



## Research article

# Bayesian analysis of psychological capital in peruvian university students: Differences by sex and age

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## ARTICLE INFO

## Keywords:

PsyCap  
Psychological capital  
Bayesian analysis  
Bayes factor  
University students  
Resilience  
Self-efficacy  
Optimism

## ABSTRACT

Psychological capital (PsyCap) constitutes a positive personal resource that enhances better well-being and academic performance in university students. Initially addressed in the organizational realm and recently in the academic one. This study aimed to establish the differences in PsyCap according to gender and age in Peruvian university students. A quantitative, comparative, non-experimental, and cross-sectional study was conducted with 708 students (77.4 % women and 22.6 % men), aged between 18 and 61 years ( $M = 22.1$ ;  $SD = 5.95$ ), selected in a non-probabilistic manner, who completed the Psychological Capital Questionnaire (PCQ-12). The results indicate very strong evidence supporting the existence of significant differences between different age groups, suggesting that the observed variations are not due to chance but reflect real differences between ages. Regarding gender, the data do not provide enough information to confidently assert whether there are significant differences between men and women in relation to psychological capital (PsyCap) and its dimensions. This implies that we cannot confirm whether gender influences these variables. These findings highlight the need to consider age when assessing and intervening in PsyCap in university students.

## 1. Introduction

The notion of Psychological Capital (PsyCap), particularly in academic settings, has been receiving a lot of attention in recent years. Several studies have shown that students' PsyCap can influence their academic performance, well-being, satisfaction, and engagement [1,2]. This construct derives from positive psychology and refers to a personality resource consisting of four main components: self-efficacy, hope, optimism, and resilience [3]. Each component of PsyCap has an impact on a person's perception of themselves and their life goals.

Self-efficacy is conceptualized as the set of beliefs that lead a person to complete a task [4], which can have a direct impact on their thoughts, motivations, attitudes, and behaviors. In other words, this psychological resource denotes the confidence a person has in their own abilities for task completion and successful learning, perceiving themselves as capable of mastering essential methods and components around learning, believing they can use their own knowledge and professional skills to solve a variety of problems and achieve more accurate results [5–7].

Previous research has shown that self-efficacy beliefs are one of the most important factors for academic success [8] and have been associated with excellent academic performance through increased commitment, perseverance, and effort [9]. A student with low

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self-efficacy tends to attribute their failure to their limited abilities, is more likely to fear performing a task, to avoid it, postpone it, or abandon it [5,7,10], which can determine task choice and persistence in task completion [8].

On the other hand, the ability to effectively find and use means to achieve personal aspirations is known as hope [11]. Hope constitutes a significant positive psychological resource and a future-oriented emotional factor that has a significant influence on an individual's thinking and behavior regarding the future [12]. This resource can help cope with difficulties and challenges when facing barriers and stressful situations [13,14]. A meta-analytic study demonstrated that hope is strongly linked to academic outcomes; 45 primary studies have shown a moderate and significant relationship between hope and academic performance [15]. Other research has shown that high levels of hope predict better grades, greater well-being, less psychological distress, higher likelihood of graduation, and lower risk of academic dropout [16–20].

Resilience stands out as another important factor that influences a person's development and demonstrates an individual's ability to adapt to circumstances [21,22] and recover from adversity, failure, conflict, or even positive events [23,24]. In other words, individuals can recover from life's challenges, academic failure, and start anew [25]. Studies on resilience in the academic context have reported that perceptions of happiness, sympathy, sociability, self-regulation, and perseverance, aspects that integrate resilience, have a significant impact on motivation to learn a second language like English [26]. Similarly, various studies have found a direct relationship between resilience, optimism, academic success [27], and academic performance [28–31].

Finally, optimism encompasses a positive attitude toward life that leads a person to persist in overcoming difficulties in the academic environment. In other words, this resource is based on an individual's belief that life circumstances and challenges can be overcome because their causes are changeable and not fixed over time [32]. Thus, a student believes that academic failures can be reduced because they are changeable circumstances [33]. Studies that have explored optimism in the academic context have indicated that this variable can help predict other psychological variables. For example, Cabras and Mondo (2017) have reported that optimism and more adaptive coping strategies have a significant influence on life satisfaction in college students [34]. Additionally, it significantly predicts greater self-regulation in learning a second language [35] and is related to self-efficacy and academic performance [36].

PsyCap (self-efficacy, optimism, hope, and resilience) forms a cohesive and distinctive construct that represents a general psychological strength, positively influencing individuals' performance and well-being [3]. These four components not only coexist but also interact and enhance each other's effects [37]. For example, self-efficacy can increase optimism, and a person with high hope tends to be more resilient [24]. However, they can interfere with each other; unrealistic optimism without sufficient resilience can lead to disappointment. Combined, these components provide a more comprehensive measure of psychological strength, allowing for better prediction of performance and well-being in organizational and personal contexts [24].

