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Integrating Maritime Imagery into Tai Chi Training: An Intervention for Enhancing the Psychological Resilience of Seafarers

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Abstract: *Seafarers are chronically exposed to a unique confluence of challenges in the maritime environment, including chronic stress, social isolation, and sensory monotony. These factors pose a significant challenge to their psychological resilience, directly impacting their mental well-being and maritime safety. While traditional mind-body interventions have shown some efficacy, they often suffer from low appeal and poor adherence due to a perceived disconnect from the seafarers' lived context. This study aims to design and validate an innovative, contextualized psychological intervention — "Maritime Imagery-Integrated Tai Chi (MIIT)"—to effectively enhance the psychological resilience of seafarers. This program synergistically combines Tai Chi, a proven mind-body exercise, with specifically designed positive maritime imagery, guiding seafarers to transform their neutral or negative perceptions of the ocean into an empowering internal resource. This paper first systematically reviews the current state of seafarer resilience and its challenges, followed by an in-depth analysis of the theoretical foundations and mechanisms of Tai Chi and imagery training as psychological interventions. Based on this, a theoretical model of synergy between maritime imagery and Tai Chi is constructed, proposing that through this integrated mind-body practice, positive attributes of the ocean—such as its "serenity", "power", and "vastness"—can be internalized as individual psychological qualities. To validate this model's effectiveness, a 12-week longitudinal randomized controlled trial (RCT) is proposed, dividing seafarer participants into three groups: the MIIT group, a traditional Tai Chi group, and a blank control group. The Connor-Davidson Resilience Scale (CD-RISC) will serve as the primary outcome measure, supplemented by secondary measures including the Perceived Stress Scale (PSS) and the Profile of Mood States (POMS), administered at pre-, mid-, and post-intervention time points. We hypothesize that, compared to the traditional Tai Chi and control groups, seafarers in the MIIT group will demonstrate the most significant improvement in psychological resilience and show superior outcomes across other dimensions such as stress perception and emotional state. This research not only aims to provide a novel, low-cost, and easily disseminable intervention tool for promoting seafarer mental health but also seeks to provide theoretical and empirical support for the design and application of contextualized psychological interventions, deepening our understanding of the interplay between environment, body, and mind.*

Keywords: *Psychological Resilience, Tai Chi, Seafarers, Maritime Environment, Mind-Body Intervention*

1. Introduction

In the grand narrative of global economic integration, the maritime industry serves as the indispensable "blue lifeline" connecting the world. Seafarers, the human capital at the heart of this vast fleet, are central to ensuring the stability and safety of the global supply chain.[1] However, this critical responsibility is accompanied by extraordinary occupational challenges. The unique nature of the maritime environment—endless voyages, profound social isolation, confined and monotonous living quarters, incessant noise, potential hazards, and high-pressure workloads—collectively forms a unique, chronic, and multifaceted stressor nexus. Prolonged exposure to this environment places seafarers at high risk for severe mental health issues, including anxiety, depression, sleep disturbances, and burnout, which ultimately erode their psychological resilience.

Psychological resilience is defined as the capacity for an individual to successfully adapt, cope effectively, and "bounce back" in the face of adversity, trauma, tragedy, threats, or other significant sources of stress. For seafarers, a high level of psychological resilience acts as a psychological immune

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system,[2] essential for withstanding environmental pressures, maintaining a positive mindset, making sound judgments, and ensuring navigational safety. The current reality, however, is concerning, as the depletion of seafarer resilience has become a latent threat to the entire shipping industry.[3]

In response, academia and industry have explored various psychological interventions, including enhancing onboard recreational facilities, distributing mental health manuals, and offering remote counseling services. While these measures have achieved some success, they often face limitations: they can be equipment-dependent, hampered by unstable internet connectivity, and met with low acceptance due to cultural differences. Crucially, these exogenous interventions are often disconnected from the daily work and life contexts of seafarers, failing to ignite intrinsic motivation and sustained engagement.[4] Consequently, there is an urgent need to develop an endogenous, contextualized, low-cost, and easily implementable psychological intervention program suitable for onboard conditions.

