




# Psychological capital as a predictor of work engagement in a training academy



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**Orientation:** Employees in education and training are expected to be engaged, and Psychological Capital (PsyCap) may be a critical personal resource for fostering work engagement and creating competitive advantage.

**Research purpose:** The main aim of this study is to examine the relationship between PsyCap and work engagement within a training academy context, with a particular focus on whether PsyCap serves as a significant predictor of work engagement.

**Motivation for the study:** In a VUCA environment, fostering work engagement is vital for organisational performance, especially in training colleges where staff shape future human capital. PsyCap may be a key resource for enhancing work engagement.

**Research approach/design and method:** Quantitative data were collected from 119 employees at a TVET college in the Eastern Cape using non-probability, convenience sampling. Paper-and-pencil-based questionnaires were employed using the shortened validated scales to measure both PsyCap and work engagement to gather data.

**Main findings:** The results suggest that PsyCap and work engagement have a statistically significant positive relationship. It further indicates that PsyCap predicts work engagement, with efficacy and optimism positively predicting engagement. Hope and resilience are insignificant in predicting work engagement.

**Practical/managerial implications:** Recruitment and selection strategies can benefit from assessing PsyCap, as employees with high PsyCap are likely to show greater work engagement. Additionally, training and development programs should include PsyCap interventions, particularly targeting self-efficacy and optimism, to further boost engagement.

**Contribution/value-add:** This research provides meaningful insights into work engagement by highlighting the pivotal role that PsyCap plays in promoting work engagement.

**Keywords:** psychological capital; work engagement; training academy; hope; optimism; resilience; efficacy.

## Introduction

Organisations keep striving to not only remain sustainable but to gain a competitive advantage in a dynamic world that is continuously changing. Using traditional human resource strategies and practices may not provide the same results as in the past (Uthman, 2024). To make optimal use of our human capital, organisations would benefit from looking at positive constructs, including psychological capital and work engagement, which have received attention in both the researcher and practitioner circles (Husin et al., 2021).

Uthman (2024) and Lim et al. (2017) posit that in an evolving world, organisations are required to re-examine how they utilise their resources, particularly their human resources, to remain sustainable and gain a competitive advantage. Work engagement is critical for organisational performance and sustainability, especially when employees approach their work with vigour, absorption and dedication (Kodden, 2020; Schaufeli et al., 2002).

This is particularly important for Technical Vocational Education and Training (TVET) colleges, which play an invaluable role in addressing unemployment, fostering inclusive growth and bridging the gap between education and the job market through knowledge-based and skills-driven approaches (Habiyaemye et al., 2022; OECD, 2020; Selane & Odeku, 2024). This further supports national development by equipping trainees with technical knowledge, practical skills

and the competencies required for employment and economic performance (Selane & Odeku, 2024). Technical Vocational Education and Training colleges hold strategic importance for the Department of Higher Education and Training as they play a vital role in advancing skills development for the formal economic sector, business and entrepreneurs (Nundkumar & Subban, 2020). South African TVET colleges are encountering difficulties in the implementation of proficient management, optimal performance and being the preferred institution of choice for prospective students (Sithole et al., 2022). To tackle youth unemployment and related challenges in the sector, the enhancement of TVET management and the cooperation of its staff would go a long way to address these difficulties (Tadle et al., 2021).

According to Sithole et al. (2022), TVETs experience these challenges owing to a negative organisational culture, inflexibility and low work engagement. Having insight into the work engagement of TVET employees would be useful owing to the valuable role they have to play in the development of a competent, effective workforce and the current challenges they are facing. Work engagement has been shown to lead to numerous positive behaviours and attitudes in the workplace, including heightened creativity, improved financial performance and citizenship behaviours (Bakker & Demerouti, 2008; Borst et al., 2020). The Job Demands-Resources model by Bakker and Demerouti (2008) advocates that personal resources such as optimism, efficacy and resilience can enhance work engagement. Personal resources such as these align with the components of psychological capital (PsyCap), namely hope, optimism, resilience and self-efficacy (Luthans et al., 2006). As such, it stands to reason that PsyCap may have the capacity to influence and possibly even predict work engagement. A great deal of research has taken place in developed, first world countries and while there is some research in developing countries, it would be valuable to gain further insight into this relationship, especially in the light of a South African training academy where the value in their role lies in addressing South Africa's pressing challenges of joblessness, poverty and inequality (Nundkumar & Subban, 2020).

