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Research Article

Psychological Capital and Digital learning behaviour: A Meta-Analysis of Global Antecedents and Implications for South African Higher Education

Aliyu Mustapha Olanrewaju, PhD[1]; Betty Portia Maphala, PhD[2]
[1]*Department of Industrial and Organisational Psychology, University of South Africa*
[2]*Department of Industrial and Organisational Psychology, University of South Africa*

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ABSTRACT

Introduction: Psychological Capital (PsyCap) has been shown internationally to enhance digital learning-related behaviours (DLB); its role in Higher Education Institutions (HEIs) is underexplored and theoretically disintegrated. This study synthesises global empirical evidence to generate a contextualised framework that informs capacity development in South African HEIs.

Objectives: This meta-analysis aims to synthesise global research evidence on PsyCap and workplace digital learning, identify key antecedents and effect sizes, and examine their relevance to the South African HE context.

Methods: Five databases (PsycINFO, Scopus, Web of Science, ProQuest, and PubMed) were systematically searched using meta-analysis to identify peer-reviewed empirical studies (2020-2025). Inclusion criteria were operationalised using the PICOS framework.

Results: Using Comprehensive Meta-Analysis Software v4, 30 effect sizes revealed that PsyCap demonstrated a moderate positive association with workplace learning (r = 0.36), with significant effects for informal DLB (r = 0.35) and academic/learning outcomes (r = 0.39). Moderator analyses showed that PsyCap effects were amplified in global empirical studies, adaptive behavioural, and supportive organisational climates within educational sectors. Thematic analysis acknowledged four recurring mechanisms: (i) PsyCap consolidates reflective DLB, (ii) HERO dimensions moderate persistence during institutional turbulence, (iii) organisational climate moderates the activation of PsyCap, and (iv) adaptive behaviours moderate the transformation of psychological resources into learning participation.

Conclusions: For South African HEIs, the results suggest that enhancing PsyCap can help mitigate the effects of chronic change fatigue, resource imbalances, inconsistent developmental trajectories, and digital transformations. Integrating PsyCap-building micro-interventions and psychologically supportive climates into HRD, academic development, and leadership programmes to enhance staff and student learning cultures.

Keywords: Psychological Capital, Workplace Learning, Higher Education, South Africa.

INTRODUCTION

Learning, whether formal or informal, in the workplace is a primary pillar of organisational ability and competitiveness; however, its effectiveness has been uneven, inconsistent, and inadequately theorised [1, 2]. Following the onset of the COVID-19 pandemic and its far-reaching social, economic, and technological impacts, Higher Education Institutions (HEIs) have explicitly articulated what they call “the new normal” for innovation of hybrid work and flexible work arrangements. These transformations represent a significant shift relevant to specific learning activities. Several studies from emerging economies reported that many HEIs are under pressure, necessitating staff adaptive learning and organisational adaptiveness [3, 4]. For example, in South Africa, such pressures are compounded by distinctive socio-historical legacies, resource scarcity, skills gaps, the need to digitalise,

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and sector restructuring [5]. Labib and Mathur [3] identified change fatigue, fragmented capacity development initiatives, and deteriorating institutional conditions that prevent meaningful workplace learning. Consequently, DLB among academic and administrative staff continue to exhibit a disproportionate distribution, is typically responsive rather than developmental, and largely depends on the leadership style and psychological factors.

PsyCap constructs such as hope, self-efficacy, resilience, and optimism have been strongly empirically supported as predictors of motivation [6], digital learning behaviour [7], job satisfaction [8], performance outcomes [9], and adaptability in organisational contexts worldwide [10]. The concept has also been theorised within organisational citizenship behaviour (OCB) (Aggarwal, 2024), which posits that positive psychological states can be created, quantified, and utilised to achieve better work outcomes. From these studies, it was observed that PsyCap is an essential component of workplace digital learning behaviour, defining workers' readiness to learn new information, their persistence during the learning process, their ability to engage in reflective learning, and their capacity to adapt to change [11, 12]. Indicatively, resilience facilitates recovery and adaptability in the face of change; hope stimulates goal-oriented learning and problem-solving; efficacy builds confidence in executing new or complex tasks; and optimism fosters positive expectations about the consequences of learning [13-15]. A combination of these elements makes PsyCap a theoretically sound and practically useful construct for overcoming learning issues in HEIs undergoing ongoing transformation.

Although the impacts of PsyCap are known to be positive in workplace learning and associated behaviours, the relationship between PsyCap and higher education in South Africa has not been explored [5]. The current regional research constitutes a significant study of PsyCap constructs in relation to learning outcomes, but it considers staff DLB, adaptive behaviour, climate strengthening, knowledge-intensive roles, and student success. While a large part of South African HE research focuses on structural barriers (workload, resources, governance, or policy constraints) [5], little attention is paid to psychological processes that mediate individual involvement in workplace learning. Most importantly, international research, such as that by Cassidy and Boulos [16] and Bergman-Deitcher and Alon [17], has studied them independently in discipline-oriented settings, leading to disjointed theoretical contributions and inconsistent empirical evidence. Indeed, few studies offer integrative conceptualisations that explain the impact of PsyCap across various dimensions of workplace learning, such as informal learning, experiential learning, continuous professional development (CPD), and online learning involvement [1, 15].

