

# The stress model of neuroticism and anxiety symptoms in fishermen

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## ABSTRACT

**Background:** Marine fishermen experience high levels of environmental and relationship stress and anxiety. The current study explored the role of stress in the relationship between neuroticism and anxiety symptoms among marine fishermen.

**Materials and methods:** Participants (fishermen from Tanmen in Qionghai city, Hainan Province) completed three questionnaires: the NEO-Five-Factor Inventory-Neuroticism Subscale (NEO-FFI-N); the Mental Stressor Investigation Questionnaire (MSIQ); and the Mood and Anxiety Symptoms Questionnaire-30-item-Anxious Arousal Subscale (MASQ-D30-AA) within 1 week before embarking on a fishing trip and then again within 1 week after their return to port. The data were subjected to correlational analyses and structural equation modelling.

**Results:** Positive correlations were found between NEO-FF-N (neuroticism) score, MSIQ score (total stress), MSIQ work-relationship score, ship environmental stress score, and MASQ score (anxiety symptoms). Regression analyses showed environmental stress had a significant moderating effect on the relationship between neuroticism and anxiety symptoms, and further analysis showed a mediating effect of work-relationship stress on the relationship between neuroticism and anxiety symptoms.

**Conclusions:** Marine fishermen with high environmental stress had greater anxiety symptoms than those with low environmental stress. Neuroticism in marine fishermen further affects anxiety symptoms by affecting the level of work-relationship stress.

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**Key words:** marine fishermen, neuroticism, stress, stress model, anxiety symptoms

## INTRODUCTION

Marine fishing is a difficult and life-threatening occupation. Storms, high winds, and tumultuous waves pose unpredictable threats for working fishermen. Moreover, those who work at sea long-term are prone to developing serious clinical conditions, including cardiovascular disease, hearing loss, digestive system diseases, and urinary system diseases [1]. Marine fishing is recognized as an industry with a very

high occupational risk and a very high mortality rate [1]. Indeed commercial fishing industry workers have higher fatality rates than workers in other occupations in many countries (214 deaths/100,000 fishermen annually) [2].

The occupational risks of fishing work extends beyond death and physical injury to risks of mental health disorders. According to the most recent cross-sectional epidemiological study of mental disorders in China, anxiety disorders

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is the most prevalent type of mental disorders (incidence, 7.6%) [3]. Work-related stressors including a heavy workload, intense time pressures, latitude in decision-making, occupational risks, and lack of support from co-workers can contribute to the development of anxiety symptoms [4]. Notably, Melchior et al. [5] found that work stress can precipitate anxiety in working young women and men, and Fan et al. [4] reported that job insecurity was strongly associated with anxiety symptoms. Consistent with previously established associations between workplace stress and anxiety [4], Yu et al. [6] showed that fishermen who face extended periods of work stress are prone to anxiety, and further detected significant differences in anxiety symptom indicators between the early stages (within 15 days) and the later stages of a trip. They further showed that mariners experience sustained high anxiety levels upon returning from long sea voyages, suggesting that the mental health of fisherman and the psychological stressors of working at sea are not being addressed effectively for a long time.

Beyond work stress factors, individual personality factors also play an important role in the development of anxiety [7]. Neuroticism is regarded as a particularly relevant personality characteristic for psychopathology risk, especially with respect to anxiety risk. Individuals with a high level of neuroticism may lack the ability to regulate their emotions effectively and to overcome stressful obstacles, making them prone to anxiety [8]. The reported strengths of the correlation between neuroticism level and anxiety symptoms vary substantially across studies (0.19~0.70) [9, 10]. This variance suggests that the relationship may be modulated by additional factors, such as rumination [11], marital satisfaction [12], and stress exposure [13]. In the present study, we examined the hypothesis that work stress may have a moderating influence on the relationship between neuroticism and anxiety in fishermen, and employed the diathesis-stress model to explore this possibility.

The diathesis-stress model (a.k.a. vulnerability-stress model) of mental illness pathogenesis assumes that everyone has a certain predisposition to develop mental disorders if exposed to sufficient stress [14]. Empirical support for the diathesis-stress model has been published in recent years. For example, Xu et al. [15] found that adolescents with higher hair cortisol levels were more likely to exhibit higher anxiety symptoms than those with lower levels but greater academic stress. Additionally, Cox et al. [16] found that individuals with higher trait disgust proneness were more likely to experience anxiety responses in pandemic-associated high-stress environments.

