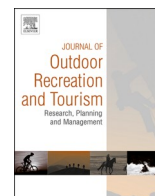




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Research Article

Study on the mental health of women practicing mountain sports and climbing: elite vs. non-elite



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ABSTRACT

There's current social interest in participating in outdoor activities, which necessitates a deeper examination of the psychosocial factors surrounding these sports. This proposal is part of the project "Evaluation of the physical and mental health of women practicing mountain and climbing sports". Mental health and psychosocial variables are analyzed in women who participate in these sports. The purpose of the study is to investigate the psychosocial well-being of the participants and to analyze the effect of age and sporting level (elite vs. non-elite). A total of 91 women participated, divided into two groups: 20 athletes from the Spanish national teams (junior and senior) in climbing, ski mountaineering, and mountain running (elite group), and 71 non-elite women. The following scales were used: the Spanish Subjective Happiness Scale Satisfaction with Life Scale, Brief Resilient Coping Scale, DASS Scale (for depression and stress), and the Competitive State Anxiety Inventory. All scales employed are validated. Significant differences were found by age (under 35 years vs. over 35 years) in resilience [$Z = 688, p = .007, \text{Hedges' } g = .702$]; depression [$Z = 780, p = .05, \text{Hedges' } g = .452$]; stress [$Z = 789, p = .05, \text{Hedges' } g = .442$]; cognitive anxiety [$Z = 560, p < .001, \text{Hedges' } g = .863$]; somatic anxiety [$Z = 758, p = .03, \text{Hedges' } g = .453$]; and self-confidence [$Z = 688, p = .007, \text{Hedges' } g = .613$]. By sporting level (elite vs. non-elite), elite athletes exhibited greater life satisfaction [$Z = 482, p = .028, \text{Hedges' } g = .559$] and lower cognitive anxiety [$Z = 383, p = .002, \text{Hedges' } g = .841$]. The linear regression analysis revealed that the two predictor variables accounted for 57.7 % of the variance in subjective happiness ($R = .785, R^2 = .586, R^2 = .577, F(2-88) = 62.307, p < .001, \text{power } \beta-1 = .97783$). The variable with the greatest weight was life satisfaction ($\text{Beta} = .582, t = 6.901, p < .001$), followed by resilience ($\text{Beta} = .263, t = 3.118, p = .002$). The discussion of the study's findings demonstrates that this research is consistent with other similar investigations. A potential limitation of the study is the relatively small sample size.

1. Introduction

Mountain sports have experienced significant global growth,

particularly in the last decade (Martín-Talavera et al., 2024). In Spain, the recent Spanish Sport Habits Study (Ministry of Culture and Sport of Spain, 2022) reports that hiking and mountaineering are among the

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most practiced outdoor activities.

The Self-Determination Theory, developed by Deci and Ryan (1985, 2002), provides a psychological framework that explores how individuals are motivated and develop. It emphasizes the importance of basic psychological needs for optimal well-being, which is a key focus of our study. This theory postulates that autonomy, competence, and relatedness are fundamental for motivation and personal growth. Specifically, sport promotes intrinsic motivation and active participation (Moreno & Martínez, 2006). Similarly, Fredrickson's Broaden-and-Build Theory (Fredrickson, 2004) proposes that positive emotions broaden an individual's thought and action repertoires, which, in turn, build enduring personal resources. Both theories are highly relevant to our study.

Activities in natural environments demand various physical and mental competencies, in addition to requisite levels of self-esteem and self-image (Gavín-Chocano et al., 2025). There is growing social interest in participating in outdoor activities, which necessitates a deeper examination of the psychosocial factors surrounding these sports, especially mountain sports. Consequently, there's a need to delve into the psychosocial determinants inherent to these activities (Gavín-Chocano et al., 2023), such as well-being and life satisfaction (Papadopoulos et al., 2019; Ritpanitchajchaval et al., 2023; Sanz-Junoy et al., 2023), resilience (Ancarani et al., 2024; Buchecker & Degenhardt, 2015; Martín-Talavera et al., 2024), self-concept (Casino-García et al., 2024; Martín-Talavera et al., 2023), self-esteem (Šagát et al., 2021).

Specifically, the association of sports practice with significant psychological and social benefits for health has been demonstrated in numerous studies, the most relevant being well-being, anxiety, and stress reduction (Singh et al., 2023). This is further substantiated by the recent systematic review conducted by Pomfret et al. (2023) on outdoor adventure activities for subjective well-being.