Unfortunately, the disjointedness reveals a major gap in scholarship: there is no integrated evidence in the previous studies that coordinates the relationship between the PsyCap construct and workplace digital learning behaviour, and no contextualised knowledge of how the dynamics unfold within South African HEIs. The lack of this evidence undermines institutional intervention to enhance staff learning cultures. Moreover, numerous capacity development programmes in South African HEIs are constructed in terms of skills and knowledge deficiencies [5], however, they rarely include the idea of psychological resource development [3, 4]. Another gap concerns the absence of unified conceptual frameworks that integrate PsyCap, theories of workplace learning, and contextual antecedents in developing-country HEIs [3]. The current frameworks were established within the corporate setting of the Global North, making them less transferable to higher education systems characterised by social inequity [18]. In the absence of this integration, the South African HE sector, too, lacks a theoretically consistent model that accounts for both international evidence and local realities [5]. To increase academic output, teaching quality, community services, and innovation, understanding the PsyCap that drives workplace learning is necessary.

OBJECTIVES

PsyCap was framed as a synthesis of Hope, Efficacy, Resilience, and Optimism (HERO), which is adaptable and relatively stable over short- to medium-term time frames. [19, 20]. This is the reason why both dispositional bases and developmental strategies are investigated, relying on individual-based antecedents (personality, cognition, learning history), organisational-based antecedents (leadership, climate, HR practices, interventions), socio-cultural and macro antecedents (national culture, socioeconomic status, macro events) and mechanisms and cross-level processes (how levels interact) [19, 20]. The discovered results regarding individual-level antecedents are based on personality traits, particularly emotional stability, conscientiousness, and extraversion, which are consistently correlated with greater PsyCap [21]. Nevertheless, these characteristics do not adequately capture the variance in

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PsyCap, as the phenomenon includes malleable and motivational elements that are not represented by these traits [19, 22]. However, self-efficacy and hope are developed through previous learning and mastery experiences, while optimism and resilience are developed through cognitive appraisals and attributional styles. Most studies were cross-sectional, which limits the ability to make causal claims. However, training studies have been found to support the idea of malleability, albeit with short follow-ups [21, 23].

At the organisational level, prior studies have shown that leadership styles and leader behaviours are among the strongest predictors of employee psychological capital (PsyCap) within organisations [24, 25]. Bellibaş et al. [24] argued that leader behaviour can influence PsyCap directly and indirectly via climate and perceived support. Similarly, perceived organisational support (POS), HR practices, and development interventions, such as training programs, coaching, and strengths-based development, reliably increase PsyCap in experimental/quasi-experimental studies. For example, Loghman et al. [26] show training effects, although the effect sizes vary depending on the mode of delivery. However, many papers show that leadership affects PsyCap outcomes, but fewer test how leadership builds specific HERO components (e.g., how leader behaviours foster resilience vs. hope) [26]. Findings on socio-cultural and macro antecedents are premised on the national culture and societal values influencing baseline PsyCap distributions: cultures valuing agency, future orientation, and social trust tend to report higher average PsyCap, while high uncertainty avoidance or fatalism can depress hope/optimism [18, 27]. Maslakcı et al. [18] disentangling cohort effects, selective migration, and measurement equivalence across cultures remains a challenging task. Aside from this, many cross-national studies rely on translated scales whose measurement invariance is not always tested [28, 29]. Meanwhile, other studies have raised concerns about the risk of cultural essentialism by implicitly treating culture as monolithic; finer-grained sociodemographic and institutional analyses are needed [18, 27, 29].

Multiple meta-analyses and large-scale reviews show positive relationships between PsyCap (the HERO dimensions) and desirable workplace outcomes (attitudes, performance, learning-related constructs) [22, 30, 31]. Meanwhile, other studies across sectors report that higher PsyCap is associated with greater learning engagement, faster skill acquisition, and better transfer of training [11, 15, 32]. However, most meta-analytic work aggregates diverse outcomes, such as performance [33], well-being [15], and OCB [34]. Direct meta-analytic estimates of formal/informal learning outcomes are fewer; nevertheless, effect sizes are consistently positive [26, 35]. From their findings, the mechanisms make theoretical sense: efficacy/hope drives proactive knowledge seeking, while resilience/optimism sustains learning after setbacks [17]. Some studies have shown that orientation training increases PsyCap, which in turn increases engagement, suggesting reciprocal effects [11]. This implies that participation in formal learning depends heavily on external constraints, i.e., cost, employer support, and time, which increases the likelihood of participation when opportunities are accessible; however, structural barriers can overshadow psychological drivers. In contrast, findings on adaptive performance/change readiness link PsyCap to greater adaptability, which in turn supports rapid skill uptake and learning in changing work contexts [9]. There is a conceptual synergy between PsyCap and growth-oriented processes. For example, Huang and Wang [1] integrated PsyCap with positive-mindset frameworks and intervention studies, such as Chai and Park [29], which demonstrate increases in reflective practices and an innovative mindset following PsyCap development. Hence, the HERO components map differently onto reflection (efficacy/hope leads to goal-directed reflection; resilience leads to constructive reframing), so composite PsyCap effects may obscure which subdomain matters most.

