National University of Political Studies and Public Administration
Faculty of Management

Mental Health and Work Engagement as Predictors of Cadet Performance in Indonesian Maritime Education

Wahyudi SANTOSO[1]
[1] AMNI Maritime University, 180 Jl. Soekarno Hatta, Semarang 50275, Indonesia;
bpk.udi12@gmail.com (corresponding author)

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Abstract: The maritime industry increasingly recognises that sustainable competitiveness relies on human capital capable of managing both the technical and psychological demands of life at sea. This study investigates the dynamic roles of mental health and work engagement as key components of human capital influencing cadet performance within Indonesian maritime education. A quantitative approach was employed using survey data from 115 deck and engine cadets who had completed the mandatory 12-month onboard training as required by the STCW Code. Data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM 4) to test the proposed relationships among variables. The findings reveal that mental health exerts a positive and significant direct effect on cadet performance, while work engagement also shows a strong and significant influence. However, mental health does not significantly predict engagement, indicating that cadet engagement is shaped more by structural and organisational discipline than by individual psychological well-being. These results suggest that performance in maritime education emerges from the synergy between psychological resilience and institutional structure, highlighting the contextual uniqueness of engagement in regulated and hierarchical training environments. Theoretically, this study extends the Job Demands–Resources (JD-R) model and human capital theory by integrating psychological and structural dimensions within a knowledge-based workforce framework. Practically, it emphasises the need for holistic maritime education policies that balance technical competence, mental health promotion, and engagement development to produce resilient, motivated, and high-performing future officers for the global maritime sector.

Keywords: human capital; mental health; work engagement; cadet performance; maritime education.

Introduction

One of the important phases that must be passed by cadets before becoming officers on merchant ships is to carry out 12 months of sea service as cadets, as stipulated in STCW Code A-II/1 for Deck and STCW Code A-III/1 for Engine (International Maritime Organization [IMO], 2017). Through the sea project, cadets gain real work experience, implement the knowledge they have acquired at school, so that they can improve their technical skills and develop confidence and instincts as (Barlis et al., 2015; Sevilla & Arceno, 2017). As future ship officers, deck and engine cadets will play a crucial role in navigating ships, handling cargo, maintaining engines, and ensuring ship safety. Considering that 90% of world trade is transported by sea (Song & Yeo, 2004), the quality and readiness of cadets have strategic implications for the global shipping industry so that they can become strong and competent ship officers in the future.

Seafarers face high challenges and risks while working on ships, ranging from limited recreational and medical facilities, exposure to occupational hazards, to psychosocial burdens due to isolation and being far from family (Brooks & Greenberg, 2022; Jonglertmontree et al., 2022; Nittari et al., 2024). Research shows high levels of stress, depression, and anxiety among seafarers, with 25% experiencing symptoms of depression, 17% anxiety, and 13% experiencing both symptoms (Lefkowitz & Slade, 2019). Based on the Maritime Labour Convention 2006, the International Labour Organization (ILO, 2006) emphasised that occupational health protection on board, including mental health, is part of seafarers' fundamental rights.

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The importance of seafarers' resilience and mental health cannot be overstated. This not only affects individual seafarers but also has implications for the safety and efficiency of the entire shipping industry. Seafarers' mental health is crucial to safety and productivity. Poor psychological conditions can trigger errors and workplace accidents, as well as decreased performance (Daley et al., 2009; Hetherington et al., 2006). Researchers and the maritime industry are increasingly recognising the importance of mental health for the well-being and safety of seafarers at sea, and this is particularly relevant as cadets today belong to Generation Z, who are said to be more vulnerable to stress, depression, and loneliness due to social changes and weak social support (Rozanov, 2020). Moreover, in a knowledge-based economy, human resources have become the main driver of organisational competitiveness and innovation. The maritime sector, traditionally considered a technology-driven industry, is now increasingly influenced by human factors that determine operational safety, performance quality, and sustainable development. In this context, maritime cadets represent strategic human resources whose psychological resilience, engagement, and professional competence determine the future strength of the global shipping workforce.

Although technical proficiency and regulatory compliance remain important in maritime education, recent research emphasises that the effectiveness of human resources also depends on psychosocial and cognitive aspects (Bakker & Demerouti, 2017). The high-risk and isolated nature of life on board places substantial psychological demands, making mental health and work engagement critical components in the professional development of cadets (Nittari et al., 2024; Pauksztat et al., 2022). Mentally healthy and engaged cadets are more likely to maintain motivation, focus, and adaptive behaviour under pressure, core competencies in maritime human capital. Empirical evidence on the relationship between mental health and work engagement among seafarers remains inconsistent. Earlier findings suggest that mental health alone may not directly enhance engagement without the presence of supportive conditions such as social resources, job autonomy, and fatigue management (Brooks & Greenberg, 2022). However, these inconsistencies highlight that the role of mental health in fostering engagement is likely conditional and context-dependent, rather than universally linear.

Despite increasing scholarly attention to seafarer well-being, research focusing on maritime cadets remains limited. Most existing studies examine active officers or general crew members (Abila & Acejo, 2021; Pauksztat et al., 2022), overlooking cadets' unique experiences during onboard training. The sea project phase is a critical developmental period during which cadets must adapt psychologically, manage fatigue, and translate theoretical knowledge into professional competence under real operational pressures.

To address these gaps, this study investigates how mental health and work engagement interact as dynamic components of human capital to influence cadet performance during the mandatory 12-month sea project. By integrating perspectives from organisational behaviour, psychology, and human capital theory, this research advances understanding of human sustainability within maritime education. It argues that preparing future-ready maritime officers requires not only technical training but also the cultivation of mental resilience and sustained engagement to ensure long-term performance and safety at sea.