Tai Chi, a gem of traditional Chinese mind-body practice, has been widely demonstrated to effectively alleviate stress, improve mood, and enhance cognitive function through its unique "three-in-one" model of regulating the body, breath, and mind.[5] Its gentle, flowing movements require minimal space, making it ideally suited for practice on ship decks or in cabins. However, traditional Tai Chi instruction may seem abstract to seafarers lacking the cultural background.

Meanwhile, imagery training, originating from sport psychology, involves the systematic use of mental rehearsal to simulate or reshape experiences.[6] It has proven to be a powerful tool for enhancing performance, managing anxiety, and building confidence. The core principle of imagery training lies in harnessing the power of the mind to guide positive physiological and psychological changes.

The innovation of this paper lies in the pioneering attempt to creatively fuse these two powerful techniques and deeply contextualize them, proposing the Maritime Imagery-Integrated Tai Chi (MIIT) program. Our core philosophy is to transform environmental challenges into empowering resources. Instead of passively enduring the isolation and monotony of the sea, we aim to guide seafarers to actively draw positive psychological strength from the ocean through imagery—the serenity of the deep sea, the power of the waves, the vastness of the horizon. By integrating these positive images with the gentle, circular movements of Tai Chi, we hypothesize a synergistic effect of "1+1>2", making the intervention more engaging, relevant, and transformative.

This research aims to answer the following core questions through a rigorous randomized controlled trial: Compared to no intervention, does traditional Tai Chi training improve the psychological resilience of seafarers? Compared to traditional Tai Chi training, does the imagery-integrated training more significantly enhance seafarers' psychological resilience and improve their emotional and stress states? What are the potential mechanisms underlying this integrated training? Through this study, we hope to construct and validate a novel and effective model for enhancing seafarer resilience, providing a feasible and sustainable solution for the mental well-being of millions of seafarers worldwide and offering new theoretical and practical insights for the contextualized design of mind-body interventions.

2. Literature Review and Theoretical Basis

2.1 Seafarer Resilience and its Influencing Factors

Psychological resilience is not a rare trait but a dynamic process that can be learned and cultivated. It encompasses multiple dimensions, such as optimism, self-efficacy, positive coping styles, and strong social support networks. For seafarers, resilience is continuously eroded by a specific set of factors. First is social isolation, where prolonged separation from family and friends leads to a lack of emotional support and heightened loneliness. Second is environmental monotony, where daily exposure to the same seascape and work environment can trigger sensory deprivation and burnout. Third is the high workload and risk, where shift work, sleep deprivation, and anxieties about piracy, severe weather, and technical failures contribute to a state of chronic stress.[7] These factors collectively deplete an individual's psychological resources, making them more susceptible to maladaptation when facing new challenges. Therefore, an effective resilience-building intervention for seafarers must help them replenish psychological resources, reframe cognitive appraisals, and master effective stress-coping skills.

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2.2 Tai Chi as a Mind-Body Intervention

The health benefits of Tai Chi are well-supported by modern science. Its mechanisms operate on three primary levels:

Body Regulation (Physical Level): The slow, continuous, and coordinated movements of Tai Chi improve balance, muscle strength, and joint flexibility. More importantly, by cultivating a fine-tuned awareness of body posture (proprioception), it strengthens the mind-body connection, a process that inherently draws attention away from external stressors and towards internal sensations.[8]

Breath Regulation (Physiological Level): The deep, even, diaphragmatic breathing emphasized in Tai Chi effectively activates the vagus nerve, enhancing parasympathetic nervous system activity. This induces the "Relaxation Response", directly counteracting the sympathetic hyperarousal caused by stress, manifesting as a lowered heart rate, reduced blood pressure, and decreased cortisol levels.