In this regard, Próchniak (2022) analyzed the relationship between life satisfaction, optimism in mountain sports, personality, and emotional responses. Evidence suggests that resilient athletes tend to be more satisfied with life (Baumsteiger et al., 2022). Achieving psychological well-being, and consequently life satisfaction, requires several components, which Mosquera-Castro et al. (2021) identified as essential for higher levels of well-being. These components include self-acceptance, positive relationships with others, autonomy, environmental mastery, purpose in life, and personal growth (Iranian-Pahrabad et al., 2016).

Valdés-Badilla et al. (2020) demonstrated a positive relationship between outdoor sports training activities and life satisfaction. Similarly, Aquino Linares and Gavala González (2020) concluded that sports training in natural environments was positively associated with life satisfaction. Overall, it appears justified to state that sports training in natural environments is linked to increased life satisfaction (Martín-Talavera et al., 2024).

Various psychological factors, such as stress and anxiety, affect mountain sport participants (Garrido-Palomino & España-Romero, 2023; Puhakka, 2023). The scientific literature suggests that effective anxiety management is closely related to emotional regulation (Amstadter, 2008; Hanin, 2010; Sakiris & Berle, 2019), for this reason, it is essential to analyze all socio-emotional aspects related to variables such as the emotional intelligence of outdoor sports practitioners (Garrido-Palomino & España-Romero, 2019; Laborde et al., 2015; Nicolas et al., 2019).

This study analyzes subjective happiness, life satisfaction, resilience, depression, stress, and anxiety in individuals associated with the Spanish Federation for Mountain and Climbing Sports (FEDME). This federation is uniquely positioned as the only Spanish sports federation participating in both the Summer Olympics (with sport climbing) and the Winter Olympics (with ski mountaineering).

1.1. Objective

Following a review of the theoretical framework for the variables under investigation in the preceding sections, the general objectives of this study are outlined as follows:

(a) To ascertain the scores for subjective happiness, life satisfaction, resilience, depression, stress, and anxiety in women who participate in mountain sports. (b) To determine the existence of significant correlations among the dimensions of the instruments evaluating the considered variables. (c) To establish the presence of statistically significant differences in the scores of the considered variables based on the participants' age (under 35 vs. over 35). (d) To identify the existence of statistically significant differences in the analyzed variables according to the athletic level of the sample subjects (elite vs. non-elite). (e) To determine the extent to which life satisfaction and resilience variables predict subjective happiness in women engaging in mountain sports.

1.2. Hypotheses

Based on the preceding theoretical review and in alignment with the stated objectives, the following hypotheses were formulated.

Hypothesis 1. (H1): A significant positive correlation exists among the variables of subjective happiness, life satisfaction, resilience, and self-confidence.

Hypothesis 2. (H2): Subjective happiness, life satisfaction, resilience, and self-confidence are significantly inversely correlated with the variables of depression, stress, and anxiety.

Hypothesis 3. (H3): Significant differences exist based on age (under 35 years vs. over 35 years) in the variables considered.

Hypothesis 4. (H4): Significant differences are observed based on athletic level (elite vs. non-elite) in the analyzed variables.

Hypothesis 5. (H5): Life satisfaction and resilience are predictive variables of subjective happiness among female mountain sports practitioners.

2. Method

2.1. Participants

The sample comprised a total of 91 women, divided into two groups: 20 athletes from the Spanish national teams (junior and senior) in climbing, ski mountaineering, and mountain running (elite group), and 71 non-elite women practicing mountain sports. Participants were recruited through an incidental non-probabilistic sampling method. The mean age of the participants was 37.7 years (± 12.2). Inclusion criteria included belonging to one of the two aforementioned groups, being over 18 years of age (the age of majority in Spain), and holding a federative license in mountain sports and climbing.

2.2. Materials and instruments

A non-experimental quantitative method was employed, combining descriptive and relational studies; all scales utilized were previously validated.

Sociodemographic Variables. Participants were requested to indicate their gender, age in years and the sport they participated, prior to completing the instruments included in the response form.

Subjective Happiness Scale Spanish -SSHS- (Extremera & Fernández-Berrocal, 2014). This scale consists of 4 items, responded to on a 7-point Likert scale (1–7 points), reflecting the degree of disagreement or agreement (lower happiness to higher happiness), la cual está basada en la escala SHS (Lyubomirsky & Lepper, 1999). The reliability of the scores obtained in the study sample was $\alpha = .886$ and $\omega = .889$.

Satisfaction with Life Scale (SWLS). Developed by Diener et al. (1985), this scale measures the level of satisfaction with life. Participants respond to 5 items on a 7-point Likert scale, indicating their level of agreement or disagreement with each item. The scale was adapted and validated in Spanish by Vázquez et al. (2013). The reliability of the scores obtained with this instrument was $\alpha = .851$ and $\omega = .855$.