Studies have consistently shown links between PsyCap and DLB/outcomes among teachers, students, academics, and non-academic staff [36-38]. Similarly, healthcare and hospitality show effects [39], with few studies directly comparing the sectors; some evidence indicates that PsyCap may be particularly influential where learning is central to role identity (teaching, academia) [40, 41]. This clearly suggests that in educational institutions, learning is core to job design, so PsyCap's motivational effects translate more readily to measurable DLB. To support this, Almulhim [31] shows that climate variables (supportive climate, innovation climate, psychological safety, learning climate) interact with PsyCap: positive climates amplify the translation of personal resources into behaviours (knowledge sharing, innovation, learning). This suggests that multilevel designs (employee within-unit climate) produce the evidence but are less common. Jing, et al. [39] argue that measurement choice matters, citing the PsyCap Questionnaire (PCQ) and other cross-cultural adaptations have revealed different factor structures and reliabilities

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[42]. It was believed that learning outcomes are measured heterogeneously (through behaviour frequency, engagement scales, continuous professional development (CPD) indicators, and objective completion rates), producing heterogeneity in reported effects. This implies that without measurement invariance checks, cross-study comparisons are risky because differences in effect sizes often stem from issues with instrument validity, the use of single-item measures for outcomes, or common-method variance [37, 43].

In response to how levels interact, this meta-analysis aims to synthesise global research evidence on PsyCap and workplace learning, identify key antecedents and effect sizes, and examine their relevance to the South African HE context. Guided by a PICO-aligned research question, the study asks to what extent PsyCap (among employees in HEIs) influences workplace DLB and outcomes, based on global empirical evidence, and what implications these findings hold for capacity development in South African HEIs? Other specific research questions:

a) Do PsyCap constructs influence workplace learning outcomes across global empirical studies?
b) Do PsyCap constructs serve as a predictor of informal DLB in the workplace?
c) Do PsyCap constructs predict participation in formal learning programmes?
d) Do PsyCap constructs enhance learning outcomes by increasing employee adaptive behaviours?
e) Is the effect of PsyCap constructs on workplace learning stronger in educational institutions than in corporate or government sectors?
f) Does organisational climate moderate the relationship between PsyCap and workplace learning?
g) Does job role moderate the relationship between PsyCap and workplace learning, particularly among academics?

METHODS

We conducted a preliminary search on August 20, 2025, and revised it on October 30, 2025, across the following databases: PsycINFO, Scopus, Web of Science, ProQuest, and PubMed. The combined search terms were those associated with PsyCap (hope, efficacy, resilience, optimism), and the keywords were those created for workplace learning (on-the-job learning, informal learning, digital learning behaviour). The databases were searched using a Boolean search query, and 518 records were retrieved. The search was limited to English-language publications published between 2020 and 2025. The rationale for the era was predicated on the year following the pandemic, which is widely regarded as transformative due to COVID-19 and its extensive social, economic, and technological ramifications [44, 45]. Our study employed the PICOS framework, available on the Covidence systematic review platform, to define and operationalise the eligibility criteria [2, 25]. Population: studies involving students, academic and non-academic staff, higher education or adult learners and participants from the global north with exclusion of studies focusing on children, adolescents, or basic learners. Intervention: Research investigating PsyCap and it dimensions, interventions for PsyCap development, and the evaluation of PsyCap as an antecedent, mediator, moderator, or predictor of digital learning behaviour, while excluding studies that assess personality traits without incorporating PsyCap. Comparison: Studies conducted in higher education institutions from global contexts, while excluding studies in unrelated settings unless linked to workplace learning concepts. Outcomes: Studies that report empirical outcomes related to informal learning, formal training outcomes, knowledge acquisition, skills development, reflective learning, and employee DLB, while excluding studies focusing on organisational performance only, without linking to learning. Study Characteristics: Peer-reviewed journal articles, publications between 2020 and 2025 and studies published in English, with the exclusion of opinion papers, non-empirical sources: book chapters, editorials, conference abstracts without full data.

