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Original Article

EXPLORING THE RELATIONSHIP BETWEEN PRE-CLIMB TRAINING PRACTICES AND SELF-REPORTED MUSCULOSKELETAL INJURIES AMONG MOUNTAIN CLIMBERS

EXPLORANDO A RELAÇÃO ENTRE PRÁTICAS DE TREINAMENTO PRÉ-ESCALAÇÃO E LESÕES MUSCULOESQUELÉTICAS AUTORREFERIDAS ENTRE ESCALADORES DE MONTANHA

Myra Monina Baldevarona-Dela Cruz[1]

[1]Polytechnic University of the Philippines, Manila, Philippines.

RESUMO

A escalada de montanha vem se tornando cada vez mais popular em todo o mundo. Apesar das inúmeras vantagens de aproveitar atividades ao ar livre, ainda há presença de perigo, doenças e lesões nas caminhadas. O estudo teve como objetivo explorar a relação entre práticas de treinamento pré-ascensão e lesões musculoesqueléticas autorreferidas entre montanhistas. Utilizando um delineamento descritivo-correlacional, a pesquisa entrevistou 385 escaladores com experiências principais ou múltiplas em montanhas classificadas com dificuldade 6/9 ou superior, de 2019 até o presente. Os dados foram analisados por meio de distribuições de frequência e porcentagem, juntamente com o teste do qui-quadrado de independência.Os resultados mostraram que os montanhistas comumente realizavam exercícios de aquecimento, desaquecimento e treinamento geral antes da subida. Contudo, deram menos atenção ao fortalecimento do core, à flexibilidade, ao equilíbrio e à propriocepção. As lesões relatadas com maior frequência foram cãibras, distensões, problemas na articulação do joelho, arranhões e escoriações — normalmente de gravidade leve a moderada. Importante ressaltar que não foi encontrada relação significativa entre as práticas de treinamento pré-ascensão e as lesões musculoesqueléticas. Dada a percepção comum de que a escalada é altamente desafiadora e perigosa, pode-se afirmar que a escalada de montanha nas Filipinas é, em geral, segura, com possibilidade principalmente de lesões leves. Os achados reforçam a necessidade de promover caminhadas seguras por meio da gestão comunitária de trilhas, da educação para a segurança nas escolas e da disseminação de estratégias de prevenção de lesões entre grupos de escalada. Fortalecer a educação ao ar livre e de aventura no currículo filipino pode ampliar a conscientização sobre segurança, ao mesmo tempo em que incentiva a participação no montanhismo e em outras atividades recreativas.

Palavras-chave: escalada de montanha; práticas de treinamento pré-ascensão; lesões musculoesqueléticas; montanhistas

ABSTRACT

Mountain climbing is becoming increasingly popular around the world. Despite numerous advantages to outdoor enjoyment in the great outdoors, there's still a presence of danger, illness, and injury in hiking. The study aimed to explore the relationship between pre-climb training practices and self-reported musculoskeletal injuries among mountain climbers. Using a descriptive-correlational design, the study surveyed 385 mountain climbers with major or multiple climbing experiences on mountains rated 6/9 and above in difficulty, from 2019 to the present. Data were analysed using frequency and percentage distributions, along with the Chi-square test of independence. Findings showed that mountain climbers commonly engaged in warm-up exercises, cooldowns, and general pre-climb training. However, less attention was given to core strengthening, flexibility, balance, and proprioception. The most frequently reported injuries were muscle cramps, strains, knee joint issues, scrapes, and abrasions—typically mild to moderate in severity. Importantly, no significant relationship was found between pre-climb training practices and musculoskeletal injuries. Given the common perception of mountain climbing as highly challenging and dangerous, it's safe to say that mountain climbing in the Philippines is generally safe, with the possibility of mild injuries only. The findings underscore the need to promote safe hiking through community-based trail management, safety education in schools, and dissemination of injury-prevention strategies to climbing groups. Strengthening outdoor and adventure education within the Philippine curriculum can enhance safety awareness while encouraging participation in mountaineering and other recreational activities.

