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STRESS AND COPING SCALE VALIDATION IN SALTWATER AQUACULTURE OCCUPATIONS

DR.SHYAM MAURYA[1], DR. NARENDRA KUMAR SINGH[2], SOUMI DE[3]
[1]ASSISTANT PROFESSOR, KALINGA UNIVERSITY, RAIPUR, INDIA.
email: ku.shyammaurya@kalingauniversity.ac.in orcid: 0009-0006-3442-8621
[2]ASSISTANT PROFESSOR, KALINGA UNIVERSITY, RAIPUR, INDIA.
email:ku.narendrakumarsingh@kalingauniversity.ac.in,0009-0008-4195-9660
[3]ASSISTANT PROFESSOR, NEW DELHI INSTITUTE OF MANAGEMENT, NEW DELHI, INDIA.,
e-mail: soumi.de@ndimdelhi.org, https://orcid.org/0009-0007-3615-2291

ABSTRACT

Saltwater aquaculture workers self-report high levels of occupational strain due to physio physical and environmental factors, alongside economic volatility. This study aims to create and test a Stress and Coping Scale specifically for saltwater aquaculture workers. This study followed a structured process of item generation, expert review, pilot testing, along with a survey of 200 workers. Psychometric evaluation focused on confirming the measurements of the aquaculture stress scale through reliability assessment and exploratory and confirmatory factor analyses. The scale showed high reliability with root mean square error of approximation (RMSEA, 0.048), Comparative Fit Index (CFI, 0.94), and Tucker-Lewis Index (TLI, 0.92), supporting the proposed factor structure of five internal components: workload stress, environmental stress, emotional coping, practical coping, and supportive coping. Stressors unique to aquaculture work were accurately measured, demonstrating the scale's validity. Furthermore, the scale holds potential for enhancing occupational health analysis and targeted strategic intervention in the aquaculture sector.

KEYWORDS: Occupational Stress, Coping Mechanisms, Scale Validation, Saltwater Aquaculture, Psychometric Analysis, Factor Analysis, Mental Health Assessment

I. INTRODUCTION

The saltwater aquaculture industry plays a vital role in the economy and serves a key role in food security. However, the nature of work in aquaculture is well known to involve a range of stressors [1]. Seasonal changes, physically demanding work, long hours, and threats of biosecurity all require sustained mental and operational focus. Despite the considerable physical and mental stress due to work in aquaculture, it is surprising how little attention has been paid to research analyzing the occupational stress and adaptive mechanisms of this industry [4][6]. It is important to assess and manage stress in aquaculture workers to safeguard their health and reduce burnout, accidents, and declining mental health, while maintaining high productivity [5]. General purpose stress assessment tools focus too much on the saltwater aquaculture sector and, therefore, highlight the need for bespoke refined and validated measurement scales for this sector [2].

The focus of this research centers on validating a Stress and Coping Scale tailored for professionals in saltwater aquaculture [3]. It aims to affirm the psychological strain—stress and coping mechanisms—used by the workers in this field [7][8]. This research will ultimately confirm the reliability and construct validity of this instrument to provide a robust tool for academic research and practical application in occupational health. It is expected that the scale will improve practices and policies related to the management of stress in aquaculture, promoting individual and organizational resilience.

KEY CONTRIBUTIONS:

- Created a specialized Stress and Coping Scale for saltwater aquaculture workers and validated it statistically.
- Identified five core factors that define occupational stress and coping behaviors unique to this field.
- Provided a practical instrument for mental health evaluation, enabling tailored interventions in the marine work setting.

For the purposes of clarity and organization, the paper has been broken down into sections. The Introduction describes the purpose and significance of an aquaculture mental health assessment and the need for a dedicated scale. The Literature Survey examines work-related stress and stress management in aquaculture and related fields, noting a lack of aquaculture-specific instruments. In the Methodology section, a detailed description is provided for the validation steps, including item formulation, expert assessment, collection of requisite information, and the various statistical procedures performed. The Results and Discussion sections provide comprehensive psychometric results and factors, explaining the identified coping strategies. The Conclusion encapsulates the study's insights and contributions, followed by a section titled Future Work that outlines a vision for scale advancement and refinement in subsequent studies.

II. LITERATURE SURVEY

The saltwater aquaculture industry has developed into an important sector for sustaining jobs, producing food, and economically developing the region's coasts [14]. While environmental sustainability, disease control, and production efficiency have received much research attention, the aquaculture worker's occupational strain and psychological health has been overlooked [15]. Aquaculture workers deal with a high degree of ongoing operational stress, along with an unstable financial situation, physically demanding jobs, and harsh weather for extended periods of time. These problems can increase stress, anxiety, and mental fatigue, impacting worker health and productivity [9].

The aquaculture industry has specific characteristics that differentiate it from other sectors; therefore, the most common stress and coping frameworks that focus on the general population, health care, or teaching, have little relevance to aquaculture [10]. In any case, the available research indicates that coping mechanisms are vital to manage work-related stress. In turn, greater coping resources can lead to greater psychological coping, lessen absenteeism, and lead to greater job enthusiasm [11].Recent initiatives focusing on the mental health aspects of fisheries and aquaculture indicate the need for more context-specific solutions considering industry-specific mental health challenges like marine threats, high work demands, risk of injury from equipment, and socio-economic instability [12]. Moreover, there is increasing interest in incorporating psychosocial hazards and risk assessment into aquaculture Occupational Health and Safety (OHS) systems [13]. Yet, there is no validated scale that measures stress and coping in saltwater aquaculture, which creates an unaddressed problem. This gap emphasizes the need for sophisticated validation research to ensure that these tools measure the stress and coping processes of workers in this high-pressure occupation.