Studies that have evaluated PsyCap and its dimensions in relation to sociodemographic variables have found that PsyCap overall and in the dimension of self-efficacy differ significantly by students' gender, with men tending to present better PsyCap resources compared to women [38]. On the other hand, Cao et al. (2022) note that emerging adults tend to have higher PsyCap because they have a certain degree of internal strength to rely on in adversity compared to young adolescents [39].

Additionally, differences in the study variables such as gender and age have been explored. For example, it has been reported that men display higher self-efficacy [40], while women exhibit greater hope [41]. Other studies found no differences in resilience [42] and optimism [43]. As age increases, so does self-efficacy [44] and hope [41], however, this is not the case with resilience [42] and optimism [43]. These internal strengths stem from adult identity or the ability to take control of oneself [45], as well as the development of daily life skills and coping abilities for adverse situations [46].

Studies on PsyCap present it as a second-order construct, due to the positive interrelation between its four composing elements [37]. However, although these elements are interrelated, some studies show that empirically they are independent and have discriminative validity, so individuals often present different levels regarding hope, resilience, optimism, and self-efficacy [47]. In fact, Dawkins et al. (2013) mention that studies addressing PsyCap have focused on examining the construct in general and not the individual profile of its components [48], because it can differentially affect outcomes [24]. The literature has shown that individuals obtain different scores in the four components, however, they obtain high scores in some and low scores in others [49,50].

This is how replications of studies in the educational field are crucial to help professionals make decisions for the student population's benefit. Baños-Chaparro (2021) mentions that sometimes study conclusions can be erroneous or confusing due to problems with the methodological design or statistical analysis [51], this is because most research uses the frequentist approach to test hypotheses, based on statistical significance (NHST, for its acronym in English), with a probability cutoff of  $p < 0.05$ . However, its weakness lies in sensitivity regarding sample size, which could lead to rejecting the null hypothesis, presuming type I or II errors, and not presenting effect sizes in the analysis.

In response, Bayesian inference stands out as an alternative to address these problems, as it explains the joint uncertainty surrounding all unknown parameters. This indicates that the probability of a theoretical assertion being more likely to exhibit spiral behavior than incremental theorists is equal to 0.95, explaining uncertainty not only at the beginning of the spiral but also uncertainty in individual and group-level regression coefficients and error variances. Thus, greater certainty can be had that the effect is real than if we were to incorporate a better estimate of other unknown parameters and calculate a p-value [52]. According to the Bayes factor, hypotheses can be tested by verifying the alternative hypothesis (BF10) and null hypothesis (BF01), which provides an appropriate interpretation of findings. Additionally, this provides advantages in conducting analyses, as it can be done with small sample sizes, specifying parameters a priori if knowledge is available, etc., [51].

Bayesian analysis offers several advantages to psychologists interested in moving beyond tests of differences between individuals at the group level to investigate whether their theories of individual-level processes influence observed response patterns within the individual and how [52]. Due to the limitations of using frequentist statistics, as well as unclear evidence showing that PsyCap may be

higher in men and adults but also in women and young people, this study aimed to determine differences in PsyCap by sex and age in Peruvian university students.

## 2. Methods

### 2.1. Study design

A quantitative, comparative, non-experimental and cross-sectional study was used.

### 2.2. Participants

Students were recruited from a private university center in the city of Lima, Peru. A total of 708 students participated, 548 women and 160 men from various professional careers, who were intentionally probabilistically selected. Undergraduate students who studied in the academic cycles 2022-1 and 2022-2, who agreed to participate voluntarily in the research, were included. Participants who did not complete the informed consent were excluded. It is worth noting that the ages of the students ranged from 18 to 61 years ( $M = 22.1$ ;  $SD = 5.95$ ).

Participants represented a diverse range of academic disciplines: Environmental Sciences (73 participants, 10.31 %), Health Sciences (349 participants, 49.29 %), Business Sciences (86 participants, 12.14 %), Humanities (70 participants, 9.89 %), and Veterinary and Biological Sciences (130 participants, 18.37 %). These distributions reflect the broad spectrum of academic interests among the student population surveyed.

### 2.3. Instrument

**Psychological Capital Questionnaire–12 (PCQ–12).** The PCQ-12 questionnaire was used to assess the PsyCap of university students. It was initially developed by Luthans et al. (2007) [47] and adapted to Spanish and the academic context by Martínez et al. (2019) [53]. It consists of 12 items distributed across four dimensions: self-efficacy, resilience, hope, and optimism. Additionally, it has a six-point response scale ranging from 1 “totally disagree” to 6 “totally agree.” Its administration is brief and can take approximately 5 min. The PCQ-12 questionnaire has reported adequate indicators of construct, convergent, discriminant validity, and reliability, both in samples of Spanish and Chilean university students [53], as well as Ecuadorian students [54], making it reliable for application. In the Peruvian context, Guerrero (2023) explored the evidence of construct validity and the reliability of the questionnaire, confirming the factorial structure composed of 4 s-order factors, in addition to reliability indicators ( $\alpha$  and  $\omega$ ) like previous studies [55].