## Literature review

Psychological capital and work engagement are situated in the Positive Organisational Behaviour paradigm and have the potential to enhance employee and organisational performance. These constructs will be discussed next.

### Psychological capital

Psychological capital is a key higher-order construct within positive organisational behaviour and is comprised of hope, optimism, resilience and self-efficacy (Avey, 2014; Luthans et al., 2006; Shah et al., 2019). Hope is the motivation to pursue goals and the expectation that even in the face of adversity, when one must find alternative pathways, the desired outcome will be achieved (Compton & Hoffman, 2013). Optimism is defined as having a

positive outlook in every circumstance and anticipating success both now and into the future (Seckinger et al., 2010). Resilience can be explained as the ability to effectively cope with and recover from adversity, obstacles or challenges (Rook et al., 2018). Self-efficacy refers to an individual's belief in their own ability to achieve their goals or successfully complete a task in a given context (Bandura, 1997).

Psychological capital is measurable and open to development through simple interventions, making it a valuable especially in its ability to increase performance (Finch et al., 2023; Lupşa et al., 2020; Luthans & Youssef-Morgan, 2017; Reichard et al., 2024; Salanova & Ortega-Maldonado, 2019). Mbatha's (2016) study on a South African sample supports the performance relationship and highlights PsyCap as a significant predictor of performance. Psychological capital has been positively associated with desirable work attitudes and behaviours such as job satisfaction, employee well-being, organisational commitment, organisational citizenship behaviours, reduced job stress and reduced turnover intention (Avey et al., 2011; Lupşa et al., 2020; Shah et al., 2019). Furthermore, when leaders demonstrate high levels of PsyCap, it is known to enhance the PsyCap and performance of employees and teams (Rebelo et al., 2018; Walumbwa et al., 2010).

### Work engagement

Work engagement is defined as a positive, meaningful work-related mindset that is characterised by vigour, dedication and absorption (Bakker, 2022; Bakker & Albrecht, 2018). Vigour is characterised by high energy levels, excitement and cognitive resilience at work, motivating employees to be persistent in achieving their goals (Bakker & Demerouti, 2008). Dedication refers to a deep involvement in one's work and experiencing meaningfulness, passion, challenge and gratification in one's role (Bakker & Demerouti, 2008). Absorption is characterised by being deeply captivated and involved in work that time passes quickly, and it becomes difficult to disengage from the task (Bakker & Demerouti, 2008).

Work engagement has numerous positive consequences for organisations, including greater customer satisfaction, performance, commitment to the organisation, lower levels of turnover intention (Bakker & Demerouti, 2008), creativity (Agarwal et al., 2012); better customer service (Rabiul et al., 2022) and performance (Borst et al., 2020). Husin et al. (2025) highlighted that work engagement is pivotal in fostering innovative work behaviours. Work engagement is contagious and can be influenced by engaged co-workers, leaders and even family (Bakker, 2022).

Wang (2024) suggests that work engagement plays a critical role in teachers' psychological well-being and is considered a mediator between job demands and well-being. Both individuals and organisations can therefore benefit immensely from elevated levels of work engagement. According to Kawada et al. (2024) job resources are positively related to work engagement, positing that by enhancing

coaching, social support, constructive performance feedback and other resources at work it will likely result in higher work engagement. This relates back to the JD-R theory, whereby personal resources and job resources are likely to have a positive effect on work engagement (Bakker, 2022; Bakker & Demerouti, 2008). Mazzetti et al. (2023) in their meta-analysis of work engagement concluded that personal and development resources have a stronger relationship than job and social resources.

## Relationship between psychological capital and work engagement

Numerous studies have demonstrated a positive relationship between PsyCap and work engagement. Simons and Buitendach (2013) found a positive relationship between PsyCap and work engagement in their study of South African call centre employees. Bekker (2016) corroborated this result, finding a positive relationship between PsyCap and work engagement in a South African study at a poultry hatchery. Biswal et al. (2025), Bonner (2016) and Wirawan et al. (2020) concur with these results, suggesting a significantly positive relationship between the constructs under study.