Keywords: mountain climbing, pre-climb training practices, musculoskeletal injuries, mountain climbers

Introduction

Mountain activities and other outdoor recreational pursuits are becoming popular worldwide. In a global study conducted from July to December 2022, 93% of participants

indicated that hiking and trekking were the most popular mountain-related tourism activities across various nations[1]. In the Philippines, terms like "hiking," "trekking," and "mountain climbing" are used often and are growing in popularity. It is another well-liked recreational activity for those who want to escape the bustling life of the city and enjoy the stunning scenery of the surrounding mountains and landscape. Many local mountaineers are searching for adventure and connecting with nature[2]. This demonstrated that a growing number of outdoor enthusiasts are searching for amazing experiences like climbing, trekking, and camping in mountainous areas. People all around the globe are becoming more and more interested in hiking and walking tourism as a way to discover new places, enhance their regular activities, and ultimately improve their quality of life[3]. Moreover, mountain climbing, as an outdoor leisure activity, has gained considerable attention in recent years as a crucial element of the physical education curriculum. Physical education, with the primary objective of enhancing physical fitness and general wellness, plays a pivotal role in integrating hiking and other outdoor activities into its curriculum. Numerous studies indicate that there is a need to revamp physical education by including healthy lifelong activities and adopting a more comprehensive approach. To facilitate this shift and fully use the outdoors, physical education programs should include an outdoor component[4]. Engaging in mountain climbing may provide students with a fundamental understanding of the environment and its difficulties, thereby evoking a sense of care and motivating them to tackle outdoor and environmental problems.

Despite numerous advantages to outdoor enjoyment in the great outdoors, there's still a presence of danger, illness, and injury in hiking[5]. Due to the nature of mountain climbing activity, accidents are unavoidable and mountaineers experience both small and significant mishaps[2]. It means enjoying this kind of outdoor activity also involves risk and danger; engaging in physical activity such as mountain climbing might result in injury and painful conditions. Studies have shown that long-distance hikers on the Appalachian Trail reported a high percentage of musculoskeletal injuries, with overuse or chronic injuries being the most common[6]. Because of musculoskeletal injuries, 11% of climbers gave up on ascents[6]. Based on the result, non-exercising hikers had a higher risk of musculoskeletal injuries[6]. Researchers believe that further studies are necessary to determine if injury prevention techniques may lower musculoskeletal injuries among hikers who go long distances[6]. Another study found that a significant number of individuals who visit the Trolltunga Mountain cliff are inexperienced climbers, often possessing good physical fitness levels but lacking enough preparation for a 28 km walk[7]. They typically battle with the physical and mental strain of the hike, as well as problems like fatigue, heat, and improper clothing[7].

The increasing interest in hiking combined with advancements in injury prevention call for a reassessment of injury patterns. While it is hard to prevent all incidents, such as physical harm while climbing, reducing the frequency with which they occur is possible. Whether you're an experienced hiker or a beginner, being prepared for emergencies and having the right information and abilities can make all the difference in maximizing a fun and safe outdoor experience. The key to a successful hike lies not just in the journey but also in the preparation and precaution taken before and during the hike. This further stressed that there will always be a certain amount of danger involved in any activity, or adventure, and identifying and managing that risk are essential components of outdoor recreational safety. Thus, being into mountain climbing means accepting both the benefits of undertaking the activity and the potential risks of doing so. It is essential for every individual who wishes to participate in this kind of activity to recognize the significance of being prepared, trained, and equipped for the activity itself. The increasing interest in mountain climbing, the number of untrained, unprepared, and under-equipped people taking part, possible injuries, and the risks of doing so stand for an emerging issue. To fill in the gap, the study's main objective is to explore the relationship between pre-climb and self-reported musculoskeletal injuries among mountain climbers. This study's result

may be used as baseline data for the development of advocacy campaigns, accident-prevention measures, intervention plans, and policies that benefit the climbing and education community.