Brief Resilient Coping Scale Spanish -BRCS- (Rodríguez-Rey et al., 2016). This is a 6-item self-report scale with a 5-point response scale ranging from 1 (strongly disagree) to 5 (strongly agree), based on the original BRC scale (Smith et al., 2008). A higher score indicates a greater degree of resilience. The version used presents one factor and shows a reliability of $\alpha = .794$ and $\omega = .806$.

DASS-21. Spanish version of the Depression, Anxiety and Stress Scales (DASS), and its short form (DASS-21), has been used in our study (Bados et al., 2005), employing only the depression and stress subscales. The original instrument was developed by Lovibond and Lovibond (1995). It consists of 21 items encompassing three factors, there are three 7-item scales (Depression, Anxiety and Stress). Respondents evaluate from 0 to 3 the severity/frequency with which they have experienced each during the previous week. The scales's reliability was $\alpha = .866$ and $\omega = .878$ for Depression; and $\alpha = .831$ and $\omega = .845$ for stress (employing only the depression and stress subscales in this research).

Spanish version of the Revised Competitive State Anxiety Inventory-2 (CSAI-2R). Anxiety levels and self-confidence were measured using the Spanish version of the Revised Competitive State Anxiety Inventory-2 -CSAI-2R- (Andrade-Fernández et al., 2007) adapted from Martens et al. (1990). The scale consists of 18 items that measure three dimensions of anxiety: somatic anxiety, cognitive anxiety, and self-confidence. The Likert-type response format with four alternatives, numbered from 1 (not at all) to 4 (much). The questionnaire has demonstrated good psychometric properties, $\alpha = .865$ and $\omega = .869$ for cognitive anxiety; $\alpha = .907$ and $\omega = .907$ for somatic anxiety; and $\alpha = .932$ and $\omega = .933$ for self-confidence.

2.3. Procedure

The study adhered to national and international ethical guidelines for research conduct and data collection. Data were processed in accordance with the regulations set forth in Regulation (EU) 2016/679 of the European Parliament and of the Council of April 27, 2016 concerning the protection of personal data, and Organic Law March 2018 of 5 December, ensuring digital rights. Participants were informed that their responses would be kept anonymous and confidential, and that the information provided would be used exclusively for scientific purposes. Informed consent was obtained from participants following a comprehensive explanation of the study's aims. Research instruments were administered individually via the Google® platform (Google LLC).

Researchers explained the purpose of the research and the guidelines for its proper development. Data were collected ensuring at all times the ethical principles for research established in the Declaration of Helsinki (World Medical Association, 2024) and the European Code of Conduct for Research Integrity (All European Academies, 2017). The study received approval from the Ethics Committee of the University of Jaén (Spain) for human studies, with reference code JUL.23/5.LINEA, approved on July 21, 2023.

2.4. Data analyses

The normality of the data was assessed using Mardia's multivariate test, which was employed to examine the skewness and kurtosis of the observed variables. Analyses were conducted to verify the assumptions of multicollinearity, homogeneity, and homoscedasticity, ensuring that the resulting distribution met the criteria for interdependence among variables. The data were fitted to a non-normal distribution, so non-parametric tests were used.

Descriptive statistics were obtained, and the reliability (alpha and omega coefficients) of the instruments used in the participant sample was analyzed. All values were reported as means (*M*) and standard deviations (*SD*) for continuous variables. The existence of significant correlations between the variables considered was also analyzed using Spearman's *Rho*. Tests for differences in means for independent samples (Mann-Whitney *U*) were calculated based on the sociodemographic variables considered. Finally, a regression analysis was performed to examine whether life satisfaction and resilience variables were predictors of subjective happiness. Effect sizes were reported for all analyses. Spearman's *rho* itself serves as a measure of effect size (Cohen, 1992), with its value indicating the magnitude of the effect; reference values .10: small, .30: medium, .50: large (Domínguez-Lara, 2018). For the Mann-Whitney *U* test, Hedges' *g* was employed to determine the effect size; reference values .10: small, .30: medium, .50: large (Coolican, 2009; Domínguez-Lara, 2018). In the case of the regression analysis, the effect size will be derived from the adjusted *R*² value; reference values for predictors: .02: small, .15: medium, and .35: large (Cohen, 1992; Domínguez-Lara, 2018).

Analyses were conducted using Jamovi software version 2.6 and IBM SPSS Statistics software version 27.0. A statistical power analysis was conducted using G*Power 3.1 software. In all cases, a 95 % confidence level was employed, and effect sizes were reported for the analyses performed.

3. Results

We present the results that address the purposes and hypotheses considered in our study. First (see Table 1), the scores obtained for each dimension of the instruments used to assess the analyzed variables are presented (descriptive statistics), along with the reliability (Cronbach's alpha and McDonald's omega coefficient) of the instruments employed in our investigation.