According to the diathesis-stress model, anxiety disorders develop through an interaction between each individual's anxiety diathesis and their stress exposure. Furthermore, poor cognitive control leads one to have exposure to

more stressful events, further favouring the development of anxiety symptoms [17]. Thus, in addition to a diathesis-stress interaction in anxiety symptom development, stress exposure itself may also influence the generation of anxiety through a mediating effect, as postulated in Eberhart et al. [18] stress-generation model. Briefly, the stress-generation model postulates that differing diathesis traits affect the likelihood of experiencing stressful life events, which in turn, further affects susceptibility to mental disorders. Several risk factors, including a negative cognitive style [19], and prior levels of emotional distress [20] have been reported to increase the risk of self-generated stressful events. Most studies that have considered the diathesis-stress and stress-generation models have focused on exploring mechanisms of depression pathogenesis, and the few studies that have examined whether neuroticism is a predictor of anxiety symptoms have yielded inconsistent results [21, 22].

In this study, we sought to better understand the development of anxiety symptoms through the application of the diathesis-stress and stress-generation models. The present analysis segregates environmental stress from work-relationship stress. We considered it appropriate to apply the diathesis-stress model to investigate a potential moderating effect of environmental stress on the relationship between neuroticism and anxiety symptom development. Meanwhile, because work-relationship stress may be affected by neuroticism, we postulated that work-relationship stress may have a mediating effect on neuroticism and anxiety symptoms.

## MATERIALS AND METHODS

### PARTICIPANTS

A cohort of 397 native Mandarin-speaking Chinese fishermen from the town of Tanmen in Qionghai city, Hainan Province were included in the study. Usually, fishermen are recruited by the captain and familiar with each other, with all crew members engaging in similar tasks. The fishermen participants were recruited through the Hainan Fishery Mutual Protection Association and the local village committee. The inclusion criteria were: participation in ocean-going fishing; no mental disorders; no clinically significant hearing or vision loss; and the ability to understand questionnaire items. Participation was voluntary and all participants signed informed consent prior to data collection. All procedures for this study were in accordance with the ethical standards of the Institutional Research Committee. The flow chart of research is displayed in Figure 1.

### MEASURES

**Neuroticism.** Neuroticism traits were assessed with the NEO-Five-Factor Inventory-Neuroticism Subscale (NEO-FFI-N) [23]; the other four subscales of this instrument were

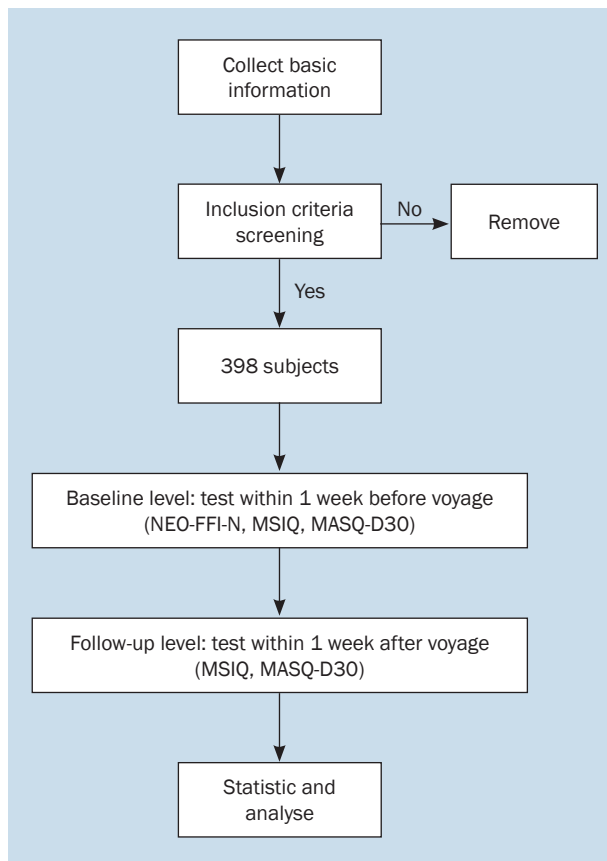


Figure 1. The flow chart of research

not used. The NEO-FFI-N is composed of 12 items, each scored on a 5-point scale, such that higher scores indicate more pronounced neuroticism. The internal consistency of the NEO-FFI-N was 0.81. And found that it had acceptable structural validity with the following fitting index values:  $\chi^2/\text{degrees of freedom (df)} = 1.95$ , comparative fit index (CFI) = 0.94, Tucker Lewis index (TLI) = 0.96, and root mean square error of approximation (RMSEA) = 0.06.