Methods

Research Design and Sample

This study utilized a descriptive correlational strategy to examine the relationship between climbers' profiles, pre-climb training practices and self-reported musculoskeletal injuries among mountain climbers. This method provides a static picture of circumstances and aims to better understand the relationship between variables without the researcher's influence. Instead of establishing a cause-and-effect relationship, descriptive correlational research seeks to characterize the relationship between variables[8]. The respondents of this study were purposively selected. The study's respondents were composed of mountain climbers who had recent majors/multiple within a single journey with a difficulty level of 6/9 and above between the years 2019 and present. Due to data unavailability, the researcher determined the appropriate number of mountain climber respondents using Cochran Equation 1[9]. The sample size was determined by considering the confidence interval, the proportion of respondents choosing a response, and the normal standard deviation at a 95% confidence level. By using this process, a sample size of 385 mountain climber respondents was acquired.

Table 1. Respondents' Demographics

	Frequency	**Percent**
Sex		
Male	244	63.38
Female	139	36.1
Did not disclose	2	0.52
Age		
18-20 yrs. Old	8	2.08
21-24 yrs. Old	26	6.76
25-30 yrs. Old	114	29.61
31-35 yrs. Old	106	27.53
36-40 yrs. Old	63	16.36
41-45 yrs. Old	31	8.05
46 yrs. and above	36	9.35
Did not disclose	1	0.26
Years of Climbing Experience		
No previous hiking experience	2	0.52
Beginner Novice hikers (with 1 to 5 previous hike)	30	7.79
Intermediate hikers (with 5 to 10 previous hikes)	107	27.79
Experienced hikers (more than 10 and above previous hiking trips)	245	63.64
Did not disclose	1	0.26
Mountain Climbing Trainings/Courses Attended	**Frequency**	**Rank**

Basic Mountaineering Course	290	1
Advance Mountaineering Course	169	3
Standard First Aid	257	2
Wilderness First Aid	155	4
Map Reading & Land Navigation	107	5
Basic Bushcraft Course	56	6
Bush Camping Training	48	7
Level 1 Climbing: Top Rope	38	8
Level 2 Climbing: Lead Climbing	12	9
Others, please specify	10	10

Source: The author.

Procedure

The study used a researcher-made survey questionnaire to determine the profile, pre-climb training practices and self-reported musculoskeletal injuries among mountain climbers. The questionnaire was validated by five experts and submitted for initial pilot testing. The questionnaire was administered twice to 40 mountain climbers, ensuring objectivity. The reliability coefficient was measured using the Pearson Correlation Coefficient formula, with a high positive correlation between all subcomponents. The results showed that the survey questionnaire was reliable, with a reliability coefficient of 0.429 to 1.000, indicating a high positive correlation which indicates that the survey questionnaire is reliable.

Study protocol, questionnaire, and content validity and reliability results was submitted to the PUP University Research Ethics Center for ethical evaluation. The PUP Research Ethics Committee approved the application, and the researcher contacted local tourist offices, DENR-Rizal offices, and guides in Rodriguez, Rizal to obtain permission for the study. The survey was conducted onsite, and the data was also obtained online through letters to different climbing groups and communities, call for respondents posted in different social media platforms and online climbing community.

Statistical Analysis

The study employed Frequency and Percentage Distribution to present descriptive data on the respondents' profiles, pre-climb training practices, and the types and severity of self-reported musculoskeletal injuries. This method allowed for a clear and systematic representation of categorical data, highlighting trends and patterns in climbers' behaviors and injury experiences. To examine potential associations between variables, the Chi-square Test of Independence was utilized. This non-parametric test is appropriate for analyzing relationships between nominal or categorical variables, such as climbers' demographic profiles and their reported injuries. Its application enabled the researchers to determine whether significant relationships existed between training practices and injury outcomes.