In the presented results, we can observe that not all scales employed share the same response range, with the exceptions being the Subjective Happiness Scale and Life Satisfaction Scale, as well as the anxiety subscales. Consequently, direct comparisons across all scales are not feasible. Subjective happiness and life satisfaction responses exhibit similar scores, with life satisfaction being slightly higher ($M = 5.78$, $SD = \pm .98$). Regarding the anxiety subscales, self-confidence scores noticeably higher ($M = 2.95$, $SD = \pm .78$), while somatic anxiety shows the lowest value ($M = 2.30$, $SD = \pm .77$).

Table 2 presents the results of the correlation analysis conducted to address Hypothesis 1 (A significant positive correlation exists among the variables of subjective happiness, life satisfaction, resilience, and self-confidence). H1 was confirmed, demonstrating significant correlations between subjective happiness and all dimensions. Direct correlations were observed with life satisfaction ($Rho_{(n=91)} = .66$, $p < .001$), resilience ($Rho_{(n=91)} = .57$, $p < .001$), and self-confidence ($Rho_{(n=91)} = .40$, $p < .001$); characterized by a large effect size across all measures ($Rho > .50$).

For Hypothesis 2 (Subjective happiness, life satisfaction, resilience,

Table 1
Descriptive statistics and reliability.

	N	Mean	SD	α	ω
Subjective happiness (Range 1–7)	91	5.588	± 1.178	.886	.889
Life satisfaction (Range 1–7)	91	5.789	$\pm .988$	.851	.855
Resilience (Range 1–5)	91	4.055	$\pm .731$	.794	.806
Depression (Range 0–3)	91	.641	$\pm .592$	.866	.878
Stress (Range 0–3)	91	1.166	$\pm .628$	.831	.845
Cognitive anxiety (Range 1–4)	91	2.360	$\pm .893$	.865	.866
Somatic anxiety (Range 1–4)	91	2.300	$\pm .771$	.907	.907
Self-confidence (Range 1–4)	91	2.954	$\pm .787$	.932	.933

Note. *M*: Mean; *SD*: Standard Deviation; α : Cronbach's Alpha; ω : McDonald's Omega coefficient.

Table 2
Spearman's *Rho* correlations.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subjective happiness (1)	<i>Rho</i>	–							
	<i>p</i>	–							
Life Satisfaction (2)	<i>Rho</i>	.66***	–						
	<i>p</i>	<.001	–						
Resilience (3)	<i>Rho</i>	.57***	.50***	–					
	<i>p</i>	<.001	<.001	–					
Depression (4)	<i>Rho</i>	–.63***	–.42***	–.45***	–				
	<i>p</i>	<.001	<.001	<.001	–				
Stress (5)	<i>Rho</i>	–.39***	–.35***	–.42***	.63***	–			
	<i>p</i>	<.001	<.001	<.001	<.001	–			
Cognitive anxiety (6)	<i>Rho</i>	–.30**	–.22*	–.30**	.29**	.38***	–		
	<i>p</i>	.003	.032	.03	.005	<.001	–		
Somatic anxiety (7)	<i>Rho</i>	–.28**	–.28**	–.24*	.22*	.38***	.66***	–	
	<i>p</i>	.007	.006	.019	.030	<.001	<.001	–	
Self-confidence (8)	<i>Rho</i>	.40***	.52***	.38***	–.43***	–.30**	–.42***	–.41***	–
	<i>p</i>	<.001	<.001	<.001	<.001	.004	<.001	<.001	–

Note. *: $p \leq .05$; **: $p \leq .01$; ***: $p \leq .001$; *Rho*: Spearman's *Rho*.

and self-confidence are significantly inversely correlated with the variables of depression, stress, and anxiety), the obtained evidence confirmed this hypothesis. Statistically significant inverse correlations were observed between these variables, with $Rho_{(n=91)}$ values ranging from .66 to .22 ($p < .001$), indicating a medium effect size (see Table 2).

As hypothesized, subjective happiness also exhibited inverse correlations with the remaining variables: depression ($Rho_{(n=91)} = -.63, p < .001$), stress ($Rho_{(n=91)} = -.39, p < .001$), cognitive anxiety ($Rho_{(n=91)} = -.30, p = .003$), and somatic anxiety ($Rho_{(n=91)} = -.28, p = .007$). Similarly, life satisfaction showed inverse correlations with depression ($Rho_{(n=91)} = -.42, p < .001$), stress ($Rho_{(n=91)} = -.35, p < .001$), cognitive anxiety ($Rho_{(n=91)} = -.22, p = .032$), and somatic anxiety ($Rho_{(n=91)} = -.28, p = .006$). Finally, resilience demonstrated a comparable pattern, inversely correlating with depression ($Rho_{(n=91)} = -.45, p < .001$), stress ($Rho_{(n=91)} = -.42, p < .001$), cognitive anxiety ($Rho_{(n=91)} = -.30, p = .003$), and somatic anxiety ($Rho_{(n=91)} = -.24, p = .019$). Consistently, the effect sizes were observed to be either medium or large.