Literature review and hypotheses development

Dynamics of human capital and knowledge in maritime education

In a knowledge-based economy, human capital is not only defined by technical qualifications but also by cognitive, emotional, and social abilities that enable individuals to learn, adapt, and innovate (Becker, 1993). Maritime education, as a subsystem for human capital formation, requires cadets to transform academic knowledge into practical competencies during onboard training. This transformation involves knowledge acquisition, psychological adaptation, and behavioural engagement, key

mechanisms through which mental health and engagement contribute to cadet performance (Zhenjing et al., 2022).

Recent studies indicate that the success of maritime institutions depends on their ability to foster psychologically resilient and motivated cadets (Lucas et al., 2021; Nittari et al., 2024). From a management dynamics perspective, the integration of mental health and engagement represents an organisational investment in human resources that supports productivity, innovation, and safety at sea (Bakker & Demerouti, 2017).

Mental health and cadet performance

Mental health represents a central determinant of effective functioning in high-demand environments such as maritime training and ship operations. The World Health Organization (WHO, 2004) defines mental health as a state of well-being in which individuals realise their abilities, cope with normal stress, and contribute productively to their community. According to the Conservation of Resources Theory (COR) (Hobfoll, 1989), individuals seek to acquire and preserve psychological and emotional resources such as optimism, focus, and self-efficacy that sustain goal-directed performance. When these resources are depleted by chronic stress, fatigue, or poor social support, task effectiveness and decision accuracy decline.

In the maritime context, cadets experience distinctive psychological pressures, including isolation, command hierarchy, fatigue, and communication barriers that heighten their vulnerability to stress and emotional exhaustion (Abila & Acejo, 2021; Pauksztat et al., 2022). The biopsychosocial model (Engel, 2012) and the Job Demands–Resources Theory (JD–R) (Bakker et al., 2023) jointly explain how high demands combined with limited resources can impair concentration, resilience, and performance. Recent studies emphasise that mental health directly shapes seafarers' motivation, alertness, and operational safety. For instance, Sampson and Ellis (2020) found that proactive well-being programs in maritime institutions enhance situational awareness and task efficiency. The Seafarers International Research Centre further reported that officers with stable psychological health display superior teamwork and problem-solving performance (Sampson et al., 2025). Conversely, prolonged distress can result in fatigue-induced human error, a recurrent causal factor in maritime incidents (IMO, 2019).

Nonetheless, the strength of the mental health–performance relationship varies by organisational structure. The happy–productive worker hypothesis (Luthans et al., 2007; Zacher et al., 2012) holds that well-being drives productivity, yet evidence suggests this effect weakens in rigid, low-autonomy environments. The broaden-and-build theory (Fredrickson, 2001) proposes that positive emotions broaden cognitive flexibility, but cadetship hierarchies may suppress this mechanism. Hence, cadets' performance depends not only on emotional stability but also on institutional culture and resource availability. The first hypothesis is following developed:

H1: Mental health has a positive and significant effect on cadet performance.

Work engagement and cadet performance

Work engagement is a motivational construct defined by vigour, dedication, and absorption Schaufeli and Bakker (2004) represents the behavioural energy through which human capital translates into performance. Within the JD–R model (Bakker & Demerouti, 2007; Bakker et al., 2023), engagement emerges when job resources (e.g., autonomy, feedback, social support) buffer job demands and enhance intrinsic motivation. Engaged individuals demonstrate persistence, creativity, and proactive behaviour, yielding higher task performance (Xanthopoulou et al., 2009).

From a human capital perspective, engagement operationalises behavioural investment in organisational goals (Bakker & Leiter, 2010). Empirical studies in safety-critical sectors

Vol.13 (2025) no.4, pp.376-394; DOI 10.2478/mdke-2025-0021

confirm this link Hystad and Eid (2016) found that engaged seafarers maintain stronger safety behaviour and learning orientation. Similarly, Bakker et al. (2023) emphasise that engagement contributes to organisational sustainability through resilience and adaptability qualities essential for maritime competence.

In maritime settings, work engagement becomes particularly salient given the extreme job demands of seafaring, including long working hours, isolation, and rigid hierarchies. Cadets who sustain engagement despite these constraints demonstrate stronger learning orientation, teamwork, and compliance with safety procedures (Hystad & Eid, 2016). Empirical evidence supports this link Yuen et al. (2018) found that seafarers with higher intrinsic motivation and psychological capital exhibit greater engagement and safer operational behaviour.

However, the engagement–performance linkage is not universally stable. Some studies indicate that excessive engagement, when unbalanced with rest and recovery, can lead to emotional fatigue or overcommitment, reducing long-term performance (Salanova et al., 2005; Schaufeli, 2021). This raises a theoretical tension: while the JD–R framework posits engagement as universally beneficial, the maritime environment's rigid structure and chronic fatigue conditions may moderate this effect. Bakker et al. (2014) argue that work engagement is optimized when employees have sufficient job resources, including supportive leadership and opportunities for recovery from demanding work conditions. These resources help employees sustain their motivation and energy, enabling engagement to remain high over time.

In line with the happy–productive worker hypothesis (Zacher et al., 2012) engagement serves as a psychological conduit linking positive mental states with effective task execution. Within maritime training, it acts as a bridge between cadets' motivation and their ability to perform competently under pressure. Based on the reviewed literature, the following hypothesis is proposed:

H2: Work engagement has a positive and significant effect on cadet performance.

Mental health and work engagement

The interaction between mental health and work engagement has become a growing focus in organisational psychology, emphasising how psychological well-being supports sustained motivation and productivity. Individuals with good mental health exhibit positive affect, intrinsic motivation, and energy, all of which foster engagement (Sonnentag, 2015). Conversely, poor mental health can manifest as withdrawal, exhaustion, and disengagement (Bakker & Leiter, 2010). The Job Demands–Resources Theory (JD-R) (Bakker et al., 2023) conceptualises mental health as a personal resource that strengthens resilience and self-efficacy, enabling individuals to remain engaged even when job demands are high.