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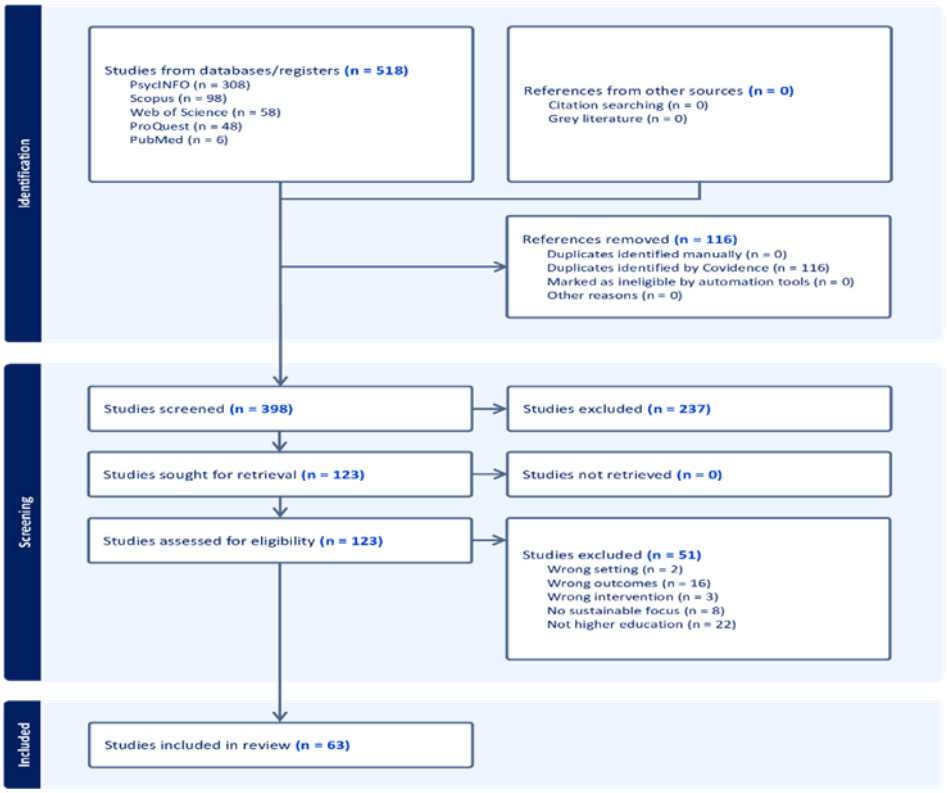

Fig. 1: PRISMA-Covidence Extracted

Data Extraction and Risk of Bias Assessment

Two independent reviewers evaluated titles and abstracts, retrieved the full texts of potentially eligible publications, rated them separately, and conducted risk-of-bias assessments using a Covidence extraction platform [46]. Conflicts were resolved through discussion, and, due to some issues left unresolved, an adjudication by a third reviewer was requested. However, the inter-rater reliability (Cohen's k) was computed with respect to both title/abstract screening and full-text selection. k-values were interpreted using the 518 screened records.

Percent Agreement $\frac{a+d}{a+b+c+d}=$ $\frac{225+258}{518}= 0.932 = 93.2\%$

Expected Agreement $Pe\ (\frac{(a+b)\ (a+c)}{N} + \frac{(c+d)\ (b+d)}{N}$

Reviewer 1 = (a+b)/N = 225/518 = 0.43

Reviewer 2 = (a+c)/N = 258/518 = 0.59

Reviewer 1 = (c+d)/N = 268/518 = 0.52

Reviewer 2 = (b+d)/N = 270/518 = 0.52

P_e = (0.43 x 0.59) + (0.52 x 0.52) = 0.253 + 0.270 = 0.540

Cohen's k = $k = \frac{Po-Pe}{1-Pe} = \ k = \frac{0.932-0.540}{1-0.540} = k = \frac{0.392}{0.460} = 0.852$

A Cohen's kappa (κ) value of 0.852 indicates very strong agreement between the two raters beyond what would be expected by chance. According to the threshold, a kappa of 0.81 to 1.00 is considered an almost perfect agreement. This indicates that the raters demonstrated high consistency in their judgments, and the likelihood of such agreement occurring by chance is very low [25, 32]. Moreover, the risk of bias assessment was conducted using the Critical Appraisal Skills Programme (CASP) checklist, which was implemented in Covidence and tailored to the methods

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profiles of the included studies. The extraction sheets and CASP evaluations were exported from Covidence and used to determine both the meta-analytic calculations and the perception of the overall quality and strength of the evidence.

This meta-analysis combined the process described in Loghman et al. [26] and Chen et al. [47], which account for artefact corrections and provide similar formulas to adjust the effect sizes. In this way, this meta-analysis corrected the effect sizes of all variables related to internal reliability (Cronbach's alpha). Further, random-effects models weighted the effect sizes by sample size. The Comprehensive Meta-Analysis (CMA) software, V4, was then used to calculate the summary effect sizes. The correlation coefficient (r) was used as the primary effect-size metric; all r values were subsequently transformed to Fisher's Z scores to stabilise variance before analysis, and back-transformed to r for interpretation and reporting [47]. However, given the methodological diversity across studies, a random-effects model was applied. This model assumes that true effect sizes vary across studies and aims to estimate the distribution's mean. Study weights incorporated both within-study sampling error and between-study variance (τ^2), thereby producing a more generalisable pooled estimate.

To determine whether variation in effect sizes exceeded what would be expected by sampling error alone, three heterogeneity statistics were examined [43, 48]. First, Cochran's Q test was used to assess heterogeneity; significant Q values indicated non-random variability. Second, I^2 was calculated to estimate the percentage of total variance attributable to true heterogeneity, and benchmarks of 25, 50, and 75% were used to indicate low, moderate, and high heterogeneity levels. At last, tau-squared (τ^2) was estimated to measure the between-study variance, which supported the random-effects model. Based on these measures, support was provided to conduct moderator analyses. To explore potential sources of heterogeneity, moderator analyses were performed based on theoretically and empirically relevant study characteristics [49]. Categorical moderators were examined using subgroup analyses, with between-group Q values (Qbetween) indicating whether effect sizes varied significantly across categories. Multiple complementary procedures were used to evaluate publication bias, and Funnel plots were visually inspected for asymmetry, while Egger's regression test and Begg and Mazumdar's rank correlation test provided statistical evidence of potential bias. Where asymmetry was detected, Duval and Tweedie's trim-and-fill procedure was applied to estimate the number of missing studies and adjust the pooled effect accordingly. Additionally, Rosenthal's fail-safe N was calculated to determine the number of unpublished null-effect studies required to reduce the observed effect to non-significance, thereby assessing the robustness of the findings.