Du Plessis and Boshoff (2018) found a similar result in their study on 647 managers in a national private healthcare institution, with a strong statistically significant positive correlation between PsyCap and work engagement. Alessandri et al. (2018) highlighted that personal resources are related to work engagement. This aligns with the JD-R model, suggesting that PsyCap could increase work engagement through the fostering of personal resources (Bakker & Demerouti, 2008):

$H_1$  – There is a positive relationship between PsyCap and work engagement

Kotze (2018), together with Ngwenya and Pelsler (2020), state that PsyCap has a significantly positive influence on work engagement. In addition, the studies of Wu (2025), Du Plessis and Boshoff (2018), Bekker (2016) and Alessandri et al. (2018) revealed that PsyCap can predict work engagement. In a study on high school teachers, Wu (2025) determined that PsyCap is a significant predictor of work engagement. While Nagoji and Mackasare's (2023) study on private higher institutions in India showed that resilience and optimism could predict work engagement. As such, hypotheses two to six were developed:

$H_2$  – PsyCap can predict work engagement

$H_3$  – Hope can predict work engagement

$H_4$  – Self-efficacy can predict work engagement

$H_5$  – Resilience can predict work engagement

$H_6$  – Optimism can predict work engagement

With these hypotheses in mind to explore the PsyCap–work engagement relationship, the methodology will be discussed in the next section.

## Research design

### Sample and procedure

The study encompassed the entire population of a private TVET college in the Eastern Cape. Non-probability convenience sampling was used to survey the entire population. Participants were given the option to exit the study at any time, and of the 176 surveys that were distributed, 119 completed surveys were returned, indicating a 68% response rate. This quantitative research took on a correlational, cross-sectional design, measuring the constructs at a single point in time. Participants completed a composite self-report survey in group sessions, giving an opportunity for the participants to ask questions and the researcher to provide clarity.

### Measuring instruments

The questionnaire comprised the shortened versions of the Utrecht Work Engagement Scale (UWES-9) and the Psychological Capital Questionnaire (PCQ-12), together with a section on biographical details. The UWES-9 measures work engagement with nine items on a seven-point Likert scale to identify scores for vigour, dedication and absorption (Schaufeli et al., 2006). An example of an item is 'at my work I feel bursting with energy'. The measure shows great reliability in its studies with a Cronbach's alpha of between 0.80 and 0.91 (Schaufeli et al., 2006). The UWES is freely available for research purposes, and as such, permission was not required to use this instrument.

The PCQ-12 uses a six-point Likert scale to measure efficacy, hope, resilience and optimism with twelve items and is shown to be reliable (Luthans et al., 2008). An example of an item is 'I can think of many ways to reach my current work goals'. Kamei et al. (2018) calculated an internal consistency of 0.81 for the measure, suggesting that it is reliable. Permission to use the PCQ-12 was obtained from Mind Garden.

### Statistical analysis

Data were manually captured onto Microsoft Excel and were then statistically analysed using IBM SPSS 25 and Amos version 25. The factor structures for PsyCap and Work Engagement were assessed using confirmatory factor analysis (CFA) and Cronbach's alpha to ensure adequate factor validity and reliability. The resulting factor structures were used in further analyses (using factor scores). Relationships were measured using Pearson's Product Moment correlation, while multiple regression was used to determine if PsyCap could predict work engagement.

### Ethical considerations

Ethical clearance to conduct this study was obtained from Nelson Mandela University Research Ethics Committee (Human) (H18-BES-IOP-024). All research procedures were in accordance with the institutional ethics and written informed consent was obtained from all individual participants involved in the study.

## Results

The factors for PsyCap and work engagement were assessed for validity and reliability; these results can be seen in Table 1. Cronbach's alphas were calculated to determine reliability, while the validity was assessed using CFA.

As seen in Table 1, all the factors demonstrated adequate reliability with Cronbach's alpha values of 0.70 or greater. Further to this, most of the factors showed adequate validity. Work engagement had three model fit indices indicating an adequate model fit and one model fit index reflecting a poor fit (GFI = 0.83). Similarly, PsyCap had shown adequate model fit for all indices except for the GFI (88). As per the guidelines from Hair et al. (2013), the model fit for both work engagement and PsyCap can be deemed as adequate as at least two indices indicate appropriate model fit.

Once the factors validity and reliability were shown to be adequate, factor scores were obtained as seen in Table 2.