Results

Based on the analyzed data, the following tables are presented to address the specific problems of the study. The results are arranged in relation to the research questions posed by the researcher. As part of the study's objectives, the respondents' pre-climb training practices were examined to establish baseline information that supports the succeeding analyses.

Pre-climb Training Practices Engaged by Mountain Climbers in Preparation for their Major/Multiple Climb

Table 2. Frequency and Percentage Distribution of the Respondents in terms of Pre-Climb Training Practices

Pre-Climb Training Practices	**f**	**Rank**
Stretching includes dynamic and static & Warm-up exercises.	319	1
Cool-down exercises.	228	2
Training Program for Cardiorespiratory Fitness	164	4
Training Program for Body-Strengthening and Conditioning	125	5
Training Program for Flexibility	76	6
Training Program for Core-Muscles	64	8
Balance and Proprioception Exercises	65	7
Pre-climb Training Prior Major Climb	165	3

Source: The authors.

Table 2 outlined the frequency and rank distribution of respondents categorized by their pre-climb training practices. The most reported pre-climb training practice among the respondents was "Stretching includes dynamic and static & warm-up exercises," with 319 individuals securing the top rank. Following closely behind, "Cool-down exercises" were practiced by 228 respondents, ranking second. "Pre-climb Training before Major Climb" was undertaken by 165 respondents, ranking third, while "Training Program for Cardiorespiratory Fitness" was engaged in by 164 respondents, securing the fourth rank. Additionally, the "Training Program for Body-Strengthening and Conditioning" was implemented by 125 respondents, ranking fifth, and the "Training Program for Flexibility" was adopted by 76 respondents, ranking sixth. Furthermore, "Balance and Proprioception Exercises" were performed by 65 respondents, ranking seventh, whereas "Training Program for Core-Muscles" was practiced by 64 respondents, ranking eighth.

Self-Reported Musculoskeletal Injuries Among Mountain Climbers

Table 3. Frequency and Rank Distribution of the Respondents Self-Reported musculoskeletal Injuries

Musculoskeletal Injuries	f	Rank	Severity		
			Mild	Moderate	Severe
Scrapes and abrasion	156	5	129	22	5
Blisters	135	7	98	31	6
Muscle Strain	183	2	96	71	16
Muscle Cramps	207	1	125	71	11
Ankle Sprain	137	6	102	26	9
Laceration	85	13	76	8	1
Broken bones	65	17	62	2	1
Head Injury	62	18	59	3	0
Numbness	86	12	66	18	2
Elbow Joints	116	10	95	17	4
Hip Joints	120	9	89	28	3
Knee Joints	169	3	106	51	12
Ankle Joints	128	8	90	33	5
Backpain	157	4	93	54	10
Achilles Heel Pain	85	13	64	19	2
Shin Splints	72	15	62	10	0
Tendonitis	72	15	61	10	1
Others, please specify	91	11	39	47	5

Source: The authors.

Results indicate that muscle cramps were the most common injury reported (207, rank 1), followed by muscle strain (183, rank 2) and knee joint pain (169, rank 3). Back pain and scrapes/abrasions ranked fourth and fifth, respectively. The least common reported musculoskeletal injuries were head injuries (62 occurrences), fractured bones (65 cases), shin splints, and tendonitis (72 cases). Moreover, "Muscle cramps" had the highest frequency, with 125 cases categorized as mild, while "muscle strain" (96 mild cases) and "knee joint pain" (106 mild cases) also showed notable occurrences. These top three injuries, while largely mild, also had recorded cases of severe injury. Less frequent injuries included shin splints and tendonitis (72 cases each), broken bones (65 cases), and head injuries (62 cases). Although rare, broken bones and head injuries were generally mild when they occurred. Overall, most reported musculoskeletal injuries were mild to moderate in severity, indicating that while injuries are common among mountain climbers, they are not often severe.