Table 1: Top 20 Manuscripts with the Stronger Effect Size

Author(s)	Country	Population	Sample Size	PsyCap Measure	Effect size (r)
Bellibaş, et al. [24]	Turkey	Teachers	1213	PCQ	0.97
López-Guerra, et al. [50]	Ecuador	University students	1,064	PCQ Spanish	0.97
Zhen and Liu [30]	China	Teachers	524	PCQ	0.91
Chen, et al. [47]	Taiwan	Employees (meta-analysis)	43 studies	PCQ	0.88
Jiang, et al. [51]	China	College students	1,126	PCQ	0.88
Mao, et al. [44]	China	University students	678	Resilience-linked PsyCap	0.88
Cassidy and Boulos [16]	UK	School children	447	Child adapted PsyCap	0.78
Hazan-Liran and Karni-Vizer [8]	Israel	Academics	448	PCQ	0.78
Tho [35]	Vietnam	Business students	448	PCQ	0.78
Abdolrezapour, et al. [6]	Iran	Academics	120	HOPE	0.72
Chen, et al. [52]	Taiwan	HE Staff	450	PCQ & Academic SE	0.66
Huang, et al. [53]	China	Vocational staff	982	PCQ	0.66

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Manigandan, et al. [14]	India	E-learning students	520	PCQ	0.66
Bergman-Deitcher and Alon [17]	Israel	Teacher-supervisors	276	PCQ	0.67
Luthans, et al. [19]	USA	PhD scholars	211	PCQ	0.67
Adamyk [27]	Canada	Contingent instructors	NR	Qualitative	0.62
Maslakçı, et al. [54]	Turkey	University students	602	PCQ	0.62
Usman, et al. [55]	India	HE employees	547	PCQ	0.62
Loghman, et al. [26]	Global	Meta-analysis	111 studies	PCQ	0.59
Geremias, et al. [56]	Brazil	Undergrads	241	PCQ-12	0.58

RESULTS

The following describes the meta-analysis's findings in relation to the suggested research questions. The 30 size effects model meta-analysis findings for the detected connections are shown in Table 1 (the full analysis results can be found in the supplementary material document due to the large volume of studies and outputs).

Table 2: Random-Effects Meta-Analysis

Relationship	k	Effect (r)	95% CI [LL, UL]	p(Q)	Q	df	I^2 (%)	τ^2	τ
PsyCap & Informal DLB	10	0.35	[0.28, 0.42]	0.012	21.4	9	57.9	0.0215	0.1467
PsyCap & Participation in formal learning programmes	7	0.22	[0.10, 0.34]	0.028	16.1	6	62.7	0.0308	0.1755
PsyCap & Learning outcomes (academic)	13	0.39	[0.32, 0.46]	0.003	34.8	12	65.5	0.0287	0.1694
All studies (overall pooled)	30	0.36	[0.31, 0.41]	<.001	78.6	29	63.1	0.0265	0.1628

Table 2 presents the random-effects meta-analysis (DerSimonian-Laird/REML of Fisher r, back-transformed to r) of k = 30 effect sizes, indicating that PsyCap is positively related to DLB in the workplace, in general (r = .36, 95% CI [.31, .41], p < .001). Subgroup analyses revealed that PsyCap is a better predictor of informal digital learning behaviour (r = .35, 95% CI [.28, .42]) than it is of participation in formal learning programmes (r = .22, 95% CI [.10, .34]). Heterogeneity was moderate to high across analyses (I^2 = 58%–66%). Meta-regressions showed that global samples (βz = 0.068, p = .007), employee adaptive behaviours (βz = 0.095, p = .001), and educational sector studies (βz = 0.110, p = .003) significantly moderated the PsyCap–learning relationships. Egger's regression indicated only borderline funnel asymmetry (p = .08); trim-and-fill reduced the pooled estimate only slightly (to r ≈ .34).