Within maritime education, mental health becomes particularly salient because cadets operate in stressful, isolated, and hierarchical settings. Prolonged voyages, fatigue, and limited social support may erode psychological energy, thereby threatening engagement (Pauksztat et al., 2022). Conversely, mentally healthy cadets are better able to regulate emotions, sustain attention, and remain committed to learning and safety tasks. Empirical studies confirm this relationship (McVeigh et al., 2019) stating that positive psychological functioning significantly enhances engagement and well-being among seafarers. Similarly, Hystad and Eid (2016) demonstrated that psychological capital mitigates fatigue and strengthens engagement in maritime environments. Recent findings suggest that when healthcare organizations provide adequate resources such as supportive leadership, fair treatment, and effective communication employees are more capable of maintaining positive mental health and higher levels of work engagement (Senbursa & Dunder, 2024). However, findings across studies remain mixed. Carotenuto et al. (2012) noted that fatigue and social isolation can weaken the mental health–engagement relationship, while

Oldenburg et al. (2010) emphasised the moderating role of workload and recovery opportunities. Recent evidence indicates that excessive engagement when unbalanced with rest and recovery can lead to emotional fatigue or overcommitment, reducing long-term performance (Salanova et al., 2005). This raises a theoretical tension: while the JD–R framework posits engagement as universally beneficial, the maritime environment's rigid structure and chronic fatigue conditions may moderate this effect. Work engagement can be sustained effectively when employees have access to sufficient job resources, such as supportive leadership and opportunities to recover from work demands. These resources help buffer the impact of stressors and strengthen motivational processes that drive employee engagement (Bakker et al., 2014)

Critically, these contrasting results imply that mental health is a necessary but insufficient condition for engagement. While it provides the psychological foundation for optimism, resilience, and emotional balance, the degree to which it translates into engagement depends on whether the surrounding environment reinforces or undermines these resources. Thus, in maritime education, engagement emerges not only from internal psychological states but also from the dynamic interplay between personal and contextual resources. The third hypothesis is following developed:

H3: Mental health has a positive and significant effect on work engagement.

The mediating role of work engagement

Integrating COR theory (Hobfoll, 1989) and the JD–R framework (Bakker & Demerouti, 2007; Bakker et al., 2023), mental health is expected to influence cadet performance both directly and indirectly through work engagement. Mentally healthy individuals possess sufficient psychological resources (energy, optimism, resilience) that drive engagement, the motivational mechanism translating inner states into effective performance (Schaufeli & Bakker, 2004).

Prior studies confirm this mediation: well-being enhances engagement, which in turn predicts safety behaviour and performance (Xanthopoulou et al., 2009). However, in maritime contexts, engagement's mediating power may weaken under high structural constraints such as strict command systems and limited autonomy because external control can substitute intrinsic motivation (Pauksztat et al., 2022). Recent research Singh and Mishra (2024) found that seafarers with stable mental health showed higher work engagement and psychological resilience, which had an impact on ship performance and safety.

From a broader psychological perspective, the broaden-and-build theory (Fredrickson, 2001) further clarifies this mechanism: positive emotions foster cognitive flexibility and resilience, expanding the individual's capacity to engage effectively. Yet, in maritime education and shipboard environments, limited recovery time, rigid hierarchies, and restricted social interaction can constrain this resource-building process. Consequently, engagement functions as a dynamic mediator, translating mental health into enhanced cadet performance but remaining sensitive to contextual moderators such as leadership support, workload management, and organisational culture (Schaufeli & Taris, 2014).

Recognising these interdependencies deepens the understanding of human capital development in maritime education, where psychological resilience and institutional support jointly determine cadet effectiveness and safety competence. This implies that the mediating effect is conditional, depending on whether institutional resources reinforce the psychological energy supplied by mental health. The fourth hypothesis is following developed:

H4: Work engagement mediates the relationship between mental health and cadet performance.

Vol.13 (2025) no.4, pp.376-394; DOI 10.2478/mdke-2025-0021

Conceptual framework

The conceptual framework (Figure 1) positions mental health and job involvement as critical components of human capital dynamics, influencing cadet performance in maritime education. This model integrates psychological and organisational theories to explain how human capital operates under the unique demands of maritime training.

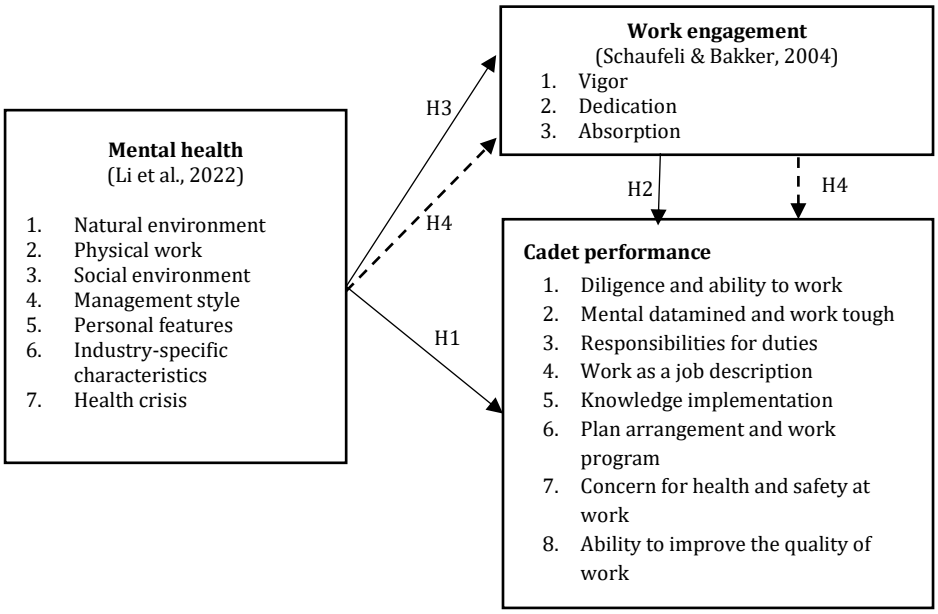

Figure 1. Research conceptual framework
Source: own processing

Methodology

This study employed an explanatory quantitative research design to examine the causal relationship between mental health, job involvement, and cadet performance in maritime educational institutions in Indonesia. This design was chosen to objectively test the proposed theoretical model using statistical techniques and to validate the role of mental health and job involvement as dynamic components of human capital affecting performance outcomes.