To address Hypothesis 3, which posits that significant differences exist based on age (under 35 years vs. over 35 years) in the variables considered, an independent samples mean difference analysis was conducted using the Mann-Whitney *U* test. As shown in Table 3, significant differences based on age were observed in all considered dimensions, with the exception of subjective happiness and life satisfaction.

Significant differences were found by age (under 35 years vs. over 35 years) in resilience [$Z = 688, p = .007$, Hedges' $g = .702$]; depression [$Z = 780, p = .05$, Hedges' $g = .452$]; stress [$Z = 789, p = .05$, Hedges' $g = .442$]; cognitive anxiety [$Z = 560, p < .001$, Hedges' $g = .863$]; somatic anxiety [$Z = 758, p = .03$, Hedges' $g = .453$]; and self-confidence [$Z = 688, p = .007$, Hedges' $g = .613$]. Older individuals achieved better

Table 3
Independent Samples Test, Mann-Whitney *U* (under 35 years vs. over 35 years).

	Under 35 Mean (SD)	Over 35 Mean (SD)	Z	p	CI (95 %) Lower/Superior		Effect size Hedges' g
Sub. happiness	5.38(±1.43)	5.75(±.90)	912	.36	–.098	.735	.318
Life satisfaction	5.65(±1.15)	5.89(±.82)	924	.41	–.17	.661	.245
Resilience	3.79 (±.84)	4.27(±.53)	688	.007**	.276	1.129	.702
Depression	.78(±.67)	.52(±.49)	780	.05*	–.871	–.032	.452
Stress	1.31(±.66)	1.04(±.57)	789	.05*	–.861	–.023	.442
Cognitive anxiety	2.74(±.85)	2.04(±.80)	560	<.001***	–1.375	–.351	.863
Somatic anxiety	2.48(±.82)	2.14(±.69)	758	.03*	–.873	–.034	.453
Self-confidence	2.70(±.80)	3.16(±.71)	688	.007**	.189	1.036	.613

Note. Effect size (Hedges' g); reference values .10: small, .30: medium, .50: large (Coolican, 2009).

*: $p \leq .05$; **: $p \leq .01$; ***: $p \leq .001$.

outcomes, with a medium to large statistical effect size (see Table 3 and Fig. 1).

In response to Hypothesis 4, which stated that significant differences exist between athletic levels (elite vs. non-elite) across the analyzed variables, the findings are presented in Table 4 and Fig. 2.

By sporting level (elite vs. non-elite), elite athletes exhibited greater life satisfaction [$Z = 482, p = .028$, Hedges' $g = .559$] and lower cognitive anxiety [$Z = 383, p = .002$, Hedges' $g = -.841$], exhibiting a large effect size in both instances.

Finally, Hypothesis 5 proposed that life satisfaction and resilience are predictive variables of subjective happiness among female mountain sports practitioners. To analyze which variables best predict subjective happiness, we conducted a linear regression using the stepwise method (see Table 5), with life satisfaction and resilience considered as predictor variables.

The model summary indicates that the predictor variables explain 57.7 % of the variance ($R^2_{adjusted} = .577$; $F_{(2,88)}=62.307, p < .001$). This indicates high statistical power (Power $\beta-1 = .97783$) and a good model fit (AIC = 113; BIC = 123; RMSE = .430). The variable with the greatest weight was life satisfaction ($Beta = .582, t\text{-test} = 6.901, p < .001$), followed by resilience ($Beta = .263, t\text{-test} = 3.118, p = .002$). Therefore, life satisfaction and resilience are key predictors of subjective happiness in women who practice mountain and climbing sports, with all scales showing a significant *t*-test value. The effect size is large ($R^2_{adjusted} = .577$), as indicated by the $R^2_{adjusted}$ value (with reference values of .02 for small, .15 for medium, and .35 for large effects).