As can be seen in Table 2, all mean scores for PsyCap ranged from 4.76 to 4.81, suggesting a tendency for respondents to agree. It demonstrates that, on average, respondents had high levels of hope, optimism, resilience, self-efficacy and overall PsyCap. Furthermore, the mean scores for work engagement ranged from 4.34 to 4.89, demonstrating that, on average, respondents had high levels of vigour, dedication, absorption and overall work engagement.

**TABLE 1:** Factor scores for the measuring instruments.

Variables	Cronbach's alpha	Parameters	CMIN/df	SRMR	CFI	GFI
Efficacy	0.70	All significant	-	0.0000	1.00	1.00
Hope	0.78	All significant	0.055	0.0050	1.00	1.00
Resilience	0.70	All significant	-	0.0000	1.00	1.00
Optimism	0.72	All significant	-	0.0000	1.00	1.00
PsyCap	0.86	All significant	1.960	0.0695	0.88	0.90
Vigour	0.88	All significant	-	0.0000	1.00	1.00
Dedication	0.87	All significant	-	0.0000	1.00	1.00
Absorption	0.73	All significant	-	0.0000	1.00	1.00
Work engagement	0.93	All significant	4.790	0.0670	0.83	0.90

Source: Adapted from Jacobs, C.-T. (2020). Psychological capital and work engagement of employees at a training academy (p. 47). Master's thesis, Nelson Mandela Metropolitan University, Faculty of Business and Economic Sciences. Retrieved from <http://hdl.handle.net/10948/48169>  
CMIN/df, minimum discrepancy divided by degrees of freedom; PsyCap, Psychological Capital; SRMR, standardised root mean square residual; CFI, comparative fit index; GFI, goodness-of-fit index.

**TABLE 2:** Factor scores for the measuring instruments ( $N = 119$ ).

Variables	Minimum	Maximum	Mean	SD
Efficacy	2.00	6.00	4.76	0.80
Hope	2.25	6.00	4.76	0.82
Resilience	2.00	6.00	4.81	0.92
Optimism	1.00	6.00	4.78	1.00
PsyCap	2.54	6.00	4.77	0.69
Vigour	0.00	6.00	4.34	1.32
Dedication	0.00	6.00	4.89	1.16
Absorption	0.00	6.00	4.67	1.05
Work engagement	0.00	6.00	4.63	1.08

Source: Adapted from Jacobs, C.-T. (2020). Psychological capital and work engagement of employees at a training academy (p. 47). Master's thesis, Nelson Mandela Metropolitan University, Faculty of Business and Economic Sciences. Retrieved from <http://hdl.handle.net/10948/48169>  
SD, standard deviation.

The results of the investigation of the relationship between PsyCap and work engagement are discussed next.

In Table 3, a statistically significant positive correlation is observed between PsyCap and work engagement ( $r = 0.609$ ), which suggests a strong positive relationship between the variables. Other statistically significant positive correlations are between PsyCap and vigour ( $r = 0.505$ ), dedication ( $r = 0.606$ ) and absorption ( $r = 0.574$ ). Work engagement has a statistically significant positive correlation with optimism ( $r = 0.584$ ), pointing to a strong relationship between the variables. Hope ( $r = 0.476$ ), efficacy ( $r = 0.488$ ) and resilience ( $r = 0.341$ ) all had statistically significant moderate correlations with work engagement. Hypothesis 1 is therefore accepted.

Table 4 presents the results of the multiple linear regression with PsyCap as the independent variable and work engagement as the dependent variable.

Table 4 shows the results of a multiple linear regression to determine if overall PsyCap was a predictor of work engagement. The overall model was significant, suggesting that PsyCap ( $b = 0.955, \beta = 0.609, t = 8.313, p = 0.000$ ) predicts work engagement. As such, hypothesis 2 is accepted.

It was further decided to dive deeper into determining the impact of efficacy, hope, resilience and optimism on work engagement, looking at the individual subscales that make up PsyCap.