### 2.4. Procedure

The data from the study were collected in a previous study conducted by the author, which was registered with the “General Directorate of Research, Development and Innovation of the Universidad Científica del Sur”, under code 067-2021-PRO99. The instruments were applied between June and September 2022, through an online survey designed in a Google form for this purpose. This survey had informed consent, sociodemographic data, and some psychological scales including the PCQ-12 questionnaire.

It is worth noting that the research was reviewed and approved by the “institutional research ethics committee (CIEI) of the Scientific University of the South”, as evidenced by document 089-CIE-CIENTIFICA-2022, thus ensuring compliance with the ethical principles and considerations established in the codes and manuals guiding studies involving human subjects. The data were downloaded into an Excel database, coded, and exported to another statistical program for analysis.

### 2.5. Data analysis

The analyses were performed using the statistical program JASP 0.18.1 [56], which is open-source software. A descriptive analysis of the variable PsyCap was conducted overall and by dimensions, using measures of central tendency and dispersion, as well as kurtosis and skewness of the data. Normality was assessed using the Shapiro-Wilk (SW) statistic. For inferential analysis of differences between gender and age, the “Mann-Whitney U statistic for Bayesian independent samples” was employed, considering the data distribution. Bayesian analysis was conducted following a Cauchy distribution with  $r = 1$ , as suggested by Jeon and Boeck (2017) for more stable

**Table 1**  
Descriptive analysis and normality of the study variables.

Variable	M	SD	Skew	Ku	Shapiro-Wilk (p-value)
PsyCap	48.436	14.114	−0.466	−0.533	0.968 (<0.001)
self-efficacy	12.233	4.062	−0.552	−0.513	0.944 (<0.001)
Hope	16.582	5.011	−0.505	−0.520	0.957 (<0.001)
Resilience	11.429	3.691	−0.258	−0.724	0.972 (<0.001)
Optimism	8.192	2.782	−0.521	−0.591	0.936 (<0.001)

**Note:** M: Mean; SD: Standard deviation; Skew: Skewness; Ku: Kurtosis.

statistical decision-making [57]. Regarding the interpretation of the Bayes factor (BF), Jeffreys' proposal (1961) was considered [58], where values ranging between 1 and 3 are considered "anecdotal evidence" for the alternative hypothesis, 3 and 10 are interpreted as "moderate evidence," 10 and 30 as "strong evidence," and 30 and 100 correspond to "very strong evidence." In the scientific literature, interpretation of values above 0.10 ( $BF > 10$ ) is recommended as support for solid and reliable evidence [51,59].