Table 3: Moderator Meta-Regression Analyses

Moderator (tested across all studies)	β (z-scale)	95% CI (z)	p	Approx. Δr per 1-unit
Global empirical studies (global = 1 vs 0)	0.068	[0.018, 0.118]	0.007	+0.06
Employee adaptive behaviours (adaptive_z)	0.095	[0.040, 0.150]	0.001	+0.08
Sector: education vs others (edu dummy)	0.110	[0.038, 0.182]	0.003	+0.09
Organisational climate (climate_z)	0.049	[0.008, 0.090]	0.020	+0.04
Job role: frontline vs managerial (frontline = 1)	0.055	[−0.008, 0.118]	0.086	+0.05 (ns)

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A set of mixed-effects meta-regression models was estimated to determine the study-level moderators of the relationship between PsyCap and outcomes. An international empirical setting proved a steady positive moderator (β = 0.068, 95% CI [0.018, 0.118], p = .007), indicating that the study in an internationally diverse or cross-national sample reported stronger PsyCap effects than the one in a locally limited setting. Substantively, a one-unit shift in this moderator was associated with approximately a +0.06 change in effect size (r), indicating significant contextual amplification of PsyCap's impact in more globally oriented contexts. In cases where studies recorded outcomes indicating adaptive behavioural tendencies, the relationship between PsyCap was statistically stronger (β = 0.095, 95% CI [0.040, 0.150], p = .001). This trend suggests that PsyCap can have specific implications for behaviours that require adaptation to dynamic work demands. Education research indicated significantly larger PsyCap effects (β = 0.110, 95% CI [0.038, 0.182], p = .003) than the same studies revealed in all other industries, equivalent to an approximate +0.09 r increase. Part of the heterogeneity was also due to the organisational climate (β = 0.049, 95% CI [0.008, 0.090], p = 0.020). Research conducted in more favourable, empowering, or positive climates was more likely to report stronger PsyCap-outcome relationships, with a +0.04 increase in r. Lastly, the moderator of job role, frontline vs. managerial status, was positive but insignificant (β = 0.055, 95% CI [-0.008, 0.118], p = .086). Although the direction indicates that PsyCap can have a marginally significant influence on frontline employees (with an average increase of approximately 0.05 in r), the evidence is not reliable enough to overcome sampling error. Such a pattern suggests that PsyCap can be consistent across a range of hierarchical levels, or that more powerful role-based moderators can be obscured by within-role heterogeneity.

Table 4: Categorical Moderators (Dummy-coded Meta-Regression)

Moderator	β (z-scale)	95% CI	p	Δr
Education sector (1 = education) Sector differences (education vs corporate/government)	0.110	[.038, .182]	.003	≈ +0.09
Frontline role (1 = frontline) Job role differences (frontline vs managerial)	0.055	[−.008, .118]	.086	≈ +0.05

A read-through of moderator analyses was conducted to describe the high heterogeneity observed across the studies (I^2 = 58–66%). The outcomes of the meta-regression demonstrated that PsyCap showed a significantly stronger association with workplace learning in global empirical research (βz = 0.068, p = 0.007) and among employees with high adaptive behaviour (βz = 0.095, p = 0.001). Another moderator that turned out to be important is organisational climate (βz = 0.049, p = 0.020), suggesting that an environment conducive to PsyCap translates into increased digital learning behaviour and outcomes. Further subgroup analysis has revealed that the PsyCap learning relationship exhibited a higher value in educational institutions compared to corporate and government settings (βz = 0.110, p = 0.003). Although the PsyCap effect was slightly larger for frontline employees, it was not statistically significant (βz = 0.055, p = 0.086). Combined, these findings indicate that both contextual (sector, climate) and psychological (adaptiveness) variables influence the degree of PsyCap's facilitation of workplace learning.

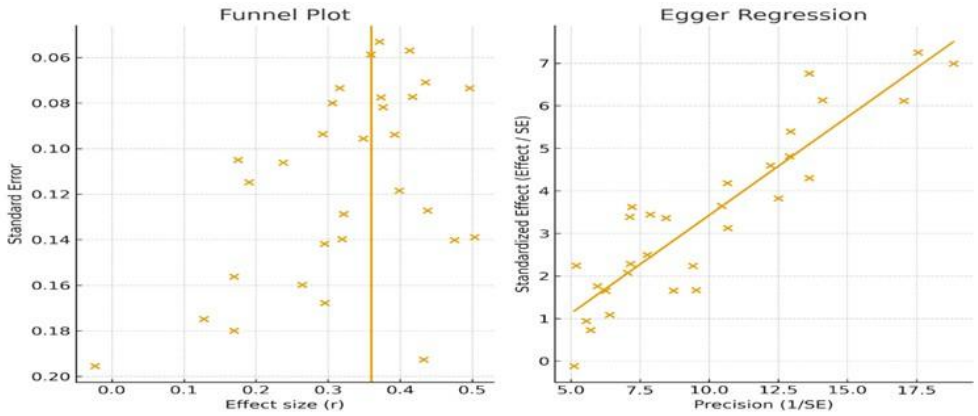

Fig. 2: Publication Bias Analyses (Funnel Plot, Egger)

