Norms	.007	.976	Non Significant (4.21)	

As far as overall risk perception and the importance of the safety norms are concerned, the practitioners agreed to the statements (mean=3.82 & 4.21). Other two dimensions i.e. importance of the equipment and weather were also considered important to avoid risk in paragliding by the practitioners, as both of them had a mean value of 4.59. Hence, from Table no-3, it can be observed that in the case of gender, four out of five 'risk perception' dimensions do not show any significant relationship with the gender; hence null hypothesis is accepted, and the alternate hypothesis is rejected.

Analysis of the risk perception dimensions from marital status:

From Table no-4 it was observed that Levene statistics is significant for two out of five statements i.e. 'for importance of equipment' and 'importance of safety norms' and accordingly, the value of the *t*-test were interpreted.

Table no -4: *t*-test on 'Risk Perception' dimensions for Marital Status

Dimensions	*Levene Sig.*	*t*-test Sig. (2-tailed)	Mean Values	
			Married	Unmarried
Overall Risk Perception	.613	.669	Non-Significant (3.82)	
Importance of Flight Techniques	.488	.547	Non-Significant (4.59)	
Importance of Equipment	.022	.061	Non-Significant (4.59)	
Importance of Weather	.880	.947	Non-Significant (4.59)	
Importance of Safety Norms	.003	.003	4.40	3.91

Here it was found that only one out of the five dimensions i.e. 'importance of the safety norms' shows a significant difference in their values as far as married and unmarried paragliding practitioners are

concerned. Further, it was observed that married practitioners highly perceive (mean=4.40) the importance of the safety norms as compared to the unmarried pilots (mean=3.91) to avoid risk in paragliding. Other three dimensions such as the importance of flight technique, equipment, and weather assessment were also considered very important to avoid risk in paragliding having equal mean values of 4.59. Finally, all the Paragliders agreed to the dimensions of 'overall risk perception' with a mean value of 3.82 which shows that all of them consider it as a risky sport. Hence from Table no-4, it can be concluded that there is no significant difference in the risk perception of the Paragliders as far as their marital status is concerned. Hence null hypothesis is accepted and the alternate hypothesis is rejected.

Analysis ANOVA on 'risk perception' dimensions for practitioners' experience:

Table no -5: ANOVA on 'Risk Perception' dimensions for Practitioners' Experience

Dimensions	Levene Sig.	ANOVA/ Robust Test	Sig. Difference Among Groups		Experience Means for Significant Differences			
					0-50 months	51-100 months	101-200 months	201 months and above
Overall Risk Perception	.419	ANOVA	.825	No	Non-Significant(3.82)			
Importance of Flight Techniques	.026	Welch	.277	No	Non-Significant (4.86)			
		Brown-Forsythe	.491					
Importance of Equipment	.299	ANOVA	.231	No	Non-Significant (4.59)			
Importance of Weather	.064	ANOVA	.480	No	Non-Significant (4.59)			
Importance of Safety Norms	.202	ANOVA	.505	No	Non-Significant (4.22)			

To investigate the differences in risk perception among practitioners with varying levels of experience, five dimensions of risk perception were assessed across four experience categories i.e. 0-50 months, 51-100 months, 101-200 months, and '201 months and above. Results from Table no-5 showed that, the Levene statistic was significant for the "Importance of Flight Techniques" dimension, while it was non-significant for the other four dimensions. Therefore, the significance of the mean differences in the "Importance of Flight Techniques" dimension was further analyzed using Welch & Brown-Forsythe tests, while ANOVA was used for the remaining dimensions. However, none of the dimensions showed significant differences among experience groups ($p > 0.05$). Across all experience levels, practitioners almost agreed (mean = 3.82) that paragliding is a risky activity. While they agreed on the importance of safety norms (mean=4.22), they were between agreed to strongly agreed on the importance of equipment and weather. Finally, all of the respondents strongly agreed about the importance of flight techniques to avoid risk in paragliding (mean=4.86). These results suggest that

there is no significant difference in the risk perception of the Paragliders as far as their experience level is concerned. Hence null hypothesis is accepted and the alternate hypothesis is rejected.

Analysis of ANOVA on 'risk perception' dimensions for practitioners' age group:

Table no -6: ANOVA on 'Risk Perception' dimensions for Practitioners' Age group

Dimensions	Levene Sig.	ANOVA/ Robust Test	Sig. Difference Among Groups		Age group Means for Significant Differences		
					17-33 years	34-43 years	44 years &above
Overall Risk Perception	.981	ANOVA	.152	No	Non-Significant(3.82)		
Importance of Flight Techniques	.001	Welch	.378		Non-Significant (4.86)		
		Brown-Forsythe	.255	No			
Importance of Equipment	.001	Welch	.140		Non-Significant (4.89)		
		Brown-Forsythe	.049	No			
Importance of Weather	.980	ANOVA	.546	No	Non-Significant (4.59)		
Importance of Safety Norms	.227	ANOVA	.001	Yes	4.09	3.98	4.46