Mind Regulation (Psychological Level): Practice requires the mind to follow the movement, focusing attention and eliminating distractions. This is essentially a form of dynamic meditation or mindfulness. Long-term attention training strengthens the function of the prefrontal cortex, a key brain region for executive control and emotion regulation. Thus, Tai Chi helps practitioners reduce negative rumination and enhance emotional stability.

In sum, Tai Chi provides a solid physiological and psychological foundation for enhancing resilience through its integrated mind-body regulation.

2.3 Imagery Training and its Application in Psychological Intervention

Imagery training, or mental rehearsal, is the systematic and controlled use of the senses in the mind to create or recreate an experience. Its theoretical basis lies in the Psychoneuromuscular Theory, which posits that vivid imagination activates similar brain regions and faint muscle electrical activity as actual movement, as if conducting a real rehearsal. In psychological interventions, imagery is widely used for: Emotion Regulation: Imagining calm, pleasant scenes can directly elicit positive emotional experiences and reduce anxiety levels; Cognitive Restructuring: Guiding individuals to successfully cope with challenging situations in their imagination can alter their beliefs about their own abilities and enhance self-efficacy; Skill Acquisition: In sports and rehabilitation, rehearsing actions through imagery can accelerate motor skill learning and recovery.[9]

2.4 The Theoretical Fusion of Maritime Imagery and Tai Chi: A Contextualized Embodied Cognition Intervention

The core innovation of this study is the organic integration of these two techniques, deeply embedding them within the maritime context. We argue this fusion is not a simple addition but a synergistic combination that can catalyze a chemical reaction. Our theoretical model is constructed as follows:

(1) Empowerment Transformation: Traditionally, the ocean may signify confinement and monotony to seafarers. Our intervention aims to achieve a positive restructuring of the meaning of the ocean through imagery. We will guide seafarers to focus on the positive attributes of the ocean during their practice:

Serenity and Depth: Corresponding to the concepts of stillness and sinking in Tai Chi, seafarers will imagine themselves as the deep ocean—calm and stable at its core, even with surface turbulence.

Power and Rhythm: Corresponding to the Tai Chi principle of hardness and softness complementing each other, they will imagine their movements as the ocean waves—at times gentle, at times powerful, always rhythmic.

Vastness and Inclusiveness: Corresponding to the opening and closing movements in Tai Chi, they will imagine their minds as vast as the ocean, capable of embracing all things and accepting negative emotions without being consumed by them.

Navigation and Direction: They will imagine themselves as experienced helmsmen, navigating the ocean of life with inner wisdom (like the stars and a compass), steering steadily towards their goals.

(2) Synergistic Amplification: The combination of Tai Chi and maritime imagery can mutually enhance their effects.

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Imagery Enriches Tai Chi: For seafarers without the cultural background, abstract concepts like "sinking qi to the Dan Tian" can be difficult to grasp. Concrete maritime images make the essence of the movements easier to understand, increasing engagement and enjoyment.

Tai Chi Embodies Imagery: Purely mental imagery can feel disconnected without physical involvement. The movements of Tai Chi provide a physical anchor for these images, making the experience more real and profound. This experience of "Embodied Cognition"—where mental concepts are shaped by the body's perceptions and actions[10]—is believed to produce more lasting psychological change.

Through this approach, seafarers are no longer simply fighting or escaping the maritime environment during practice; they are learning to dance with it, drawing strength from their surroundings.[11] This is the very essence of psychological resilience: positive adaptation.

3. Research Design and Methods

3.1 Study Design

This study will employ a three-group (MIIT group vs. Traditional Tai Chi group vs. Blank Control group), three-time-point (pre-intervention vs. mid-intervention vs. post-intervention) longitudinal randomized controlled trial (RCT) design. This design can effectively compare the effects of the two interventions while controlling for time and placebo effects.