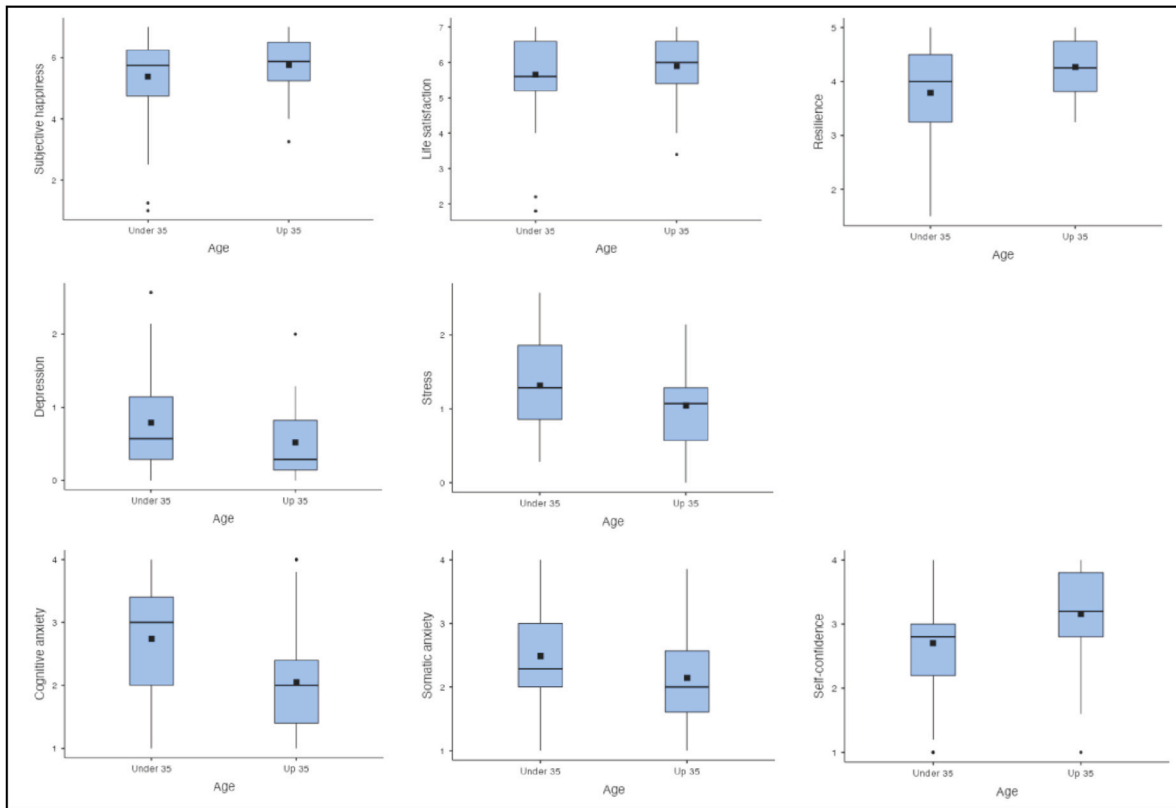


Fig. 1. Independent Samples Test, Mann-Whitney U (Differences depending on age).