Sample and data collection

The target population consisted of deck and engine cadets from six accredited maritime academies in Indonesia (Jakarta, Semarang, Makassar, Aceh, Padang, and Sorong) who had completed the mandatory 12-month sea project, as required by STCW Code A-II/1 (Deck) and A-III/1 (Engine). The purposive sampling technique was used, focusing on cadets who had completed full onboard training to ensure comparable experience and exposure. A total of 115 valid responses were obtained from 150 questionnaires distributed, with a response rate of 76.7%. Demographic profiles included 83% male and 17% female respondents, with an age range of 20–24 years. Approximately 41% of cadets sailed on international routes and 59% on domestic routes, covering vessel types such as tankers, cargo, passenger, and bulk carriers.

Research instruments

The questionnaire consisted of three constructs measured using a five-point Likert scale (1 = Strongly disagree to 5 = Strongly agree). (1) Mental health was measured using 7 indicators adapted from Li and Zhou (2022), representing natural, physical, and social environmental stressors, management styles, and personal characteristics. (2) Work

engagement was assessed using 5 indicators from Schaufeli and Bakker (2004), which include vigour, dedication, and absorption. (3) Cadet performance was measured with 8 behavioural indicators adapted from PT. Bahtera Adhiguna (internal document, 1994), covering diligence, work discipline, responsibility, and adherence to safety standards. Each construct was translated and pilot-tested for linguistic and contextual clarity among 20 cadets before formal data collection.

Validity and reliability

The validity and reliability of the instruments were tested using the Partial Least Squares Structural Equation Modelling (PLS-SEM) approach with SmartPLS 4. (1) Convergent validity was confirmed with all factor loadings above 0.70, Average Variance Extracted (AVE) > 0.50, and Composite reliability (CR) > 0.70 (2) Discriminant validity was verified using the Fornell-Larcker criterion and the HTMT ratio, both below the 0.85 threshold, which confirms that each construct is empirically distinct. (3) Internal consistency reliability was achieved with Cronbach's Alpha values ranging between 0.92 and 0.97 across all constructs (Hair et al., 2021).

Bias control and ethical considerations

To minimise common method bias, questionnaire items were randomised, and procedural separation between independent and dependent variable items was maintained. Additionally, respondents were guaranteed anonymity and confidentiality to reduce social desirability bias. This research was conducted under the ethical approval of the research committee of AMNI Maritime University, following institutional guidelines for research involving human participants. Respondents participated voluntarily and provided consent before completing the survey.

Data analysis techniques

Data analysis followed a two-step PLS-SEM procedure (Hair et al., 2021): (1) Measurement model assessment, evaluating the reliability and validity of constructs (outer model). (2) Structural model assessment, examining hypothesised relationships (inner model) through path coefficients, t-statistics, and p-values obtained via bootstrapping (5,000 samples). (3) Model fit and predictive relevance were assessed using R^2, Q^2, and SRMR indices. The mediating effect of work engagement was tested using the indirect path significance method proposed by (Preacher & Hayes, 2008). The analytical approach was chosen because PLS-SEM is robust for small to medium sample sizes, non-normal data, and complex theoretical models involving mediation relationships.

Results

Measurement model analysis

The measurement model evaluation was conducted to ensure that the indicators used in this study were able to reflect the measured constructs validly and reliably. In Hair et al. (2021), the evaluation of the reflective measurement model consists of a factor loading of > 0.70, Cronbach's Alpha of > 0.70, Composite Reliability of > 0.70, and AVE of > 0.50. More detailed results of the validity and reliability tests can be seen in Table 1 below.

Vol.13 (2025) no.4, pp.376-394; DOI 10.2478/mdke-2025-0021

Table. 1 Validity analysis

Variable	Indicator	Outer loading	Cronbach's Alpha	Composite reliability	AVE	Results
Mental health	MH1	0.933	0.975	0.985	0.868	Valid
	MH2	0.922				
	MH3	0.938				
	MH4	0.926				
	MH5	0.943				
	MH6	0.919				
	MH7	0.941				
Work engagement	WE1	0.956	0.974	0.977	0.907	Valid
	WE2	0.968				
	WE3	0.922				
	WE4	0.952				
	WE5	0.963				
Cadet performance	CP1	0.892	0.928	0.932	0.667	Valid
	CP2	0.729				
	CP3	0.783				
	CP4	0.792				
	CP5	0.752				
	CP6	0.857				
	CP7	0.799				
	CP8	0.911				

Source: own processing

The analysis results show that all indicators have a loading factor value > 0.70, thus meeting the criteria recommended by Hair et al. (2021) which indicates that each item in the latent variables of mental health, work engagement, and cadet performance remains valid. Cronbach's alpha and Composite Reliability values are > 0.70, indicating that the construct has good internal reliability and acceptable consistency between indicators. In addition, the AVE value for all constructs is > 0.50, which means that each construct can explain more than half of the variance of its indicators.