**Work stress.** Work stress was assessed with the ship environmental stress subscale (27 items) and the work-relationship stress subscale (9 items) of the 36-item Mental Stressor Investigation Questionnaire (MSIQ) [24]. Each item was rated on a 5-point scale with a higher score indicating a greater psychological impact. The internal consistencies of the total MISQ, the ship environmental stress subscale, and the work-relationship stress subscale were 0.95, 0.95, and 0.87, respectively. We found that the scale had good structural validity with the following confirmatory factor analysis fitting index values:  $\chi^2/\text{df} = 2.91$ , CFI = 0.91, TLI = 0.93, and RMSEA = 0.06.

**Anxiety symptoms.** Anxiety symptoms were assessed with the Mood and Anxiety Symptoms Questionnaire-30-item (MASQ-D30) [25], which has been shown to effectively dis-

tinguish between anxiety and depression. The MASQ-D30 is a 30-item abbreviated version of the original 90-item MASQ the Anxious Arousal (AA) subscale, composed of 10 items, each scored on a 5-point scale, was used in the current study [26]. Greater scores on the AA subscale indicate greater anxiety symptom levels. The internal consistency of the AA was 0.7. We further found that the AA had good structural validity, with the following confirmatory factor analysis fitting index values:  $\chi^2/\text{df} = 2.87$ , CFI = 0.88, TLI = 0.91, and RMSEA = 0.07.

## STATISTICAL ANALYSES

SPSS 20.0 and Mplus 8.3 (Muthén and Muthén, Los Angeles, CA) software were used for data analyses. First, descriptive statistics were carried out to determine the means and standard deviation (SD) for each scale. Bivariate relationships were examined with Pearson correlations for continuous variables. The structural equation modelling (SEM) included a measurement model and a structural model. We tested the measurement model according to the recommendations of Anderson and Gerbing [27]. In the structural model, we separately verified the moderating effects of ship environmental stress on the relationship between neuroticism and anxiety symptoms and the mediating effect of work-relationship stress.

In the moderating effect model, independent variables and regulating variables were centralized before applying the latent moderating structure equation method. Next, Akaike information criterion (AIC), Bayesian information criterion (BIC), and log-likelihood ratio tests were conducted to compare the relative fit of Model 0 (null model from SEM wherein the interaction is not estimated and therefore assumed to be zero) and Model 1 (alternative model from SEM wherein the interaction is estimated). Finally, to explore the effects of environmental stress on anxiety symptoms across individuals with different levels of neuroticism, the participants were divided into two groups: high ship environmental stress (at least one SD above the mean) and low ship environmental stress (at least one SD below the mean). Lastly, the simple slope test was applied.

The bootstrapping method was used in the mediating effect model. The bootstrap method has a high statistical efficiency compared with other methods for testing mediating effects [28] and it was ideal for testing the mediating effect in the current study. Therefore, the confidence interval was estimated with bootstrap technology, and a total of 1,000 repeated samples were sampled.

Finally, considering that the current model was relatively complex (27 items in the moderating variable and 9 items in the mediating variable), we packaged the moderating variables and mediating variables separately according to previous research [29]. The CFI, the TLI, the standardized