Dimensions of the risk perceptions were tested with practitioners' age groups and presented in Table no-6. After applying the Levene test it was found that the Levene statistics were non-significant for three out of the five dimensions i.e. *Overall Risk Perception, Importance of Weather, and Importance of Safety Norms.* Hence the value of the mean difference was analyzed using Welch & Brown-Forsythe tests for 'importance of flight techniques and 'Importance of Equipment', while ANOVA was used for the remaining three dimensions. The test results depicted that, only one dimension i.e. 'Importance of Safety Norms' is showing significant differences in its values ($p<0.05$) for different age groups. Across all age groups, practitioners almost agreed (mean=3.82) that paragliding is a risky activity. While they strongly agreed on the importance of flight techniques (mean=4.86) & importance of the equipment (mean=4.89), their perception was between agree to strongly agree for the 'importance of weather'. Further, as it was observed that the risk perception of practitioners regarding the importance of safety norms varies with their age hence to analyze this difference more significantly, the Post Hoc test was applied.

Table no-7 Post Hoc Tests: In-Depth Analysis of Age with 'Risk Perception' dimension

Dimensions	Post Hoc Test	Age Group	Age Group	Sig.
Importance of Safety Norms	Bonferroni	34-43 years	44 years & above	.017
**** Only significant results are reported***				

From **Table no-7** it was revealed that the risk perception of the practitioners regarding the 'Importance of safety Norms' varies between the age groups of '34-43 years' and '44 years & above'. Practitioners from the age group '44 years & above' agreed to strongly agreed (mean=4.46) to the dimensions of 'Importance of Safety Norms', while practitioners from the age group '34-43 years' almost agreed (mean=3.98) to the importance of safety norms.

Hence from the analysis of ANOVA & Post Hoc test, it can be inferred that four out of five 'risk perception' dimensions do not show any significant difference with the Age group, hence null hypothesis is accepted and the alternate hypothesis is rejected.

6. Recommendation & Conclusions:

Based on the findings of the study several major recommendation and conclusions can be drawn to strengthen safety practices an enhance the overall paragliding experience of the paragliding practitioners.

Recommendation:

- Regular real time weather updates, micro metrology information, and hazard warning can help pilots to make decisions before flying at destination.
- Mandatory equipment's checking and safety briefing by the designated "safety officers" at the take-off site can reduce equipment related risk to visiting paragliding pilots to avoid incidents that might ruin a wonderful moment of adventure (Ulfy et al., 2021).
- By encouraging the safety culture among the paragliding community about basic flying rules, while the paragliding association need support, cooperation from local administration for promoting responsible flying behaviour also. They need to work together to improve monitoring safety audits, funding for pilot education/trainings, and licensing procedures by creating favourable policies for the development of adventure tourism in the region (Huyen et al., 2024).
- Creating a strategic development plan for Bir-Billing with immediately need of improvement in take-off and landing areas, emergency response systems, signage, and communication facilities to ensure safer flying conditions at Bir-Billing in peak season and increase of visiting paragliding practitioners in off season (Ratkowski et al., 2011) .
- Encouraging the paragliding practitioners/school or college students to participate in ongoing training, scenario-based exercises, and SIV ('Sumulation d'Incident en Vol') activities to continuously strengthen their safety skills (Ostojić et al., 2014, Yalçın, 2024).

- Creating a centralized digital incident reporting platform where pilots can report near-misses, accidents, and unsafe conditions to help identify risk patterns and strengthen future safety planning.

Conclusions:

- Overall, the findings suggest that paragliding practitioners, irrespective of their socio-demographic characteristics (age, gender, marital status, experience level, and level of participation), recognize the inherent risks associated with paragliding and consider it a risky sport.
- There is a universal understanding of the importance of flight techniques/skills, assessing weather conditions, checking equipment, and adhering to safety norms to mitigate risk in paragliding, and it can be managed through proper training and managing risk perception. (Chess in the Air, 2019)
- While certain demographic factors may slightly influence perceptions in some dimensions, the overall consensus underscores the importance of safety in paragliding.
- Experience levels and age groups do not significantly affect risk perception among paragliding practitioners, except for a difference in the perception of safety norms between age groups 34-43 years and 44 years & above.
- These insights can inform the continuous refining of safety intervention, safety education programs, improving equipment standards, enhancing risk perceptions, and regulatory measures to promote the culture of safety and enjoyment of paragliding for practitioners worldwide (Wilkes et al.,2022).

7. Limitations and future research scope:

The study has some constraints because data were collected from the paragliding practitioners only in the Bir-Billing area, so the results may not represent paragliders at other destinations. Only a limited number of demographic variables were included; other factors, like culture, training background, or psychological traits, were not studied.

Similar studies can be done in other renowned paragliding destinations in India or worldwide to compare the risk perception across the destination and the regions with a large number of respondents for more reliable results. Comparative studies between solo pilots, tandem passengers, and professional competition pilots can give deeper insights and seasonal differences, such as how winter or summer conditions affect risk perception. Also, a long-term study can track changes in risk perception over the

years as pilots gain experience. In the last future, studies can also evaluate the effectiveness of safety training programs introduced in adventure tourism.

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