A multiple linear regression was conducted to examine if the sub-factors of PsyCap, namely efficacy, hope, resilience and optimism, were predictors of work engagement. These results can be seen in Table 5. The overall model was significant ( $F(4,114) = 19.471, p < 0.001, R^2 = 0.406$ ). Efficacy ( $b = 0.273, \beta = 0.202, t = 2.239, p = 0.027$ ) and optimism

**TABLE 3:** Correlations between psychological capital and work engagement.

Variables	Vigour	Dedication	Absorption	Work engagement
Efficacy	0.380**	0.489**	0.484**	0.488**
Hope	0.391**	0.519**	0.403**	0.476**
Resilience	0.241**	0.317**	0.396**	0.341**
Optimism	0.543**	0.560**	0.497**	0.584**
PsyCap	0.505**	0.606**	0.574**	0.609**

Source: Adapted from Jacobs, C.-T. (2020). Psychological capital and work engagement of employees at a training academy (p. 47). Master's thesis, Nelson Mandela Metropolitan University, Faculty of Business and Economic Sciences. Retrieved from <http://hdl.handle.net/10948/48169>  
PsyCap, psychological capital.  
\*\*,  $p < 0.001$ .

**TABLE 4:** Regression of psychological capital (independent variable) on work engagement (dependent variable).

Model	Coefficients		t	Sig.	Collinearity Statistics	
	Unstandardised B	Standardised Beta			Tolerance	VIF
1						
(Constant)	0.074	-	0.134	0.894	-	-
Overall PsyCap	0.955	0.609	8.313	0.000	1	1

Source: Adapted from Jacobs, C.-T. (2020). Psychological capital and work engagement of employees at a training academy (p. 47). Master's thesis, Nelson Mandela Metropolitan University, Faculty of Business and Economic Sciences. Retrieved from <http://hdl.handle.net/10948/48169>  
PsyCap, psychological capital; Sig., significance; VIF, variance inflation factor.

**TABLE 5:** Regression model of efficacy, hope, resilience and optimism on work engagement.

Model	Coefficients		<i>t</i>	<i>Sig.</i>	
	Unstandardised				
	<i>B</i>	SE			
1					
(Constant)	0.220	0.556	-	0.395	0.693
Efficacy	0.273	0.122	0.202	2.239	0.027*
Hope	0.148	0.132	0.112	1.124	0.263
Resilience	0.077	0.100	0.066	0.772	0.442
Optimism	0.427	0.098	0.396	4.363	< 0.001**

SE, standard error; Sig, significance.

\*,  $p < 0.05$ ; \*\*,  $p < 0.001$ .

( $b = 0.427$ ,  $\beta = 0.396$ ,  $t = 4.363$ ,  $p < 0.001$ ) positively predicted work engagement, with optimism having the greatest impact on work engagement. Based on these results, hypotheses 4 and 6 were accepted. The factors Hope ( $b = 0.148$ ,  $\beta = 0.112$ ,  $t = 1.124$ ,  $p = 0.263$ ) and resilience ( $b = 0.077$ ,  $\beta = 0.066$ ,  $t = 0.772$ ,  $p = 0.442$ ) were found to be statistically insignificant predictors of work engagement. This resulted in the rejection of hypotheses 3 and 5.

## Discussion

The descriptive results demonstrated that respondents reported high levels of both PsyCap and work engagement. These results suggest that employees at the TVET college are equipped with intrinsic psychological capacities, aligned with personal resources from the JD-R model and are also deeply engaged in their work. This aligns with literature that links positive psychological resources to higher levels of engagement.

Alessandri et al. (2018), Bekker (2016), Biswal et al. (2025), Bonner (2016), Simon and Buitendach (2013) and Wirawan et al. (2020) have demonstrated significantly positive relationships between PsyCap and work engagement across different contexts. This concurs with this study, which confirms a statistically strong positive relationship between PsyCap and work engagement. Further statistically significant correlations are demonstrated between PsyCap and vigour, dedication and absorption. This relationship suggests that individuals with high levels of PsyCap are more likely to exhibit energy at work, be engrossed in their work and experience meaning (Bakker & Demerouti, 2008). Work engagement had statistically positive correlations with all the PsyCap subscales, but had a particularly strong relationship with optimism, suggesting that people who have positive, optimistic views at work would likely be more engaged in their work.

The result of the mediation analysis of this study supports existing literature that suggests that overall PsyCap is a significant predictor of work engagement (Alessandri et al., 2018; Bekker, 2016; Du Plessis & Boshoff, 2018; Wu, 2025). PsyCap comprises hope, optimism, resilience and efficacy, fostering the intrinsic resources individuals need to remain motivated, energised and focused on their work. When focusing on the four individual subscales, optimism emerged as the strongest predictor of work engagement, highlighting

that positive expectations about work outcomes and viewing challenges positively can, in turn, promote a sense of purpose, motivation and commitment to goals. This concurs with the result of Nagoji and Mackasare (2023), which posits that optimism is a predictor of work engagement.