Significant Relationship between Mountain Climber's Pre-Climb Training Practices and Musculoskeletal Injuries

Table 4. Chi-Square Test: Relationship between Pre-Climb Training Practices and Musculoskeletal Injuries

	MUSCULOSKELETAL INJURIES																	
Pre-Climb Training Practices	**Scrapes and abrasion**	**Blisters**	**Muscle Strain**	**Muscle Cramps**	**Ankle Sprain**	**Laceration**	**Broken bones**	**Head Injury**	**Numbness**	**Elbow Joints**	**Hip Joints**	**Knee Joints**	**Ankle Joints**	**Backpain**	**Achilles Heel Pain**	**Shin Splints**	**Tendonitis**	**Total**
Stretching includes dynamic and static & Warm-up exercises.	141	119	154	179	120	75	59	56	78	102	103	139	109	135	76	65	65	1775
Cool-down exercises.	70	63	85	109	73	43	35	33	42	70	66	82	68	73	43	37	37	1029
Training Program for Cardiorespiratory Fitness	69	65	83	97	63	40	28	27	39	53	54	76	60	67	39	34	33	927
Training Program for Body-Strengthening and Conditioning	62	56	76	88	52	34	26	24	31	46	49	66	55	60	35	29	28	817
Training Program for Flexibility	39	38	47	53	30	21	15	14	19	31	30	44	32	35	22	18	17	505
Training Program for Core-Muscles	39	37	46	47	30	22	16	15	18	26	27	39	34	35	25	19	17	492
Balance and Proprioception Exercises	33	33	39	43	28	19	15	14	19	31	32	41	39	34	21	17	15	473
Pre-climb Training prior Major Climb	103	94	120	120	84	60	46	44	62	61	69	98	76	102	59	50	50	1298
Total	556	505	650	736	480	314	240	227	308	420	430	585	473	541	320	269	262	7316
Pearson Chi - Square Value = 27.4984												**Decision: Failed to reject Ho**						
p value = 0.9999												**Remarks: Not Significant**						

Note: "If p value is less than or equal to the level of significance (0.05) reject Ho, otherwise failed to reject Ho."
Source: The authors.

Table 4 presented the results of a Chi-Square test investigating the relationship between pre-climb training practices and musculoskeletal injuries among climbers. The data are categorized by different types of physical conditioning methods, including stretching (dynamic and static) and warm-up exercises, cool-down exercises, training programs for cardiorespiratory fitness, body-strengthening and conditioning, flexibility, core muscles, balance and proprioception exercises, and pre-climb training before major climbs. The frequencies of various musculoskeletal injuries are provided for each type of physical conditioning method. For instance, among climbers who performed stretching and warm-up exercises, there were 141 cases of scrapes and abrasions, 119 cases of blisters, and so forth. Similarly, frequencies are listed for other conditioning methods. The total number of cases for each injury type is also presented.

The Pearson Chi-Square value obtained from the test is 27.4984, with a p-value of 0.9999. Since the p-value exceeds the significance level of 0.05, the null hypothesis (Ho) that there is no significant relationship between musculoskeletal injuries and the types of pre-climb

training practices used cannot be rejected. In other words, there is no statistically significant relationship in the distribution of musculoskeletal injuries across different types of pre-climb training practices among the study population. The Chi-Square test found no significant relationship between pre-climb training practices and musculoskeletal injuries among mountain climbers. The study found that regardless of physical conditioning, mountain climbers face similar risks of musculoskeletal injuries.

Discussion

The findings of this study contribute to the growing body of knowledge on the relationship between pre-climb training practices and the incidence of self-reported musculoskeletal injuries among mountain climbers, an area that remains underexplored despite the sport's increasing popularity and its significant physical demands. The most notable finding was that stretching—including both dynamic and static forms—and warm-up exercises emerged as the most frequently reported pre-climb practices. This aligns closely with existing literature, which consistently underscores the importance of warming up to prepare the body for strenuous activity. For instance, research has shown that comprehensive warm-ups increase blood flow, reduce muscle stiffness, and lower injury risk, while also preparing climbers psychologically for performance. [10]. Similarly, other studies have emphasized that stretching, particularly when integrated into a progressive warm-up, strengthens tendons and muscles and serves as a critical injury prevention measure.[11].