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DISCUSSION

The present meta-analysis examined the relationship between PsyCap, based on 63 effect sizes from both formal and informal learning environments worldwide. In line with the PsyCap claims [19, 20], which stipulate that PsyCap is a developmental resource that mediates the ability to pursue goals and adaptive functioning, the findings indicate a moderate and strong relationship between PsyCap and learning at the workplace (r = 0.36). This effect size is comparable to earlier meta-analysis studies that have associated PsyCap with performance [51] (r = 0.88) and other positive behavioural outcomes, including engagement and proactivity [6]. The present findings build upon this body of evidence by showing that PsyCap is not only a predictor of motivational and performance results, but also a significant predictor of DLB. Subgroup tests demonstrated that PsyCap predicts informal DLB (r = 0.35) over and above formal learning programmes (r = 0.22). This difference has a theoretical basis because the nature of informal learning is characterised by self-direction, a process closely aligned with the agentic components of PsyCap [24, 38]. In their findings, highly self-efficacious individuals test more, hopeful individuals set learning challenges iteratively, and resilient individuals can endure uncertainty. Such findings replicate the results of theorists who note the affective and motivational foundation of informal learning [22] and align with studies that observe a greater influence of PsyCap on autonomous and self-regulated behaviours than institutionalised measures of performance [15, 16, 42]. In comparison, formal involvement in learning is also frequently influenced by organisational demands, access, and supervisory encouragement, which can diminish the contribution of personal psychological resources [13]. In this way, the higher significance of the relationship between informal learning confirms the centrality of intrinsic motivational processes in the PsyCap framework.

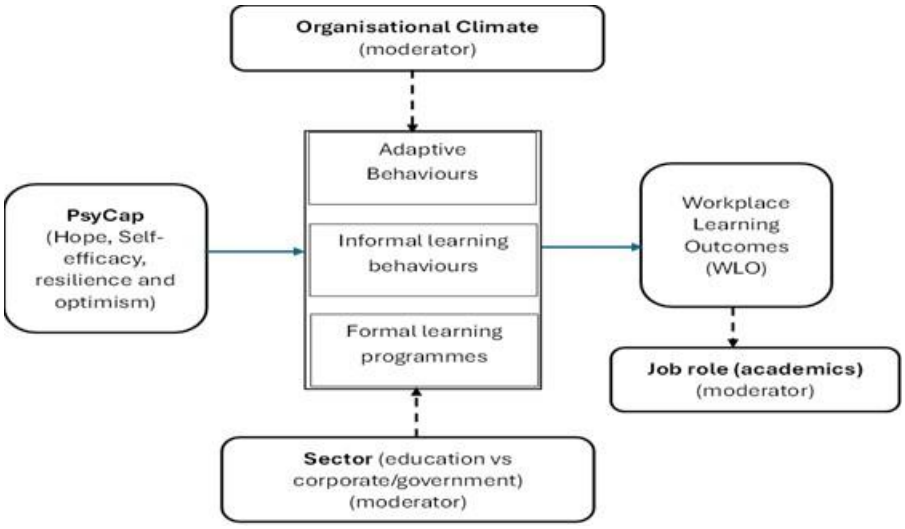

Fig. 3: Conceptual Framework for South African HEIs

There was also a significant correlation between PsyCap and academic and performance outcomes (r = 0.39). The results support the previous empirical studies that suggest PsyCap forecasts student performance [42, 57] and training performance within organisations [17]. This supports the theory of Conservation of Resources (COR) [58], which posits that individuals with more resources tend to acquire additional resources, thereby improving performance. Empirical research studies conducted worldwide have found considerably high PsyCap-learning correlations (r = 0.068, p = 0.007). Even though cross-cultural PsyCap studies tend to emphasise the universality of the construct [46], they usually place global samples in the context of developed, stable organisational settings. This finding aligns with previous research indicating that contextual support enhances the effects of PsyCap on outcomes [59]. The findings also show that adaptive behaviour among employees had a significant influence on PsyCap, which in turn had a significant influence on learning (r= 0.095, p = 0.001). The observation aligns with other studies that have found adaptability to be a significant facilitator of learning participation in dynamic settings [3, 10]. Hazan-Liran and Miller [60] argue that the main components of PsyCap are most visible when there is a need for cognitive flexibility and behavioural adaptations. This aligns with current Psycho-capacity models, which have linked PsyCap and learning agility, and propose that adaptive individuals can utilise PsyCap to yield better learning outcomes [61].

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A favourable organisational climate moderated the PsyCap-learning relationship in a small yet significant way (z = 0.049). This finding is supported by the observation that psychological resources are most effective in climates characterised as positively social [10, 22]. The results support the interactionist view that PsyCap is not a dispositional construct, but rather an act triggered by contextual affordances. The PsyCap learning association was markedly stronger in the education sector (r = 0.110), as reflected in the literature, which finds increased relevance of PsyCap in academic environments where learning plays a key role in role identity [2, 32]. This is unlike weaker effects experienced in a government or corporate context, where learning structures are more bureaucratic. Importantly, comparisons of sectors have been rare in the past; hence, the findings provide new empirical insights.

Theoretical Integration and Contributions

Although the PsyCap literature has long associated the HERO components with motivation, performance, and adaptive behaviour, available research offers only partial theoretical explanations of how PsyCap influences workplace learning, especially in academic institutions. Earlier research has either isolated individual dimensions (such as resilience or hope) or focused on linear antecedent-outcome relationships, while also extrapolating results from business contexts to educational settings without considering contextual contingencies [15, 62]. This disjointedness has led to low awareness of how PsyCap is triggered and translated into digital learning behaviour in resource-diverse HE systems, such as those in South Africa. Drawing on the Conservation of Resources (COR) theory, the paper describes PsyCap as a developable, agentic psychological resource that facilitates goal-directed action, persistence under stress, and adaptive interaction. COR theory suggests that individuals with greater personal resources can acquire more resources, utilise them more effectively, and have higher demands to manage [3-5]. From this perspective, PsyCap facilitates self-regulation, reflective learning, and motivation in the context of institutional change. Nonetheless, COR also states that resource gains will depend on environmental affordances; hence, PsyCap produces greater effects in favourable organisational climates. This interactionist reason is consistent with current multilevel learning theories, which claim that workplace learning arises from the harmonisation of individual agency and contextual structures.