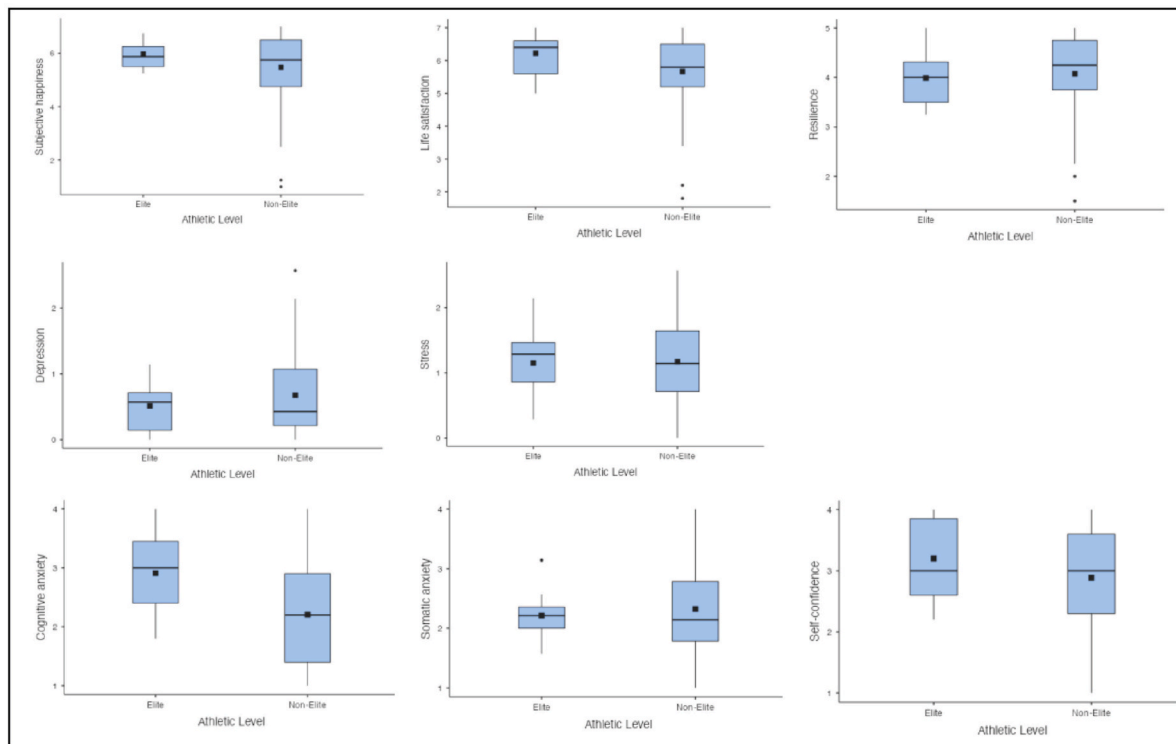


Fig. 2. Independent Samples Test, Mann-Whitney U (elite vs. non-elite).

Table 4
Independent Samples Test, Mann-Whitney *U* (elite vs. non-elite).

	Elite Mean (SD)	Non-elite Mean (SD)	Z	p	CI (95 %) Lower/Superior		Effect size Hedges' g
Sub.happiness	(5.97 ± .49)	(5.47 ± 1.28)	595	.27	-.932	.068	.431
Life satisfaction	6.20 (±.61)	5.66(±1.04)	482	.02*	-1.063	-.057	.559
Resilience	3.98(±.58)	4.07(±.76)	606	.31	-.372	.621	.124
Depression	.51(±.35)	.67(±.64)	659	.62	-.227	.769	.271
Stress	1.15(±.55)	1.17(±.65)	694	.88	-.464	.528	.032
Cognitive anxiety	2.91(±.74)	2.20(±.87)	383	.002**	-1.352	-.33	.841
Somatic anxiety	2.21(±.45)	2.32(±.84)	698	.90	-.354	.639	.142
Self-confidence	3.20(±.66)	2.88(±.80)	570	.17	-.914	.085	.414

Note. Effect size (Hedges' g); reference values .10: small, .30: medium, .50: large (Coolican, 2009).
*: $p \leq .05$; **: $p \leq .01$; ***: $p \leq .001$.

Table 5
Linear regression model.

Criterion Variable	R	R ²	R ² _{adjusted}	F (2,88)	Predictor variables	Beta (β)	t-test	p
Subjective happiness	.766	.586	.577	62.307				
					Life satisfaction	.582	6.901***	≤.001
					Resilience	.263	3.118**	.002

Note. *: $p \leq .05$; **: $p \leq .01$; ***: $p \leq .001$. Reference values for effect size: R²_{adjusted} score, are as follows: .02 for a small effect, .15 for a medium effect, and .35 for a large effect (Coolican, 2009).

4. Discussion and conclusions

4.1. Discussion

The purpose of this research was to assess subjective happiness, life satisfaction, resilience, depression, stress, and anxiety among female mountain sport athletes, including both elite-level competitors and non-elite athletes. We analyzed for significant differences in these study variables based on participants' age (under 35 vs. over 35) and their athletic level (elite vs. non-elite). Furthermore, the study confirmed that life satisfaction and resilience are significant predictors of subjective happiness, consistent with findings from other studies (Buchecker & Degenhardt, 2015; Papadopoulos et al., 2019; Ritpanitchajchaval et al., 2023; Sanz-Junoy et al., 2023). The results obtained will be discussed next, in accordance with the study's objectives and in response to the formulated hypotheses.

As indicated in the first hypothesis (H1), and as expected, subjective happiness, life satisfaction, resilience, and self-confidence were directly and significantly correlated. This trend aligns with findings from various studies (Baumsteiger et al., 2022; Mosquera-Castro et al., 2021; Próchniak, 2022) and with evidence suggesting the influence of psychosocial factors on psychological well-being and life satisfaction (Molina-Gómez et al., 2024). Furthermore, these results are consistent with other thematic studies conducted exclusively with female athletes (Rangel et al., 2017).

Regarding the second hypothesis (H2), which posited that subjective happiness, life satisfaction, resilience, and self-confidence would correlate inversely with depression, stress, and anxiety, this correlation as expected according to the literature was confirmed. Our findings provide evidence consistent with other studies, confirming that happiness, life satisfaction, well-being, and resilience do not exhibit the same patterns as less desirable psychological variables such as depression, stress, and anxiety (Pomfret et al., 2023; Singh et al., 2023). It is important to consider that these assessments may fluctuate throughout life and be influenced by individual experiences and social interactions (Gavín-Chocano et al., 2025).