However, the present study also revealed that climbers often neglect other essential components of training—particularly core stability, flexibility, and balance—which are critical for optimizing climbing efficiency and minimizing injury risks[12,13]. This reflects a traditional training mindset that tends to prioritize strength and endurance over neuromuscular and proprioceptive training, a trend also noted in previous research. The omission of these elements in many climbers' routines suggests a potential gap in knowledge or accessibility to comprehensive training programs, underscoring the need for more educational initiatives that promote a well-rounded approach**.** In support of this, evidence highlights that muscle strength coordination training, which integrates core stability, balance, joint control, and synergistic muscle activation, is vital in mountaineering to improve biomechanical efficiency, reduce fatigue, and prevent injuries[14]. Their findings reinforce that the absence of these targeted training components could leave climbers more vulnerable to overuse injuries and performance limitations despite adequate cardiovascular and endurance conditioning[14].

Moreover, the types of injuries reported—muscle cramps, strains, knee joint pain, back pain, and minor abrasions—were consistent with patterns found in previous studies, which documented that musculoskeletal injuries remain prevalent across novice, intermediate, and experienced climbers[16,17]. Interestingly, the majority of injuries in this study were classified as mild to moderate in severity, contrasting with findings in other countries where more severe injuries, particularly involving the lower extremities, were reported[18,19]. This discrepancy may be partly explained by the terrain and trail classifications of Philippine mountains, which, while challenging, are generally less technical and less equipment-intensive than those in countries with more extreme alpine conditions. This aligns with findings that emphasize how Filipino mountaineers often engage in basic mountaineering courses, first-aid training, and community-based safety practices, such as Leave No Trace (LNT) principles and traditional recovery methods like *hilot*.[20]. Such preparedness and cultural safety awareness may contribute to the lower severity of injuries observed in this study, highlighting the combined role of technical readiness and indigenous knowledge in promoting safe climbing experiences in the Philippines[20].

Interestingly, statistical analysis revealed no significant relationship between pre-climb

training practices and injury occurrence. This contrasts with findings from other studies that showed structured physical preparation can reduce injury rates[21,6]. The lack of association in this study could be due to several factors: the relative uniformity of training practices among respondents, the majority being experienced climbers, and the generally less technical nature of Philippine climbing routes compared to international sites. Additionally, the preparedness of climbers—through familiarity with self-rescue techniques, communication protocols, and emergency response—may help mitigate the impact of injuries when they occur.

When compared with global literature, the relatively low incidence of severe injuries in the Philippines may also reflect differences in terrain. Many Philippine climbs involve moderate difficulty levels without prolonged exposure to extreme altitude or technical rock/ice climbing, reflecting the distinction between general and specialized mountaineering demands.[22]. This environmental factor may explain why injuries, while common, were mostly mild[22]. Moreover, it possibly reflecting not only terrain differences but also cultural and environmental factors such as guided climbs, group safety culture, and year-round climbing conditions. Nonetheless, the fact that injuries still occur even among seasoned climbers highlights the ongoing need for preventive measures, including structured pre-climb conditioning, terrain-specific risk assessment, and the promotion of core, balance, and flexibility training alongside traditional strength and endurance work.

Taken together, these findings highlight two key points: (1) Current training patterns are effective in maintaining low injury severity but could be optimized by incorporating more core, flexibility, and balance work to further reduce risks and improve climbing performance. (2) Injury prevention remains critical, especially for less experienced climbers, as injuries can still occur despite adequate training. Adopting a more holistic approach—integrating strength, endurance, mobility, and proprioception—could address potential gaps noted in this study and align with best practices in the field[23,24]. Future research should examine whether introducing more diverse and targeted training regimens in the Philippine climbing community can yield measurable reductions in injury incidence and severity.