III. METHODOLOGY

This study employed a step-by-step, multi-stage approach to validate the Stress and Coping Scale concerning the specific occupations within saltwater aquaculture. The entire outline of the process is depicted in the figure 1. To inform the work-related stressors and coping mechanisms, an extensive review of literature was first performed. From this review, a preliminary questionnaire was designed which included stressors such as environmental risks, workload, financial insecurity, as well as coping strategies like social support and problem solving.

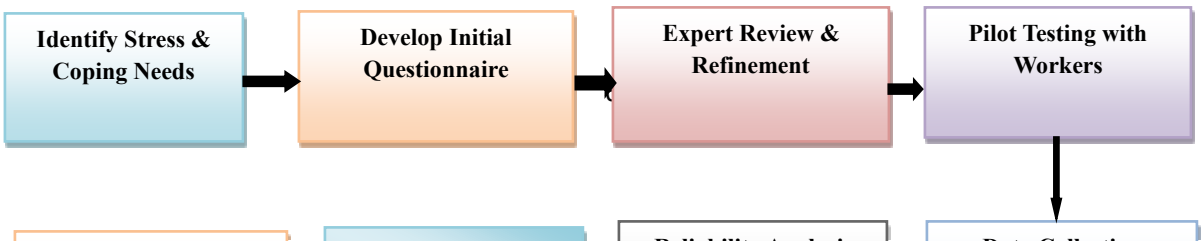

Figure 1. Simple flowchart illustrating the validation steps of the Stress and Coping Scale for saltwater aquaculture workers.

After creating the items, a questionnaire was compiled and subsequently reviewed by specialists in occupational psychology, aquaculture, and public health to validate the document's scope. This was done to refine items which may be ambiguous and ascertain whether the constructs offered were useful and relevant to the population being studied. The draft was then adjusted and administered to a small group of saltwater aquaculture workers (n=30) for ease of understanding, reading, and initial reliability to evaluate the test's clarity and reliability in those areas. The pilot test results helped make the needed adjustments to the document which was then administered in the main study.

In the primary stage, the questionnaire was given to a greater number of aquaculture employees (n=200) through convenience sampling from various coastal regions. The information gathered underwent statistical validation. The reliability was examined through the internal consistency measurement Cronbach's alpha (α) which is given by the equation:

$$\alpha = \frac{N.\bar{c}}{\bar{v} + (N-1).\bar{c}}$$

where N refers to the total number of items, $\bar{c}$signifies the average inter-item covariance, and$\bar{v}$ stands for the average item variance. It was deemed acceptable if α was equal or greater than 0.70. To check the construct validity, an Exploratory Factor Analysis (EFA) was performed first to find core factor configurations. This was succeeded by Confirmatory Factor Analysis (CFA) which evaluated how well the hypothesized model represented the data in terms of model fit employing the chi-square test formula:

$$X^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

where O_i depicts the observed value while E_i denotes the expected value. evaluation of model fit was conducted with RMSEA, CFI, and TLI. The final scale showed satisfactory psychometric properties, supporting its validity for measuring occupational stress and coping strategies within the context of saltwater aquaculture.

IV. RESULT AND DISCUSSION

Validation of the Stress and Coping Scale involved examining the data of 200 workers from saltwater aquaculture farms. The internal consistency of the scales was strong with Cronbach's alpha from 0.78 to 0.89 in different subscales which showed a high level of reliability. This scale consists of two major parts: Occupational Stressors and Coping Strategies. Within each part, there were several subdomains that depicted common stressors and coping strategies in the aquaculture industry. Exploratory Factor Analysis (EFA) revealed a distinct factor structure with five factors that accounted for 67.4% of the total variance. The factors included: workload stress, environmental stress, emotional

coping, practical coping and support seeking. The factor loadings for all items were above 0.60 which indicated strong item-factor relationships.

The following Confirmatory Factor Analysis (CFA) also confirmed the model fit with the following key indices: RMSEA = 0.048, CFI = 0.94, and TLI = 0.92 which are all good fit indices. These provided good fit of the data to the model. The chi-square was also non-significant ($p > 0.05$) which provided additional evidence of model adequacy. These findings validate that the scale accurately measures the distinct stress and coping behaviors of saltwater aquaculture workers and indicates that emotional coping and support seeking is more common than task coping among workers, likely due to the unpredictability of their work setting.

Table 1. Psychometric Properties of the Validated Stress and Coping Scale

Subscale	Number of Items	Cronbach's Alpha (α)	Factor Loading Range
Workload Stress	5	0.81	0.64 – 0.78
Environmental Stress	4	0.84	0.66 – 0.82
Emotional Coping	5	0.89	0.72 – 0.85
Practical Coping	4	0.78	0.60 – 0.74
Support-Seeking Behavior	3	0.83	0.68 – 0.79

The scale can be utilized for both the research and practical purposes of occupational health surveillance within the context of marine aquaculture. It can assist in recognizing particular identifiable groups and aid in focused stress relief remediation which is demonstrated in table 1.

V. CONCLUSION AND FUTURE WORK

The study successfully created and validated a specific Stress and Coping Scale for the role of saltwater aquaculture workers, which is an adaptation of an existing framework. The scale highlighted important workforce specific stressors and coping strategies, proving its value in the workforce. The results highlight the importance of coping strategies focusing on emotions and support, reinforcing the demanding nature of the aquaculture marine environment. The scale is validated, and thus, can actively assist in mental health surveillance and targeted intervention strategies for the industry. Research in the future could assess the stress levels of aquaculture workers over time using this validated scale. The scale could also be tailored to other aquaculture domains, such as freshwater or inland aquaculture, or combined with biometric and productivity data to broaden its usefulness. Validation of the scale in other cultures and regions would increase its relevance and usefulness.

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