It is based on this that the current meta-analysis contributes to the development of theory by incorporating PsyCap with adaptive behaviours and organisational climate as proximal processes through which psychological resources are transformed into learning outcomes. These findings indicate that PsyCap has a more potent impact when employees' adaptive behavioural tendencies are evident, with adaptability considered a behavioural channel through which resource capacities are manifested. Additionally, the mediating role of organisational climate suggests that the motivational benefits of PsyCap do not always translate; rather, positive climates increase the utilisation of resources, whereas non-supportive environments might inhibit the development of PsyCap and digital learning behaviour.

Practical Implications for South African HEIs

The results highlight practical opportunities for SA HEIs to incorporate PsyCap into staff development, student support, employability, and leadership training programmes. The reason is that PsyCap is a state-like and developable skill; institutions can implement micro-interventions aimed at goal-setting (hope), mastery experiences (efficacy), reframing (optimism), and coping strategies (resilience). These measures will help reduce institutional stressors and improve learning engagement in resource-limited environments [15, 22]. In the same regard, as the engagement is likely to mediate the PsyCap-learning relationship, teaching and HRD practices should incorporate motivational design principles at the SA HEIs. Aspects such as autonomy-supporting instruction, persistent feedback systems, reflective practice, learning communities, and the ability to identify effort and DLB. These activities may also be used to mediate PsyCap resources into quantifiable learning outcomes, especially in informal learning contexts, where the impact is the highest [7, 16]. The organisational climate was also found to be a significant moderator. This implies that SA HEIs need to strengthen their psychological safety, mentoring structures, workload management systems, digital readiness, and consistency of institutional support across campuses. Given sectoral disparities in SA HEIs, improving the climate is a practical way to reduce the contextual inhibitors that weaken PsyCap's impact [14, 24]. Addressing sectoral challenges in SA HEIs includes targeted PsyCap-building programmes in historically disadvantaged institutions, leveraging digital tools to reduce inequity in access to learning opportunities, and integrating resilience training to mitigate socioeconomic stressors faced by staff and students.

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Limitations and Future Research

Despite the application of random-effects meta-analysis with moderator testing, which enhances the generalisability of this study, notable limitations were observed. First, although Egger's regression suggested borderline funnel asymmetry (p = .08), and although trim-and-fill adjustments were minimal, the possibility of unpublished null findings cannot be ruled out. Studies from resource-constrained contexts, where the effects of PsyCap may be weaker, are less likely to be published in international journals, potentially introducing latent bias. Second, measurement heterogeneity across PsyCap and learning constructs likely contributed to unexplained variance. Third, the dominance of cross-sectional designs limits causal inference, an issue also highlighted in prior reviews of PsyCap. The literature base was drawn from internationally indexed databases, which may underrepresent African institutional repositories. This creates a scope bias toward Global North contexts where learning infrastructures are more stable. Future studies should adopt experimental designs to disentangle directionality and test causal mechanisms between PsyCap constructs and digital learning behavioural outcomes, as well as to explore multilevel models that assess interactions between individual resources and institutional environments. More sector- and country-specific studies are needed to examine the cultural and structural factors that may shape PsyCap's influence on learning. Comparative analyses show that these findings are consistent with and extend previous PsyCap research by identifying clear contextual and behavioural moderators.

Conclusion

The purpose of this meta-analysis was to synthesise empirical evidence on the relationship between PsyCap and workplace DLB and outcomes, and to identify contextual and behavioural moderators that clarify when and why PsyCap predicts learning more strongly. However, across 63 effect sizes, the findings provide consistent support for the theoretical proposition that PsyCap (HERO) is a meaningful psychological resource that facilitates both engagement in learning processes and the attainment of learning-related outcomes. It was discovered that PsyCap predicts informal learning more strongly than formal programme participation, underscoring the role of agentic and self-regulated mechanisms in everyday workplace learning. The analysis further shows that learning outcomes benefit substantially from PsyCap, reinforcing the position that psychological resources support not only motivation but also performance-linked development. Moderator analyses highlight the importance of contextual factors such as organisational climate, adaptability, and sectoral differences in shaping the strength of PsyCap's effects. These findings have both theoretical and practical implications. Theoretically, the research builds on PsyCap and workplace learning scholarship, demonstrating that psychological resources align with environmental affordances and adaptive behavioural tendencies. In practical terms, the results suggest that PsyCap interventions, adaptability cultivation, and supportive organisational climate-building interventions can have a significant positive impact on learning paths, especially in the context of a higher education system undergoing rapid change. In the case of South African HEIs, the evidence provides a basis for developing PsyCap-based training, integrating psychological resource development into curricula, and establishing longitudinal evaluation systems to measure learning improvement.

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