3.2 Participants

We plan to recruit 90 male seafarers scheduled for voyages of no less than 3 months.

Inclusion Criteria: (1) Age 20-50 years; (2) At least 1 year of sailing experience; (3) No prior Tai Chi practice experience; (4) No serious physical diseases or history of mental disorders; (5) Voluntarily participating and signing the informed consent form.

Exclusion Criteria: (1) A strong preference for or aversion to the intervention methods of this study; (2) Currently receiving other forms of psychotherapy or taking psychotropic medications.

Participants meeting the criteria will be randomly assigned to one of the three groups in a 1:1:1 ratio using a random number table.

3.3 Intervention Protocol

The total intervention duration will be 12 weeks. All intervention materials will be produced as video tutorials and waterproof, illustrated manuals for easy use onboard.

Group A: Maritime Imagery-Integrated Tai Chi (MIIT) Group (n=30)

Content: Learning a simplified 24-form Tai Chi routine. Each form or group of movements will be accompanied by specially designed positive maritime imagery scripts. For example, during the "Cloud Hands" movement, the script will be: "Imagine your hands are like clouds floating gently across a calm, blue sea. Your body, like seaweed, sways softly with the ocean current. Feel this sense of ease and freedom."

Frequency: 5 sessions per week, 30 minutes per session (10 min warm-up & imagery induction, 15 min practice, 5 min cool-down & reflection).

Group B: Traditional Tai Chi Group (n=30)

Content: Learning the exact same 24-form Tai Chi routine as Group A. However, the instructional cues will only involve technical points, breathing coordination, and traditional ideation (e.g., "focus on the Dan Tian", "let qi flow through the body"), without any maritime imagery.

Frequency: Same as Group A, 5 sessions per week, 30 minutes per session.

Group C: Blank Control Group (n=30)

Content: No Tai Chi or imagery training will be provided. Participants will only receive a brochure on healthy lifestyle habits at sea (covering topics like balanced nutrition and general exercise recommendations) to control for attention effects.

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Frequency: Participants will be instructed to follow their usual habits.

3.4 Measurement Instruments

Primary Outcome Measure:

Connor-Davidson Resilience Scale (CD-RISC): A widely used 25-item self-report scale that assesses the ability to cope with stress. It has good reliability and validity for measuring changes in psychological resilience.

Secondary Outcome Measures:

Perceived Stress Scale (PSS-10): A 10-item scale assessing the degree to which situations in one's life are appraised as stressful over the past month.

Profile of Mood States (POMS) - Short Form: Assesses transient, distinct mood states, including dimensions like tension, anger, fatigue, depression, vigor, and confusion.

Pittsburgh Sleep Quality Index (PSQI): Evaluates sleep quality over the past month.

Intervention Logs and Semi-Structured Interviews: Participants in Groups A and B will be required to log their practice frequency, duration, and feelings. At the end of the intervention, 5-8 participants from each group will be randomly selected for semi-structured interviews to gain in-depth qualitative insights into their subjective experiences, perceived benefits, and challenges.

3.5 Data Collection and Analysis

Data Collection: All quantitative data will be collected via an online survey system at pre-intervention (T0), mid-intervention (week 6, T1), and post-intervention (week 12, T2). Intervention logs will be submitted periodically via photo uploads. Interviews will be conducted via phone or video conference after the voyage.

Data Analysis: Statistical analysis will be performed using SPSS 26.0.

Baseline data will be analyzed using independent samples t-tests or chi-square tests to ensure no significant differences between groups in demographic variables or outcome measures.

A Repeated Measures ANOVA will be used to test the intervention effect, with time (T0, T1, T2) as the within-subjects factor and group (A, B, C) as the between-subjects factor. The primary focus will be on the "time × group" interaction effect for resilience scores.

If a significant interaction effect is found, simple effects analysis and post-hoc multiple comparisons (Bonferroni correction) will be conducted to identify specific differences between groups and time points.