Discriminant validity test with HTMT

Based on the overall HTMT calculation results, the HTMT value in this study is below the threshold of 0.85 (Kline, 2016). Thus, it can be concluded that the research model has met the criteria for discriminant validity, so that the constructs used (mental health, work engagement, and cadet performance) can be distinguished well from one another (Table 2).

Table 2. Discriminant validity HTMT

Variable	Cadet performance	Mental health	Work engagement
Cadet performance	1		
Mental health	0.233	1	
Work engagement	0.679	0.067	1

Source: own processing

Discriminant validity test with Fornell-Larcker criterion

Based on the table of discriminant validity test results using the Fornell-Larcker criterion (Table 3), the Average Variance Extracted (AVE) square root values shown on the diagonal (bold) are higher than the correlations between constructs in the column/section below. These results indicate that each construct has good discriminant validity because the AVE root values are greater than the correlations between other constructs. Thus, each latent variable in this study can be said to be able to distinguish itself from other variables.

Table 3. Discriminant validity Fornell-Larcker criterion

Variable	Cadet performance	Mental health	Work engagement
Cadet performance	**0.817**		
Mental health	0.222	**0.932**	
Work engagement	0.650	0.037	**0.952**

Source: own processing

Collinearity test results (VIF)

Collinearity testing was conducted to ensure that there were no multicollinearity issues between independent variables that affected the dependent variable (Table 4). This test used the Variance Inflation Factor (VIF) value with the criterion that the model was free from multicollinearity if the VIF value was < 5.0 (Hair et al., 2021).

Table 4. Collinearity (VIF)

Variable	VIF
Mental health —> Cadet performance	1.001
Mental health —> Work engagement	1.000
Work engagement —> Cadet performance	1.001

Source: own processing

The VIF threshold value according to Hair et al. (2021) is < 5.0 (or in stricter criteria, < 3.3). The Mental health —> Cadet performance construct has a VIF value of 1.001; Mental health —> Work engagement has a VIF value of 1.000; and Work engagement —> Cadet performance has a VIF value of 1.001. All VIF values obtained are < 5.0, so it can be concluded that there is no multicollinearity problem between constructs in this research model. Thus, the structural model constructed is free from collinearity issues and can proceed to the stage of testing the relationships between latent variables.

Hypothesis testing

The structural model displays direct and indirect effects, consequently the following table and figure reflect the hypothesis testing.

Table 5 below shows that Mental health has a significant effect on Cadet performance (β = 1.198, t = 3.545 > 1.96, p = 0.000 < 0.05), so H1 is accepted. Furthermore, work engagement has a significant effect on Cadet performance (β = 0.642, t = 9.688 > 1.96, p= 0.000 < 0.05), thus H2 is accepted. Mental health does not have a significant effect on work engagement (β = 0.037, t = 0.363 < 1.96, p = 0.717 > 0.05), so H3 is rejected. Finally, the Indirect test or mediating role of work engagement between the relationship of mental health and cadet performance does not have a positive and significant effect (β= 0.024, t= 0.356 < 1.96 p= 0.722 > 0.05), so hypothesis 4 is rejected.

Table 5. Hypothesis testing (direct and In-direct effect)

Hypothesis	Path coef. β	T statistics	p-value	Result
H1. Mental health —> Cadet performance	0.198	3.545	0.000	Accepted
H2. Work engagement —> Cadet performance	0.642	9.688	0.000	Accepted
H3. Mental health —> Work engagement	0.037	0.363	0.717	Rejected
H4. Mental health —> Work engagement —> Cadet performance	0.024	0.356	0.722	Rejected

Source: own processing

Figure 2 is the graphical output of the PLS-SEM Algorithm showing the structural model of the relationship between Mental Health, Work Engagement, and Cadet Performance. The diagram displays standardised path coefficients and R^2 values for endogenous constructs.

Vol.13 (2025) no.4, pp.376-394; DOI 10.2478/mdke-2025-0021

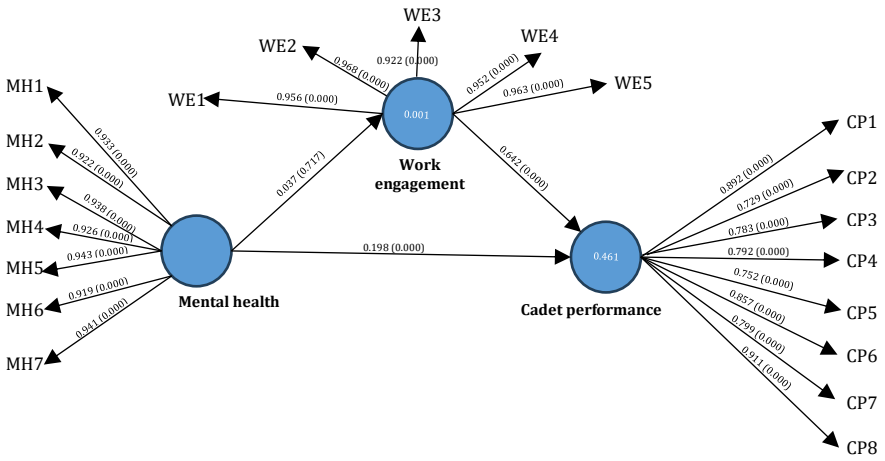

Figure 2. Graphical output of the PLS-SEM algorithm
Source: own processing

Discussion of the findings

Mental health and performance: psychological stability as a human capital asset

The results of the PLS-SEM analysis for H1 confirm that mental health has a positive and significant effect on cadet performance, underscoring the crucial role of psychological stability as a core component of human capital in maritime education and operations. This finding aligns with the happy-productive worker hypothesis (Zacher et al., 2012), the Job Demands–Resources (JD–R) model (Bakker & Demerouti, 2017) and the biopsychosocial model (Engel, 2012), all emphasising that psychological resources enhance adaptation to demanding environments. Consistent with recent maritime studies (Pauksztat et al., 2022; Slišković, 2023) cadets with sound mental health demonstrate stronger emotion regulation, cognitive focus, and fatigue recovery competencies essential for maintaining safety, discipline, and productivity at sea.