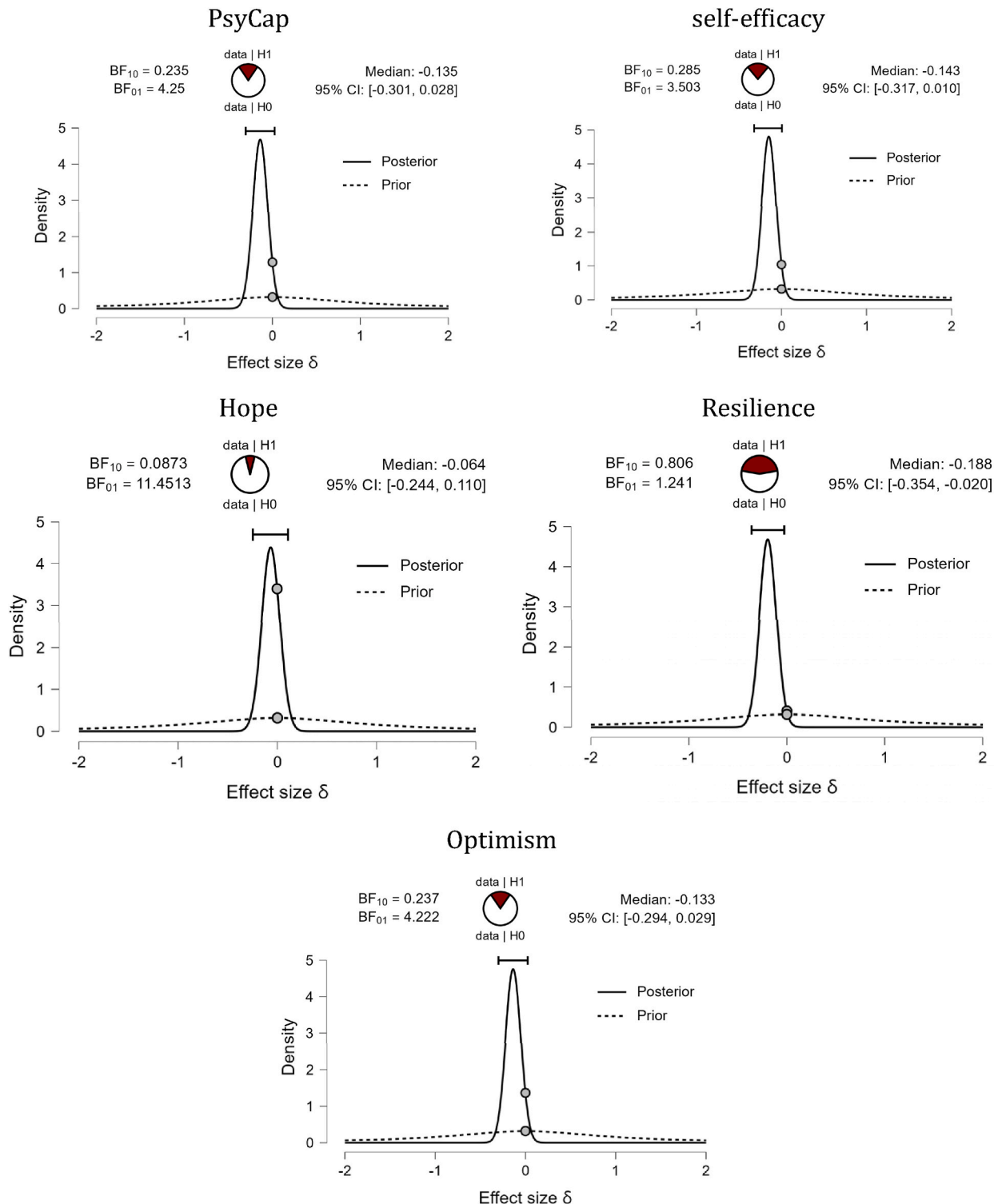


Fig. 1. Density of the  $\delta$  parameter (prior and posterior) in PsyCap and each of its dimensions according to gender.

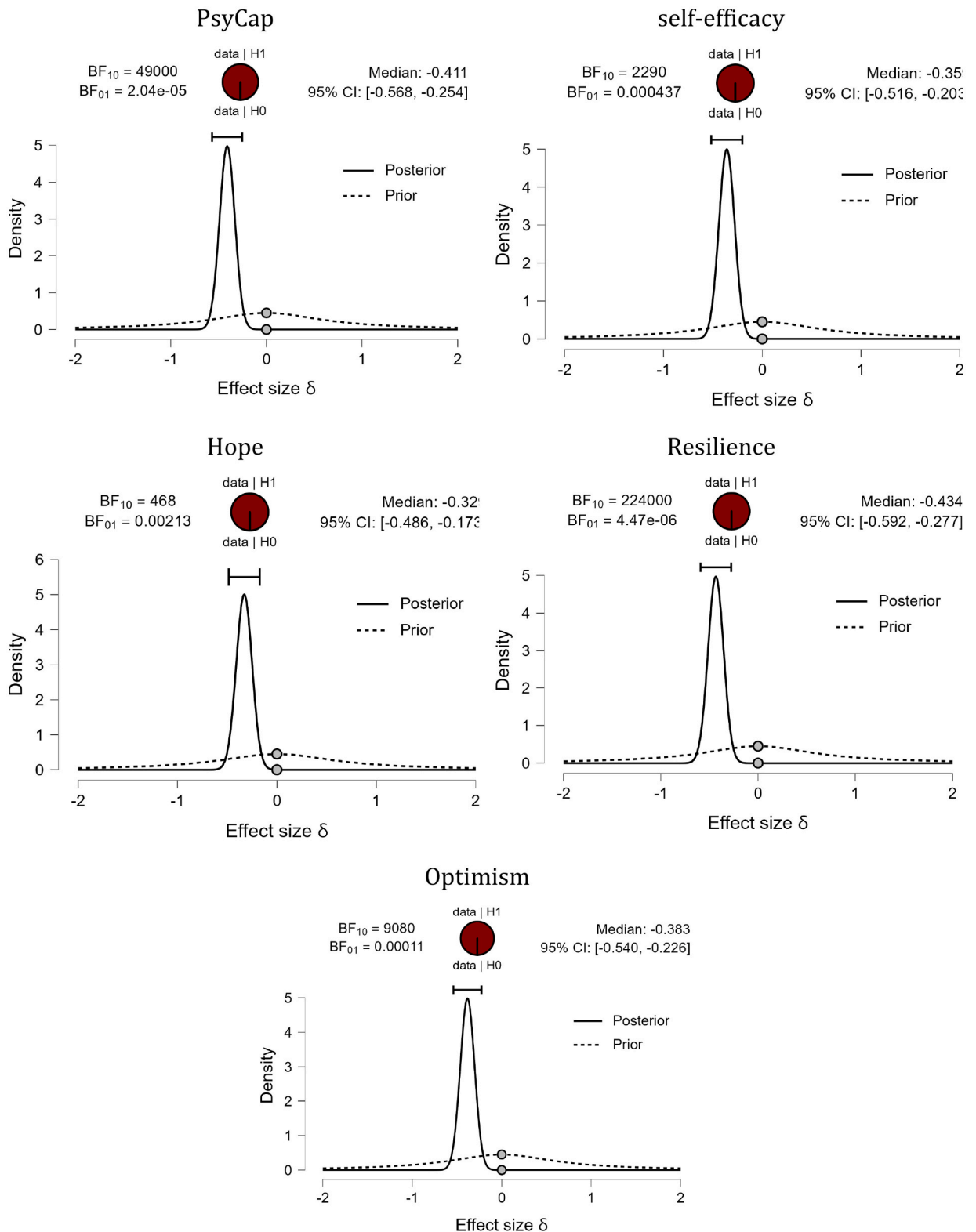


Fig. 2. Density of the  $\delta$  parameter (prior and posterior) in PsyCap and each of its dimensions according to age.