Efficacy was also shown to significantly predict work engagement in a positive direction, albeit to a lesser degree than optimism. This aligns with Bandura's (1997) theory of efficacy, suggesting that when individuals believe in their own abilities to succeed at challenging tasks, they are more motivated to expend energy at work and inclined to be persistent in working towards objectives.

While both hope and resilience are considered valuable in the work context, their predictive power was considered insignificant. Neither of these subscales contributed uniquely to predicting work engagement. This result contradicts the findings of Nagoji and Mackasare (2023), in which resilience is a predictor of work engagement. If the primary objective is to enhance work engagement, then fostering PsyCap, which is malleable, particularly optimism and self-efficacy, would likely yield the greatest benefit.

## Practical implications

PsyCap interventions have shown to have great success in enhancing PsyCap (Finch et al., 2023; Lupşa et al., 2020; Reichard et al., 2024; Salanova & Ortega-Maldonado, 2019). Interventions designed specifically to enhance optimism and self-efficacy would be greatly beneficial in enhancing work engagement in TVET colleges. Lupşa et al. (2020) in their meta-analysis concur that while interventions focusing on overall PsyCap have a significant effect, they are less effective than interventions focusing on a single PsyCap variable. Therefore, designing training programmes that build situation-specific confidence in employees (Bandura, 1997) through mastery or foster positive future expectations through coaching could potentially lead to significant increases in work engagement. Reichard et al. (2024) concur that vicarious modelling and social persuasion are useful individual sources to enhance efficacy, while organisational support can include training and career path discussions. Optimism can be enhanced through the setting of achievable goals and positive self-talk, while organisations can facilitate the development of optimism by way of coaching and awareness-building activities (Reichard et al., 2024). According to Finch et al. (2023), the HERO intervention can be conducted to enhance the PsyCap variables and include a combination of interactive quizzes, education on the variables, videos of the variable in action and worksheet activities. Furthermore, the meta-analysis of Loghman et al. (2025) suggests that the impacts of PsyCap interventions and each of its variables are even greater than those outlined by Lupşa et al. (2020), highlighting the value of investing in these interventions.

In addition to this, recruitment and selection strategies should focus on acquiring employees who have a tendency

towards hope, optimism, resilience and self-efficacy. The findings of this study propose that hiring employees with higher levels of PsyCap may serve as a predictor of greater work engagement to align better with organisational objectives.

Leadership development interventions should emphasise enhancing PsyCap, as this has a ripple effect and is likely to positively impact the PsyCap of employees.

### Limitations and recommendations

While this study offers useful insights into the relationship between PsyCap and work engagement, several limitations were observed. Data were collected through self-administered questionnaires in group settings, which may increase the tendency towards social desirability as well as common method bias. Typically, this results from the desire to provide favourable responses, rather than accurate ones and therefore the results must be interpreted accordingly.

The sample size for the study was small ( $n = 119$ ), which prevents the generalisability of results. Future research could incorporate larger samples exploring TVET colleges in South Africa. A wider selection of academic institutions and colleges could be considered to broaden the view of the study.

The study took on a cross-sectional design, providing a one-time view of the work engagement and PsyCap levels of TVET college employees. It would be beneficial to implement longitudinal studies that can measure the changes in work engagement and PsyCap over time, allowing for causal attributions to be made.

### Conclusion

Technical Vocational Education and Training colleges have a large responsibility to develop and train the future workforce, often with limited access to resources. Employees rely heavily on personal resources and their own work engagement not only to ensure teaching effectiveness but also for institutional performance and student success. These personal resources appear to bolster employees' motivational processes, enabling them to remain focused, energised, dedicated and absorbed in their work. This study highlights the pivotal role of PsyCap, particularly optimism and self-efficacy, in predicting work engagement.

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### Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced their writing of this article.

### Authors' contributions

C.J. did the research to complete his studies under the supervision and guidance of C.H. C.H. authored the manuscript, revised it with updated references and managed the article submission. C.S. did the statistical analysis for the study and assisted with the interpretation of results.

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### Data availability

The data supporting this study are available from the corresponding author, C.H., upon reasonable request.

### Disclaimer

The views and opinions expressed in this article are those of the authors and are the product of professional research. They do not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The authors are responsible for this article's results, findings and content.

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