Beyond aligning with classical frameworks, these findings extend emerging empirical evidence that positions mental health as an enabler of engagement and performance. Ryan and Burchell (2023) conceptualise mental health as a strategic asset within "healthy organizations," where well-being fosters sustainable engagement and effort. Similarly, Hayes-Mejia and Stafström (2023) highlight that a supportive psychosocial climate rooted in communication and leadership amplifies psychological stability and operational effectiveness. Your results parallel these trends, showing that cadets' psychological equilibrium underpins not only immediate task efficiency but also long-term adaptability and learning capacity. This resonates with Bakker et al. (2023), who argue that mental well-being sustains motivation and energy in high-demand contexts.

Conversely, the present findings contrast with evidence from studies of active seafarers under prolonged stress (Jepsen et al., 2015) where fatigue, isolation, and limited autonomy weaken the mental health–performance link. The cadet setting may offer greater institutional support, structured learning, and peer interaction conditions that buffer against the detrimental effects observed in long-term maritime employment. This nuance adds empirical depth to the JD–R perspective by showing that training environments can strengthen the resource–performance pathway through social and organisational support mechanisms.

From a human capital standpoint, mental health emerges as an intangible yet measurable contributor to workforce capability. Psychologically stable cadets exhibit superior

cognitive control, decision quality, and teamwork capabilities integral to maritime safety culture and performance excellence. This interpretation aligns with the Maritime Labour Convention (ILO, 2006), which frames mental well-being as a determinant of seafarer welfare and maritime sustainability. In light of recent reviews like Nittari et al. (2024), Li et al. (2022), the results reinforce the view that investing in cadets' mental health is not merely a welfare initiative but a strategic investment in the resilience and competitiveness of the maritime sector.

Work engagement and performance: behavioural energy in human capital dynamics

Results supporting H2 demonstrate that work engagement significantly enhances cadet performance, reaffirming its role as the behavioural activation of human capital. In line with the Job Demands–Resources (JD–R) model (Bakker & Demerouti, 2017) and Self-Determination Theory (Ryan & Deci, 2000) engaged individuals invest higher cognitive, emotional, and motivational energy into their work, which strengthens persistence, accuracy, and goal attainment under demanding maritime conditions.

Engagement, conceptualised through vigour, dedication, and absorption (Schaufeli & Bakker, 2004), represents the mechanism by which psychological resources are mobilised into productive effort. The present findings confirm that cadets with high engagement display superior operational performance, reflecting disciplined work behaviour and intrinsic motivation. These results reinforce earlier meta-analytical evidence (Bakker & Leiter, 2010) while extending it to maritime education settings, where structured training and mentorship amplify the engagement–performance link.

Recent empirical studies further substantiate dynamic, that engagement operates as a psychological mechanism linking well-being to productivity outcomes. Similarly, Senbursa and Dunder (2024) found that engagement, along with well-being and trust, significantly predicts work effectiveness among seafarers, suggesting that psychological and relational climates jointly sustain high performance at sea. These findings converge with Ryan and Burchell (2023) who conceptualise engagement as a sustainable performance engine, the behavioural expression of a healthy organisational system.

Moreover, Hayes-Mejia and Stafström (2023) demonstrate that psychosocially supportive environments enhance both engagement and mental health among seafarers, validating the interaction between individual resources and contextual enablers. In contrast, Onakpojeruo et al. (2023) caution that in high-stress maritime settings, disengagement and mental fatigue can compromise human reliability, underscoring the strategic importance of fostering engagement as a resilience resource.

From a human capital perspective, engagement constitutes the activation phase of human potential, the process by which learning, motivation, and affective commitment are converted into tangible work performance. This aligns with Bakker et al. (2023) and Schaufeli and Taris (2014), who regard engagement as a behavioural expression of thriving human capital. In maritime academies, engagement thus reflects both individual self-regulation and institutional quality cultures characterised by fairness, mentorship, and participatory learning. Such environments not only elevate engagement levels but also cultivate adaptive competence crucial for sustainable maritime operations.

Overall, these findings underscore that work engagement is not merely an affective state but a strategic performance resource, a mechanism through which psychological energy and professional commitment are transformed into operational excellence and long-term maritime competence. As maritime institutions increasingly prioritise human sustainability, engagement emerges as the behavioural bridge connecting mental well-being, learning, and high-performance culture within the next generation of seafarers.

Vol.13 (2025) no.4, pp.376-394; DOI 10.2478/mdke-2025-0021

Mental health and engagement: structural versus psychological drivers

The PLS-SEM results for H3 reveal that mental health does not significantly influence cadet work engagement, a finding that diverges from mainstream organisational behaviour theory. This suggests that within maritime training systems, engagement is shaped more strongly by structural and contextual factors than by individual psychological conditions. The highly regimented environment of maritime academies, marked by hierarchy, surveillance, and procedural discipline, limits autonomy, one of the three essential elements of intrinsic motivation in Self-Determination Theory (Ryan & Deci, 2000). Consequently, cadets' engagement may emerge less from psychological well-being and more from external control, institutional norms, and evaluative pressures.

This outcome aligns with Innstrand et al. (2012) and Upadyaya and Salmela-Aro (2013), who found that well-being influences engagement indirectly through contextual resources such as leadership and workload management. More recent evidence reinforces this structural dynamic. Hayes-Mejia and Stafström (2023) observed that psychosocial climate and leadership communication were stronger predictors of engagement among seafarers than individual affective states. Likewise, Senbursa and Dunder (2024) found that work effectiveness among seafarers depends not only on well-being but also on trust and institutional support systems, highlighting that structural and relational resources condition the translation of mental health into behavioural energy.