### 3. Results

The corresponding descriptive statistics for the PsyCap variable and its dimensions were performed. Table 1 shows that the range of the mean PsyCap was 48.43, which falls into a moderately high level. Self-efficacy and hope are at a moderately high level, while resilience and optimism are at a moderate level. The lowest standard deviation is found in the optimism dimension (2.782), and the highest in the overall PsyCap (14.114). Both skewness ( $-0.258$  to  $-0.552$ ) and kurtosis ( $-0.513$  to  $-0.724$ ) fall within the range described in the literature of  $\pm 2.00$  [60]. Finally, the normality analysis using the Shapiro-Wilk statistic for the variable at the overall level as well as its dimensions was less than 0.001, leading to the decision to use non-parametric Bayesian statistics to determine differences in two independent groups.

#### 3.1. Bayesian estimation according to sex

In Fig. 1, Bayesian estimates of PsyCap are shown overall and by dimensions according to participants' gender. Overall, PsyCap obtained a Bayes factor for the alternative hypothesis of  $BF_{10} = 0.235$  ( $SE = -0.135$ ); likewise, Bayes factor values for self-efficacy ( $BF_{10} = 0.285$ ;  $SE = -0.143$ ), hope ( $BF_{10} = 0.087$ ;  $SE = -0.064$ ), resilience ( $BF = 0.806$ ;  $SE = -0.188$ ), and optimism ( $BF = 0.237$ ;  $SE = -0.133$ ). This indicates that the data provide evidence for the null hypothesis at a moderate level in PsyCap, self-efficacy, and optimism, weak evidence for resilience, and strong evidence for hope.

#### 3.2. Bayesian estimation according to age

In Fig. 2, Bayesian estimates of PsyCap are shown at a general level and by dimensions according to age ( $\leq 21$  and  $\geq 22$  years). Divide the sample into two approximately equal groups (although not necessarily identical) to ensure a sufficient sample size in each group to maintain adequate statistical power in subsequent analyses. This is essential to guarantee the validity of the statistical results. Additionally, a similar age range was used by López et al. (2023) [54]. The mean age of our sample is 22.13 years, and the median is 20 years, indicating a distribution skewed towards younger students. Dividing the sample into  $\leq 21$  and  $\geq 22$  years captures this asymmetry and allows for the analysis of differences between students in the early stages of their university life and those who are older and possibly more advanced in their studies.

Overall, PsyCap obtained a Bayes factor for the alternative hypothesis of  $BF_{10} = 49000$  ( $SE = -0.411$ ), demonstrating very strong evidence in favor of the alternative hypothesis. Similarly, the effect size of the posterior distribution shows a value of  $-0.411$ , and it is likely that the parameters lie between  $-0.568$  and  $-0.254$ , with a 95 % credibility interval. As for the Bayes factor for self-efficacy ( $BF_{10} = 2290$ ;  $SE = -0.359$ ), hope ( $BF_{10} = 468$ ;  $SE = -0.329$ ), resilience ( $BF = 224000$ ;  $SE = -0.434$ ), and optimism ( $BF = 9080$ ;  $SE = -0.383$ ), they show very strong evidence in favor of the alternative hypothesis postulating differences in PsyCap and its dimensions in relation to age.

**Table 2**

Comparative values according to gender and age of PsyCap and its dimensions and credibility intervals corresponding to the Bayes factor.

Group	N	Mean	SD	CI95 %	
				Lower	Upper
<i>PsyCap</i>					
Women	548	47.75	14.09	46.57	48.93
Men	160	50.76	13.98	48.58	52.95
$\leq 21$	473	46.51	13.64	45.27	47.74
$\geq 22$	235	52.31	14.27	50.47	54.14
<i>Self-efficacy</i>					
Women	548	12.03	4.08	11.69	12.37
Men	160	12.91	3.90	12.30	13.52
$\leq 21$	473	11.74	4.01	11.38	12.10
$\geq 22$	235	13.21	3.98	12.70	13.72
<i>Hope</i>					
Women	548	16.48	4.99	16.06	16.90
Men	160	16.90	5.05	16.11	17.69
$\leq 21$	473	16.03	4.86	15.59	16.46
$\geq 22$	235	17.69	5.12	17.03	18.35
<i>Resilience</i>					
Women	548	11.16	3.67	10.85	11.47
Men	160	12.33	3.63	11.76	12.89
$\leq 21$	473	10.89	3.57	10.57	11.22
$\geq 22$	235	12.49	3.70	12.02	12.97
<i>Optimism</i>					
Women	548	8.06	2.78	7.83	8.30
Men	160	8.61	2.76	8.19	9.04
$\leq 21$	473	7.83	2.75	7.58	8.08
$\geq 22$	235	8.90	2.69	8.56	9.25

Note: SD: Standard deviation; CI: Credibility interval.