For the third hypothesis (H3), the results reveal significant age-related differences across all variables except subjective happiness and life satisfaction. These differences favor older individuals (in our study, those over 35 years old). Older women exhibit higher scores in resilience and self-confidence, and lower scores in depression, stress, and anxiety.

This indicates healthier mental well-being with increasing age. These findings align with other studies (Lima et al., 2015), which report a decrease in depression and anxiety with age, although some research presents a contrasting trend (Sánchez-Godoy et al., 2022). Regarding stress, our results follow the same pattern observed in other studies (Olmedilla et al., 2021). Similarly, a study by Jensen et al. (2018) on elite, professional, and youth athletes reported a negative correlation between age and anxiety, meaning older athletes experienced less anxiety, consistent with our findings.

For hypothesis 4 (H4), which posited that significant differences would be observed based on athletic level (elite vs. non-elite) in the analyzed variables, confirmation was found only for life satisfaction and cognitive anxiety. In both cases, elite athletes exhibited higher scores. Elite female athletes reported greater life satisfaction, which is a healthy indicator, but also presented significantly higher cognitive anxiety. These findings align with evidence from other studies conducted with samples of elite and young athletes (Jensen et al., 2018).

To address the final hypothesis 5 (H5), it was confirmed that life satisfaction and resilience are suitable predictor variables for subjective happiness in women who participate in mountain sports. Various studies have yielded evidence supporting this relationship, aligning with our findings and verifying that happiness, life satisfaction, and resilience are interconnected (Buchecker & Degenhardt, 2015; Papadopoulos et al., 2019; Ritpanitchajchaval et al., 2023; Sanz-Junoy et al., 2023). Psychological well-being intrinsically influences our life satisfaction (Casino-García et al., 2024), thereby shaping how we cope with life events through different personal dimensions and psychological variables.

4.2. Conclusions

Outdoor physical activity is recognized for promoting well-being (Guevera et al., 2021; Pomfret et al., 2023), mental health (Marconcin et al., 2022), quality of life (Giroir & Wright, 2018), self-concept (Martín-Talavera et al., 2024), and stress coping (Schultchen et al., 2019; Singh et al., 2023). It also leads to improved resilience (Ancarani et al., 2024; Nowacka-Chmielewska et al., 2022) and stress reduction (Garrido-Palomino & España-Romero, 2023), among other enhancements to physical and mental health. This strongly justifies the importance of studying these variables in individuals who engage in mountain sports.

Before concluding our proposal, we deem it necessary to reflect on the limitations of our study, which will inform future research endeavors. Crucially, the distinct characteristics of our sample represent a significant strength of our study. Our sample consists exclusively of women who participate in mountain sports, including a group of elite athletes from various Spanish national teams. Therefore, the obtained evidence should only be generalized to similar contexts or outdoor sports with comparable characteristics. A potential limitation of the study is the relatively small sample size. Future studies should undoubtedly consider athletes from other outdoor sports. While our study intentionally focused solely on women, future comparative studies involving men are warranted to understand the gender-related behavior of the analyzed variables. These considerations deserve attention in subsequent investigations addressing these variables.

In conclusion, we propose potential future research directions based on both our findings and study limitations, for consideration in prospective studies. Employing longitudinal measurement approaches, extending beyond the cross-sectional assessments conducted, could yield valuable information. Furthermore, participant selection could be broadened to include athletes from other related outdoor sports and disciplines, in addition to incorporating male athletes.

Despite the identified limitations, this research significantly contributes to the understanding of well-being, life satisfaction, resilience, and other psychological variables such as depression, stress, and anxiety. Practical initiatives and interventions based on the development of the analyzed variables in athletes, particularly in mountain sports practitioners, could lead to substantial improvements and a healthier sports practice, both physically and mentally.

CRedit authorship contribution statement

David Molero: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Vanesa España-Romero:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Investigation, Data curation, Conceptualization. **Germán Vicente-Rodríguez:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Management implications

- Subjective happiness, life satisfaction, resilience, depression, stress, and anxiety scores are reported for women engaged in mountain sports.
- Significant correlations exist between the dimensions of the instruments evaluating the considered variables.
- Statistically significant differences were found in the scores of the considered variables based on participants' age (under 35 years vs. over 35 years).
- Statistically significant differences were identified in the analyzed variables according to participants' athletic level (elite vs. non-elite).
- Life satisfaction and resilience predict subjective happiness in women practicing mountain sports.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: David Molero reports financial support was provided by Higher Sports Council of Spain, Universo-Mujer-Mountain III. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The original data presented in the study are openly available in FigShare repository at DOI: <https://dx.doi.org/10.6084/m9.figshare.29126945>

Dataset (Original data) (Figshare).

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