Qualitative data from interviews and logs will be analyzed using Thematic Analysis to code and identify core themes, deepening the understanding of the intervention process and mechanisms.

4. Expected Results and Discussion

4.1 Expected Results

Hypothesis 1 (Primary Hypothesis): A significant "time × group" interaction effect will be found for psychological resilience (CD-RISC scores). Post-hoc tests are expected to show that the increase in scores from T0 to T2 for Group A will be significantly greater than that for Group B and Group C, and the increase for Group B will be significantly greater than that for Group C (A > B > C).

Hypothesis 2: Similar patterns are expected for secondary outcomes, including a greater reduction in perceived stress (PSS scores), negative mood (POMS negative subscales), and improved sleep quality (lower PSQI scores) in Group A.

Hypothesis 3 (Qualitative Results): Thematic analysis is expected to reveal that participants in Group A report the practice as more interesting and engaging. They will likely describe how the maritime imagery helped them build a more positive connection with their environment and more deeply experience the relaxation and stillness advocated in Tai Chi. Participants in Group B may report more physical benefits, while Group C will report no systematic changes.

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4.2 Discussion

If these hypotheses are confirmed, this study will have significant theoretical and practical implications.

Theoretical Implications: First, it will provide strong empirical support for the theory of contextualized intervention in psychology. It suggests that intervention design should not be one-size-fits-all but should creatively integrate elements of the target group's living environment and cultural background to potentially amplify effects. Second, it will enrich the application of "Embodied Cognition" theory, demonstrating that using physical practice (Tai Chi) to anchor and deepen abstract mental concepts (maritime imagery) is an effective pathway for psychological transformation.

Practical Implications: This research will provide the global maritime industry with a scientifically validated, low-cost, high-adherence, and easily implementable tool for promoting seafarer mental health. The program does not require expensive equipment or continuous external expert support; a set of videos and a manual can be disseminated on any ocean-going vessel. This will not only enhance the personal well-being of seafarers and reduce the incidence of mental health problems but may also indirectly improve maritime safety by enhancing the cognitive function and decision-making abilities of the crew, contributing to the sustainable development of shipping companies.

4.3 Innovations and Limitations

Innovations: (1) Conceptual Innovation: The first to transform an environmental stressor (the ocean) into an intervention resource, reflecting principles of positive psychology. (2) Methodological Innovation: Fuses traditional Eastern mind-body techniques with Western psychological imagery training, with deep contextualization. (3) Population Innovation: Focuses on seafarers, a unique and vital occupational group, filling a gap in high-quality psychological intervention research for this population.

Limitations: (1) Implementation Challenges: Ensuring practice adherence among all participants during a real voyage is a challenge that requires effective motivation and monitoring. (2) Sample Representativeness: The recruited sample may not fully represent the diversity of seafarers of all nationalities and vessel types, so the generalizability of the findings must be considered with caution. (3) Measurement Limitations: A sole reliance on self-report measures may be subject to biases like social desirability. Future research could incorporate more objective physiological indicators like heart rate variability (HRV) or cortisol levels.

5. Conclusion and Future Outlook

In the face of the formidable challenges of the maritime environment, enhancing the psychological resilience of seafarers is key to safeguarding their well-being and maritime safety. The "Maritime Imagery-Integrated Tai Chi" program designed in this study is an innovative attempt based on theories of contextualization and embodied cognition. We have a strong theoretical basis to believe that this intervention, which artfully links environment, body, and mind, will be more effective than traditional methods in cultivating the resilience of seafarers.

Looking forward, if this study is successful, the model can be further optimized and disseminated. For instance, virtual reality (VR) technology could be used to create more immersive maritime imagery training environments. Furthermore, this "contextualized mind-body intervention" design philosophy could be adapted for other special occupational groups, such as polar researchers, firefighters, or astronauts working in long-term confinement, offering broad prospects for protecting their mental health.

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