In Table 2, the differences regarding sex and age are shown. Regarding sex, the means of PsyCap and its dimensions for men are slightly higher than those for women with evidence in favor of the null hypothesis. Regarding age, the means of PsyCap and its dimensions for students aged 22 years and older were higher compared to those aged 18 to 21, with very strong evidence in favor of the alternative hypothesis. These differences are also reflected in the credibility intervals of each variable for age.

#### 4. Discussion

PsyCap is considered a psychological resource that encompasses an invisible capital, focusing on individual positive development and leading students to present a positive facet of resources that will enable them to cope with life's frustrations and difficult situations by adopting a more positive attitude [61]. In other words, it is possible that a student with high PsyCap may have positive experiences during their academic journey in university, as they believe they are capable of achieving academic success, are less likely to be influenced by failures, and are willing to help their peers; if these levels are maintained, they are likely to obtain better grades and successful academic performance [62–64]. However, evidence is still unclear in specifying PsyCap differences according to students' gender and age. Therefore, the present study aimed to establish differences in PsyCap regarding the gender and age of students at a university center in Lima city.

Findings regarding gender indicate that there are no significant differences in PsyCap and its dimensions between men and women. This suggests that both genders have similar levels of PsyCap. These findings align with the studies of Rani and Chaturvedula (2018) and El Shobaky et al. (2020) [65], [66], who also found no significant differences in PsyCap between men and women. However, some studies have shown differences, with men scoring higher in self-efficacy [38] and women scoring higher in hope and resilience [67].

Regarding age, the results indicate significant differences in PsyCap and its dimensions, with older students ( $\geq 22$  years) having higher levels of PsyCap than younger students ( $\leq 21$  years).

This suggests that age positively influences PsyCap. Previous studies have reported varied results on age differences in PsyCap. For example, El Shobaky et al. (2020) found significant differences in overall PsyCap [66], while Liu et al. (2012) reported a small but positive relationship between age and PsyCap [68]. Additionally, Carmona-Haltym et al. (2022) found that psychological capital decreases with age in adolescents, except for self-efficacy [69]. Saman and Wirawan (2021) noted high PsyCap levels among university students, regardless of age [70].

It is worth noting the implication of Bayesian analysis as evidence of hypothesis confirmation that there are significant differences in PsyCap concerning age but not with gender. Recent research on simulations has highlighted the Bayesian factor as a statistic that performs better than the p-value [71]. Therefore, it is necessary to clarify that for an adequate interpretation of the Bayesian factor, recommended values should be greater than 10 ( $BF > 10$ ), demonstrating reliable evidence of findings, while values below 3 ( $BF < 3$ ) suggest greater uncertainty regarding hypothesis confirmation [57,72].

The findings suggest that fostering PsyCap independently in younger populations regardless of gender brings positive implications for students' academic and personal lives. Studies have described that this personal resource has the potential to improve the academic performance of university students [1], enhance coping with stressful academic situations [73], increase engagement and satisfaction with studies [54], improve lifestyle [31], etc. Therefore, it is necessary to design and implement interventions in university contexts that promote PsyCap due to the benefits it brings to this population. Scientific literature has suggested its effectiveness in university [74] and non-university [21] samples.

The strength of this study is associated with the sample size and the statistical method used.

However, some limitations must be considered. The intentional sampling used does not allow the representativeness of the findings to be generalized to samples of university students from other Peruvian institutions. Additionally, our study presents a gender imbalance, with most female participants, which could bias the results, especially in a study examining psychological characteristics such as psychological capital (PsyCap). This imbalance is common in many areas of study, particularly in health sciences.

The cross-sectional design of the study does not allow for causal inference of psychological capital in relation to age and gender. Similarly, the use of self-report measures may limit the broad exploration of a psychological phenomenon due to possible response biases and social desirability. Our participants come from diverse areas of knowledge, with a high percentage of health science students, which could influence the results due to differences in training and academic experiences between disciplines.

The behavior of PsyCap may vary according to other sociodemographic, psychological, and social characteristics, which were not considered in this study. An additional limitation is the choice to focus on biological sex rather than gender. Although gender can provide a broader range of options and is an important variable for understanding the diversity of human experiences, we decided to focus on biological sex due to its specific relevance in our research context [75]. The inclusion of intersexuality as an option could have enriched our findings, but the lack of representative data and associated stigma may have limited the accuracy and reliability of the results. Future studies should strive to include these dimensions to provide a more inclusive and comprehensive perspective.

#### 5. Conclusions

The findings of this study revealed that PsyCap and its dimensions of hope, optimism, self-efficacy, and resilience showed differences in students  $\leq 21$  and  $\geq 22$ , with very strong evidence in favor of the alternative hypothesis. Meanwhile, PsyCap and its dimensions showed anecdotal evidence in favor of the null hypothesis according to participants' gender. These findings suggest that age is an important factor to consider when assessing psychological capital in college students. Additionally, the findings highlight the need to implement specific interventions that address differences in PsyCap among different age groups, to promote the well-being and academic development of college students.