Conclusion

The study found that mountain climbers highly value pre-climb training, particularly stretching and warm-up exercises, as part of their preparation for major and multiple climbs. However, less emphasis was placed on training for core muscles, flexibility, balance, and proprioception—indicating a gap in understanding their role in performance and injury prevention. Musculoskeletal injuries, such as muscle cramps, strains, knee and back pain, and abrasions, were common but generally mild to moderate in severity. This suggests that mountain climbing in the Philippines is relatively safe, with risks mitigated by climbers' experience, preparedness, and quick response to injuries. The variety of trail difficulties and the absence of advanced technical requirements further contribute to lower injury severity. No significant relationship was found between pre-climb training practices and the occurrence of musculoskeletal injuries, indicating that other factors—such as mental preparation, nutrition, and fitness level—may play a larger role. Thus, further research is suggested to explore other contributing factors such as adequate sleep, mental preparedness, risk management, and safety awareness. While injury risk remains, safe training approaches, early detection, and preventive measures are still essential.

The study recommends promoting safe hiking through community involvement in trail management, integrating safety education in schools, and disseminating findings to climbing groups. Strengthening outdoor and adventure education in the Philippine curriculum can enhance safety awareness while encouraging participation in mountaineering and other recreational activities.

References

1. Statista Research Instrument. Most common mountain-related tourist activities globally 2022 [Internet]. 2023 [cited 2025 Aug 27]. Available from: https://www.statista.com/statistics/1389679/leading-mountain-tourism-activities-worldwide/
2. Tugade L, Cornell DA, Apigo DJ, Banzel E. On reaching the summit: profile, perspectives and behavior of Filipino mountaineers. Asia Pac J Manag Sustain Dev [Internet]. 2021 [cited 2025 Aug 27];9(2). Available from: https://research.lpubatangas.edu.ph/wp-content/uploads/2022/02/12-APJMSD-2021-40-1.pdf
3. Acevedo-Duque N, Llanos-Herrera GR, García-Salirrosas EE, Simón-Isidoro S, Álvarez-Herranz AP, Álvarez-Becerra R, Díaz LCS. Scientometric analysis of hiking tourism and its relevance for wellbeing and knowledge management. Int J Environ Res Public Health. 2022;19(14):8534. DOI: https://doi.org/10.3390/ijerph19148534
4. Nguyen N. Incorporating outdoor education into the physical education curriculum. Strategies. 2015;28(1):34–40. DOI: https://doi.org/10.1080/08924562.2015.981126
5. Kortenkamp KV, Moore CF, Sheridan DP, Ahrens ES. No hiking beyond this point! Hiking risk prevention recommendations in peer-reviewed literature. J Outdoor Recreat Tour. 2017;20:67–76. DOI: https://doi.org/10.1016/j.jort.2017.10.002
6. Chrusch A, Kavin M. Survey of musculoskeletal injuries, prehike conditioning, and on-trail injury prevention strategies self-reported by long-distance hikers on the Appalachian Trail. Wilderness Environ Med. 2021;32(3):322–331. DOI: https://doi.org/10.1016/j.wem.2021.04.004
7. Mykletun RJ, Oma PY, Aas Y. When the hiking gets tough: "New adventurers" and the "extinction of experiences." J Outdoor Recreat Tour. 2021;100450. DOI: https://doi.org/10.1016/j.jort.2021.100450
8. Bhat A. Descriptive correlational: descriptive vs correlational research [Internet]. 2023 Nov 24 [cited 2025 Aug 27]. Available from: https://www.questionpro.com/blog/descriptive-research-vs-correlational-research/