In contrast, studies conducted in less constrained occupational settings (Schleupner & Kühnel, 2021; Sonnentag, 2015) consistently demonstrate a positive, direct relationship between mental health and engagement. However, the maritime training context presents a psychological ecology of control, where command hierarchies, strict safety routines, and limited autonomy restrict the expression of intrinsic engagement. Even when cadets maintain psychological stability, engagement may manifest primarily as "structural engagement", a form of behavioural alignment driven by duty, compliance, and external accountability rather than enthusiasm.

This notion resonates with Yuen et al., (2018) who found that in seafaring contexts, engagement is often compliance-based and oriented toward safety performance rather than affective involvement. Nittari et al. (2024) similarly concluded that hierarchical structures and limited psychosocial autonomy constrain both well-being and engagement in maritime crews, emphasising the institutional rather than personal origins of motivation.

From a theoretical standpoint, these findings extend the Job Demands–Resources (JD–R) framework by demonstrating that in highly structured environments, engagement can be institutionally constructed rather than psychologically emergent. While traditional JD–R models emphasise personal resources (e.g., optimism, self-efficacy), this study reveals that organisational design elements leadership clarity, fair discipline, and communication quality, can substitute for personal affective drivers. This reflects Ryan and Burchell's (2023) assertion that sustainable engagement requires healthy system design, where structure supports meaning rather than suppresses autonomy.

From a human capital perspective, these findings indicate that maritime performance excellence may arise not solely from individual psychological health but from the alignment between structural discipline and collective behavioural norms. In such controlled learning ecosystems, organisational architecture becomes a behavioural resource, shaping engagement through environmental regulation, shared mission, and socialised adaptation. Thus, cultivating psychologically informed structures balancing order with empowerment represents the next frontier in designing sustainable engagement within maritime education and operations.

The mediating role of work engagement: contextual separation between well-being and behaviour

The PLS-SEM results for H4 indicate that work engagement does not mediate the relationship between mental health and cadet performance, challenging the conventional assumption within the Job Demands–Resources (JD–R) framework (Bakker & Demerouti, 2007) that psychological well-being naturally translates into heightened engagement and performance. In the context of maritime education, this finding reveals a functional decoupling between affective well-being and behavioural engagement. While good mental health contributes to emotional balance and stress resilience, it does not necessarily activate the motivational energy or cognitive absorption required for superior task performance in a structured maritime setting.

According to JD–R theory, engagement emerges when individuals possess sufficient job resources, autonomy, feedback, and social support that facilitate motivation. Mental health provides the psychological foundation, but it is not self-executing; engagement requires an enabling environment. This interpretation aligns with Airila et al. (2012), Innstrand et al. (2012) and Upadyaya and Salmela-Aro (2013), who demonstrated that well-being impacts engagement only through environmental or relational mediators. More recent studies echo this contextual dependency. Senbursa and Dunder (2024) found that among seafarers, trust and organisational support mediate the relationship between well-being and work effectiveness, while Hayes-Mejia and Stafström (2023) reported that the psychosocial work environment, rather than individual affect, drives engagement under high-demand conditions. Similarly, Onakpojeruo et al. (2023) emphasised that structural resilience, not merely mental stability, sustains human reliability during operational stress.

Within maritime systems, the absence of autonomy, extended working hours, and hierarchical supervision constrains intrinsic motivation, a key antecedent of engagement under Self-Determination Theory (Ryan & Deci, 2000). Consequently, cadets' engagement is maintained through external regulation mechanisms such as evaluation standards, authority hierarchies, and procedural compliance. These mechanisms reinforce discipline and safety adherence, yet they limit the capacity of individual mental health to drive engagement directly. In essence, cadet performance becomes system-driven rather than self-driven, relying on institutional scaffolding, supervision, monitoring, and reward structures rather than internal enthusiasm or vigour.

This finding resonates with Pauksztat et al. (2022), who reported that seafarers' engagement and fatigue levels are primarily governed by structural and social supports rather than personal resilience. Likewise, Nittari et al. (2024) in their systematic review, they concluded that hierarchical rigidity and reduced psychosocial autonomy suppress the link between mental health and engagement across maritime occupations. Together, these studies affirm that engagement in maritime contexts operates as a structural construct, a behavioural outcome of institutional systems rather than an affective reflection of personal well-being.

Theoretically, this evidence extends both the JD–R and human capital frameworks, suggesting that engagement can be organizationally engineered through design features such as mentoring systems, procedural justice, and communication transparency. Rather than treating engagement solely as a psychological state, it should be conceptualised as a behavioural manifestation of institutional design, a form of structural engagement rooted in teamwork, rule adherence, and safety culture (Ryan & Burchell, 2023). This reflects a shift from "happiness-driven productivity" toward "structure-driven reliability", a model increasingly relevant to high-control and safety-critical professions.

In conclusion, while mental health enhances cognitive readiness and emotional equilibrium, its indirect pathway to performance through engagement appears muted within the maritime context due to limited autonomy, rigid supervision, and system-based

Vol.13 (2025) no.4, pp.376-394; DOI 10.2478/mdke-2025-0021

motivation. This contextual separation between well-being and behaviour challenges traditional engagement models developed in corporate or autonomous work settings. It underscores that maritime human capital performance is sustained not by individual affect but by collective discipline and structural alignment, highlighting the need for systemic well-being design that integrates psychological health into the architecture of maritime training and organisational governance.

Conclusions

This study explores the dynamic roles of mental health and work engagement as predictors of cadet performance within Indonesian maritime education, framed in the broader discourse of human capital development in a knowledge-based economy. Empirical evidence confirms that both mental health and work engagement exert significant direct effects on cadet performance, while the mediating role of engagement between mental health and performance is not supported. These results suggest that in maritime training environments, performance is more directly influenced by cognitive-emotional stability and institutional discipline than by affective motivational pathways.