## Data availability statement

The data associated with this study have been deposited in a publicly available repository. They can be accessed at the following link: <https://doi.org/10.17605/OSF.IO/X679Z>.

## CRediT authorship contribution statement

**Jesús M. Guerrero-Alcedo:** Writing – original draft, Visualization, Validation, Resources, Methodology, Investigation, Conceptualization. **Lorena C. Espina-Romero:** Writing – review & editing, Supervision, Software, Formal analysis.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## References

- [1] D. Virgá, M. Pattusamy, D.P. Kumar, How psychological capital is related to academic performance, burnout, and boredom? The mediating role of study engagement, *Curr. Psychol.* 41 (10) (2022) 6731–6743, <https://doi.org/10.1007/s12144-020-01162-9>.
- [2] H. Wang, T.K. Ng, O. Siu, How does psychological capital lead to better well-being for students? The roles of family support and problem-focused coping, *Curr. Psychol.* 42 (26) (2023) 22392–22403, <https://doi.org/10.1007/s12144-022-03339-w>.
- [3] J.M. Guerrero-Alcedo, L. Espina-Romero, J. Palacios Garay, F.R. Jaimes Álvarez, Psychological capital in university students: analysis of scientific activity in the scopus database, *Heliyon* 8 (11) (2022) E11849, <https://doi.org/10.1016/j.heliyon.2022.e11849>.
- [4] A. Bandura, Self-efficacy: toward a unifying theory of behavioral change, *Psychol. Rev.* 84 (2) (1977) 191–215, <https://doi.org/10.1037/0033-295X.84.2.191>.
- [5] A. Bandura, *Self-efficacy: the Exercise of Control*, W H Freeman/Times Books/Henry Holt & Co, New York, NY, US, 1997.
- [6] M. Abbas, U. Raja, Impact of psychological capital on innovative performance and job stress, *Can. J. Adm. Sci.* 32 (2) (2015) 128–138, <https://doi.org/10.1002/cjas.1314>.
- [7] D.H. Schunk, P.A. Ertmer, Self-regulation and academic learning, in: *Handbook of Self-Regulation*, Elsevier, San Diego, CA, US, 2000, pp. 631–649, <https://doi.org/10.1016/B978-012109890-2/50048-2>.
- [8] A.A. Hayat, K. Shateri, M. Amini, N. Shokrpour, Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: a structural equation model, *BMC Med. Educ.* 20 (1) (2020) 76, <https://doi.org/10.1186/s12909-020-01995-9>.
- [9] P.R. Pintrich, E. V De Groot, A motivational science perspective on the role of student motivation in learning and teaching contexts, *J. Educ. Psychol.* 95 (4) (2003) 667–686, <https://doi.org/10.1037/0022-0663.95.4.667>.
- [10] N. Kurbanoglu, A. Akin, The relationships between university students' chemistry laboratory anxiety, attitudes, and self-efficacy beliefs, *Aust. J. Teach. Educ.* 35 (8) (2010) 48–59 [Online]. Available: <https://search.informit.org/doi/10.3316/informit.542546040730875>.
- [11] R. Li, N. Che Hassan, N. Saharuddin, Psychological capital related to academic outcomes among university students: a systematic literature review, *Psychol. Res. Behav. Manag.* 16 (September) (2023) 3739–3763, <https://doi.org/10.2147/PRBM.S421549>.
- [12] A. Scioili, M. Ricci, T. Nyugen, E.R. Scioili, Hope: its nature and measurement, *Psycholog. Relig. Spiritual.* 3 (2) (2011) 78–97, <https://doi.org/10.1037/a0020903>.
- [13] S.C. Snyder, S. Lopez, *Handbook of Positive Psychology*, Oxford University Press, New York, 2002 [Online]. Available: [http://www.ldysinger.com/@books1/Snyder\\_Hndbk\\_Positive\\_Psych\\_Snyder\\_Lopez\\_Handbook\\_of\\_Positive\\_Psychology.pdf](http://www.ldysinger.com/@books1/Snyder_Hndbk_Positive_Psych_Snyder_Lopez_Handbook_of_Positive_Psychology.pdf).
- [14] M.F. Valle, E.S. Huebner, S.M. Suldo, An analysis of hope as a psychological strength, *J. Sch. Psychol.* 44 (5) (2006) 393–406, <https://doi.org/10.1016/j.jsp.2006.03.005>.
- [15] S.C. Marques, M.W. Gallagher, S.J. Lopez, Hope- and academic-related outcomes: a meta-analysis, *School Ment. Health* 9 (3) (2017) 250–262, <https://doi.org/10.1007/s12310-017-9212-9>.
- [16] B.R. Browning, R.C. McDermott, M.E. Scaffa, N.R. Booth, N.T. Carr, Character strengths and first-year college students' academic persistence attitudes: an integrative model, *Couns. Psychol.* 46 (5) (2018) 608–631, <https://doi.org/10.1177/0011000018786950>.
- [17] M.W. Gallagher, S.C. Marques, S.J. Lopez, Hope and the academic trajectory of college students, *J. Happiness Stud.* 18 (2) (2017) 341–352, <https://doi.org/10.1007/s10902-016-9727-z>.
- [18] S.A. Moss-Pech, M.W. Southward, J.S. Cheavens, Hope attenuates the negative impact of general psychological distress on goal progress, *J. Clin. Psychol.* 77 (6) (2021) 1412–1427, <https://doi.org/10.1002/jclp.23087>.
- [19] E. Plegging, M. Burger, J. van Exel, The relations between hope and subjective well-being: a literature overview and empirical analysis, *Appl. Res. Qual. Life* 16 (3) (2021) 1019–1041, <https://doi.org/10.1007/s11482-019-09802-4>.
- [20] K.L. Rand, M.L. Shanahan, I.C. Fischer, S.K. Fortney, Hope and optimism as predictors of academic performance and subjective well-being in college students, *Learn. Individ. Differ.* 81 (2020) 101906, <https://doi.org/10.1016/j.lindif.2020.101906>.
- [21] F. Luthans, J.B. Avey, J.L. Patera, Experimental analysis of a web-based training intervention to develop positive psychological capital, *Acad. Manag. Learn. Educ.* 7 (2) (2008) 209–221, <https://doi.org/10.5465/ame.2008.32712618>.
- [22] K. Näswall, S. Malinen, J. Kuntz, M. Hodliffe, Employee resilience: development and validation of a measure, *J. Manag. Psychol.* 34 (5) (2019) 353–367, <https://doi.org/10.1108/JMP-02-2018-0102>.
- [23] F. Luthans, Positive organizational behavior: developing and managing psychological strengths, *Acad. Manag. Perspect.* 16 (1) (2002) 57–72, <https://doi.org/10.5465/ame.2002.6640181>.
- [24] F. Luthans, C.M. Youssef-Morgan, Psychological capital: an evidence-based positive approach, *Annu. Rev. Organ. Psychol. Organ. Behav.* 4 (1) (2017) 339–366, <https://doi.org/10.1146/annurev-orgpsych-032516-113324>.
- [25] A.J. Martin, Academic buoyancy and academic resilience: exploring 'everyday' and 'classic' resilience in the face of academic adversity, *Sch. Psychol. Int.* 34 (5) (2013) 488–500, <https://doi.org/10.1177/0143034312472759>.
- [26] T.-Y. Kim, Y. Kim, J.-Y. Kim, Role of resilience in (De)Motivation and second language proficiency: cases of Korean elementary school students, *J. Psycholinguist. Res.* 48 (2) (2019) 371–389, <https://doi.org/10.1007/s10936-018-9609-0>.
- [27] C.M. Fallon, School Factors that Promote Academic Resilience in Urban Latino High School Students, Loyola University Chicago, 2010 [Online]. Available: [https://ecommons.luc.edu/luc\\_diss/122/](https://ecommons.luc.edu/luc_diss/122/).
- [28] D.A. Çelik, F. Çetin, E. Tutkun, The role of proximal and distal resilience factors and locus of control in understanding hope, self-esteem and academic achievement among Turkish pre-adolescents, *Curr. Psychol.* 34 (2) (2015) 321–345, <https://doi.org/10.1007/s12144-014-9260-3>.
- [29] M. Kotzé, R. Kleynhans, Psychological well-being and resilience as predictors of first-year students' academic performance, *J. Psychol. Afr.* 23 (1) (2013) 51–59, <https://doi.org/10.1080/14330237.2013.10820593>.