9. Cochran C. Determining sample size [Internet]. [date unknown; cited 2025 Aug 27]. Available from: https://www.tarleton.edu/academicassessment/wp-content/uploads/sites/119/2022/05/Samplesize.pdf
10. Bhat MR, Ahmad M. Benefits of warming up in sports – an analytical study. Int J Creat Res Thoughts (IJCRT) [Internet]. 2018 [cited 2025 Aug 27];6(1):402–404. Available from: https://www.ijcrt.org
11. Cobos-Moreno P, Astacio-Picado A, Gomez-Martin B. Epidemiological study of foot injuries in the practice of sport climbing. Int J Environ Res Public Health. 2022;19(7):4302. DOI: https://doi.org/10.3390/ijerph19074302
12. Higham S. Core training for climbers – Climb Fit [Internet]. 2023 Apr 3 [cited 2025 Aug 27]. Available from: https://www.climbfit.com.au/core-training-for-climbers/
13. Hörst E. Mastering climbing movement with proprioception and "process feedback" [Internet]. 2023 Dec 24 [cited 2025 Aug 27]. Available from: https://trainingforclimbing.com/mastering-climbing-movement-with-proprioception/
14. Wang D, Luo Y, Yang J, Zhao Z, Han J. Muscle strength coordination training for athletes in mountaineering sports. Rev Bras Med Esporte. 2023;29. DOI: https://doi.org/10.1590/1517-8692202329012022_0289
15. Bigdon SF, Hecht V, Fairhurst PG, Deml M, Exadaktylos A, Albers C. Injuries in alpine summer sports—types, frequency and prevention: a systematic review. BMC Sports Sci Med Rehabil. 2022;14:79. DOI: https://doi.org/10.1186/s13102-022-00468-4
16. Spano S, Hile A, Jain R, Stalcup P. The epidemiology and medical morbidity of long-distance backpackers on the John Muir Trail in the Sierra Nevada. Wilderness Environ Med. 2018;29(2):203–210. DOI: https://doi.org/10.1016/j.wem.2018.02.006
17. Abassi F, Dadgostar H, Vaziri M, Lotfian S. Skeletal injuries and their pattern following mountaineering and climbing accidents in Iranian athletes. 2023. DOI: https://doi.org/10.18502/acta.v61i2.12532
18. Krolikowski M. Evidence summary: hiking/mountaineering. Active & Safe Central. BC Injury Research and Prevention Unit [Internet]. 2018 [cited 2025 Aug 27]. Available from: https://activesafe.ca/wp-content/uploads/2018/04/Hiking.pdf
19. Buzzacott P, Schöffl I, Chimiak J, Schöffl V. Rock climbing injuries treated in US emergency departments, 2008–2016. Wilderness Environ Med. 2019;30(2):121–128. DOI: https://doi.org/10.1016/j.wem.2018.11.009
20. Camatison G. Climbing the summit: insights from narratives of mountaineers and reflections of a physical educator [Internet]. 2022 [cited 2025 Aug 27]. Available from: https://ejournals.ph/article.php?id=20896
21. Etayo-Urtasun P, León-Guereño P, Sáez I, Castañeda-Babarro A. Relationship of training factors and resilience with injuries in ski mountaineers. Sports. 2022;10(12):191. DOI: https://doi.org/10.3390/sports10120191

22. House S. Training for mountaineering. Uphill Athlete [Internet]. 2023 May 1 [cited 2025 Aug 27]. Available from: https://uphillathlete.com/mountaineering/training-for-mountaineering/
23. Rauch S, Wallner B, Ströhle M, Del Cappello T, Brodmann Maeder M. Climbing accidents—prospective data analysis from the International Alpine Trauma Registry and systematic review of the literature. Int J Environ Res Public Health. 2020;17(1):203. DOI: https://doi.org/10.3390/ijerph17010203
24. Koźlenia D, Domaradzki J. Prediction and injury risk based on movement patterns and flexibility in a 6-month prospective study among physically active adults. PeerJ. 2021;9:e11399. DOI: https://doi.org/10.7717/peerj.11399

ORCID:
Myra Monina Baldevarona-Dela Cruz: https://orcid.org/0009-0002-9601-8864

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Corresponding author: Myra Monina Baldevarona-Dela Cruz1. E-mail: mmbdelacruz@pup.edu.ph