Two major insights emerge from these findings. First, mental health functions as a core cognitive and emotional resource that directly enhances cadet performance through improved focus, adaptability, and decision-making competencies vital for safety and operational efficiency at sea. Second, work engagement operates as a behavioural manifestation of institutional culture, shaped less by psychological well-being and more by structural and disciplinary mechanisms inherent in maritime education systems. Engagement, in this context, reflects cadets' conformity, commitment, and perseverance under hierarchical command and evaluation structures, rather than purely intrinsic motivation.

Theoretically, this study extends the Job Demands–Resources (JD-R) model and human capital theory by demonstrating that engagement in regulated training systems can be structurally induced rather than psychologically driven. It also advances the knowledge economy perspective by emphasising that the development of maritime human capital is not only a matter of technical competence, but also of balancing psychological resilience and institutional discipline. This duality between internal strength and external structure provides a refined understanding of how workforce readiness and sustainable performance are cultivated in high demand learning environments.

From a managerial standpoint, these insights underscore the importance of integrating mental health strategies into the core of maritime education policy. Building a balanced system that values both discipline and psychological well-being is essential for preparing mentally healthy, motivated, and high-performing officers for the increasingly complex global maritime industry. Institutions that foster empathy-based leadership, supportive mentoring, and mental resilience will not only enhance cadet performance but also strengthen the sustainability and competitiveness of the maritime workforce.

Overall, this research affirms that performance in maritime education results from the synergy between structural discipline and psychological strength. Mental health enhances adaptive capacity, while engagement reflects the internalisation of institutional values and operational discipline. In the context of the global knowledge economy, achieving equilibrium between well-being and structured engagement forms the foundation for developing resilient, competent, and future-ready maritime professionals.

Theoretical implications

This study extends the human capital framework by demonstrating that psychological well-being (mental health) and behavioural energy (work engagement) represent two complementary yet distinct dimensions of capital. Mental health functions as a cognitive

and emotional resource that directly sustains cadet performance by enhancing focus, resilience, and adaptability. In contrast, engagement operates as a behavioural manifestation that is contingent upon organisational and structural conditions such as hierarchy, supervision, and institutional culture. This conceptual separation refines existing models of human capital by positioning mental health as a personal resource and engagement as an institutional outcome of structured environments.

The finding that work engagement does not mediate the relationship between mental health and performance highlights the need to contextualise the Job Demands–Resources (JD-R) model within maritime education systems. Unlike conventional organisational settings where autonomy, feedback, and job resources stimulate engagement, maritime cadets operate under rigid hierarchies and command-based learning structures. As a result, engagement becomes less a product of intrinsic motivation and more a reflection of structural compliance. This calls for an adapted JD-R perspective that acknowledges how engagement can be externally regulated within high-discipline, safety-critical learning environments.

By situating maritime education within the broader framework of the knowledge economy, this research illustrates how the interplay between psychological resilience and structural discipline contributes to human capital formation. Maritime training institutions are not only skill providers but also incubators of adaptive, high-performance workforces essential for global maritime operations. This study enriches the literature on the knowledge economy by emphasising that in vocational systems, especially those operating under strict regulatory frameworks, human capital is co-constructed by emotional well-being, structured learning environments, and institutional governance.

Managerial implications

Maritime academies and training institutions should treat mental health programs as strategic investments in human capital, not merely as welfare initiatives. Structured interventions such as resilience workshops, onboard counselling, peer-support mechanisms, and early detection systems for psychological distress can sustain cadets' emotional balance, thereby ensuring operational readiness and safety compliance.

Instructors, supervisors, and ship captains play a pivotal role in shaping cadet engagement. Training programs should emphasise empathy-based leadership, psychological safety, and communication competence to foster trust, motivation, and openness. Mentorship approaches that value emotional intelligence can transform hierarchical command structures into supportive learning ecosystems.

Curriculum and training designs need to balance discipline with autonomy. Integrating project-based learning, reflective journaling, and peer mentoring allows cadets to experience ownership and intrinsic motivation even within a structured environment. Such designs cultivate not only technical competence but also the self-regulation and creativity needed for lifelong learning and innovation in maritime careers.

Maritime institutions and shipping companies should embed psychological indicators such as well-being, engagement, and resilience into their HR assessment and performance appraisal systems. Doing so ensures that workforce management prioritises both productivity and sustainability. Integrating mental health into HR metrics can strengthen institutional readiness, reduce turnover risk, and promote a healthier, adaptive maritime workforce.

Limitations and future research agenda

This study has several limitations that should be addressed in future research. First, the sample scope was limited to Indonesian maritime education institutions, which may restrict generalizability to other maritime systems with different cultural or operational

Vol.13 (2025) no.4, pp.376-394; DOI 10.2478/mdke-2025-0021

contexts. Second, the research model focuses only on two key variables, mental health and work engagement, while other psychological and organisational factors were not included. Future studies are encouraged to: 1) Employ cross-institutional and cross-national samples to capture variations in maritime training systems and cultural influences on engagement. 2) Apply a longitudinal design to examine how the dynamics between mental health, engagement, and performance evolve during the full training-to-employment transition period. 3) Use qualitative or mixed method approaches, such as in-depth interviews or ethnographic studies aboard ships, to explore the lived experiences of cadets within hierarchical and multicultural contexts. 4) Integrate new variables such as leadership style, organisational justice, digital learning environments, and social support networks to enrich the conceptual framework of human capital in maritime education. 5) Investigate the concept of structural engagement further, how engagement can be sustained through institutional design and command systems, even in the absence of strong intrinsic motivation. Overall, these directions will advance theoretical refinement and practical innovation in the management of human capital within maritime vocational education and the global seafaring industry.

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