- [71] B. Aczel, et al., Quantifying support for the null hypothesis in psychology: an empirical investigation, *Adv. Methods Pract. Psychol. Sci.* 1 (3) (2018) 357–366, <https://doi.org/10.1177/2515245918773742>.
- [72] X. Schmalz, J. Biurrun Manresa, L. Zhang, What is a Bayes factor? *Psychol. Methods* 28 (3) (Jun. 2021) 705–718, <https://doi.org/10.1037/met0000421>.
- [73] M.A. Ramírez-Pérez, The relationship between academic psychological capital and academic coping stress among university students, *Ter. Psicol.* 40 (2) (2022) 279–305, <https://doi.org/10.4067/S0718-48082022000200279>.
- [74] F. Luthans, J.B. Avey, B.J. Avolio, S.J. Peterson, The development and resulting performance impact of positive psychological capital, *Hum. Resour. Dev. Q.* 21 (1) (2010) 41–67, <https://doi.org/10.1002/hrdq.20034>.
- [75] W. Wood, A.H. Eagly, Biosocial construction of sex differences and similarities in behavior, in: J.M. Olson, M.P.B. T-A, E.S.P. Zanna (Eds.), *Advances in Experimental Social Psychology*, vol. 46, Academic Press, 2012, pp. 55–123, <https://doi.org/10.1016/B978-0-12-394281-4.00002-7>.