**Table 1.** Demographic characteristics of the present study cohort of fishermen

Variable	Frequency
Age [years]:	
16–18	9/397 (2.3%)
18–25	61/397 (15.3%)
25–50	275/397 (69.3%)
50–65	51/397 (12.8%)
≥ 65	1/397 (0.3%)
Level of education completed:	
Elementary school or less	91/397 (22.9%)
Middle school	272/397 (68.5%)
Technical secondary school	26/397 (6.5%)
High school or higher	8/397 (2.0%)
Time employed in fishing:	
≤ 1 year	33/397 (8.3%)
1–3 years	56/397 (14.1%)
3–5 years	35/397 (8.8%)
≥ 5 years	273/397 (68.8%)
Marital status:	
Never married	91/397 (22.9%)
Married	299/397 (75.3%)
Divorced	7/397 (1.8%)
Religion:	
None	301/397 (75.8%)
Christianity	12/397 (3.0%)
Buddhism	52/397 (13.1%)
Taoism	30/397 (7.6%)
Other	2/397 (0.5%)

root means square residual (SRMR), and the RWSEA were used to test the goodness of fit of the model. CFI and TLI values > 0.95 indicated that the model fit well, and values > 0.9 were considered acceptable. The model was accepted if it also had SRMR and RMSEA values < 0.08 [30].

## RESULTS

### DESCRIPTIVE ANALYSES

The mean age ( $\pm$  SD) of the fishermen enrolled in this study was  $36.47 \pm 11.07$  years (range: 16–66 years). The demographic characteristics of the sample are presented in detail in Table 1. The portions of missing data for neuroticism, work stress, and anxiety symptom assessments were 0.5%, 1.6%, and 1.3%, respectively. There were no significant differences in other indicators with missing data ( $t = 0.6$ – $3.2$ ,  $p > 0.05$ ), suggesting that all missing

**Table 2.** Descriptive statistics for all observable variables

Instrument observable variable	Mean	SD
NEO-FFI-N:		
T1	28.30	6.76
T2	27.42	6.24
MSIQ:		
Ship environment		
T1	40.36	15.54
T2	42.24	14.26
Work relationships stress		
T1	12.87	4.47
T2	14.71	4.17
MASQ-D30-AA:		
T1	11.87	2.95
T2	14.44	4.29

T1 is the baseline level; T2 is the follow-up level. NEO-FFI-N – NEO-Five-Factor Inventory-Neuroticism Subscale; MSIQ – Mental Stressor Investigation Questionnaire; MASQ-D30-AA – Mood and Anxiety Symptoms Questionnaire-30-item-Anxious Arousal Subscale; SD – standard deviation

data were missing at random. Consequently, the multiple imputations method was used to manage missing data. Descriptive psychometric data obtained for the study sample as reported in Table 2.

### CORRELATIONS

As shown in Table 3, Pearson correlational analyses revealed significant positive relationships among NEO-FFI-N scores (neuroticism), total MSIQ scores (overall ship stress), MSIQ-ES scores (ship environmental stress), MSIQ-WR scores (work-relationship stress), and MASQ-D30-AA scores (anxiety symptoms).

### MEASUREMENT MODEL

In the measurement model, the SEM fit information obtained indicated that all indicator values were acceptable. The model fit values for each latent variable in the measurement model are reported in Table 4.

### MODERATING EFFECT ANALYSIS

Model 0 fit the data well ( $\chi^2/df = 1.803$ , RMSEA = 0.045, SRMR = 0.046, CFI = 0.944, TLI = 0.939, AIC = 31363.417, BIC = 31801.926, Loglikelihood =  $-15571.708$ ). The AIC and BIC values for Model 1 were lower than the AIC and BIC values obtained for Model 0, whereas the Loglikelihood value for Model 1 was higher than that obtained for Model 0 (AIC = 31351.946, BIC = 31794.442, Loglikelihood =  $-15564.973$ ), and the  $-2LL$  was significant ( $p < 0.05$ ). Thus, Model 1 produced a significantly better fit for the data than Model 0.

**Table 3.** Correlation analysis among neuroticism, stress, and anxiety variables

Variables	1	2	3	4	5	6	7	8	9
<b>T1: Baseline</b>									
1. NEO-FFI-N									
2. Total MSIQ	0.31**								
3. MSIQ-SE	0.29**	0.92**							
4. MSIQ-WR	0.35**	0.91**	0.85**						
5. MASQ-D30-AA	0.27**	0.50**	0.47**	0.53**					
<b>T2: Follow-up</b>									
6. NEO-FFI-N	0.35**	0.18**	0.16**	0.22**	0.21**				
7. Total MSIQ	0.13*	0.34**	0.34**	0.27**	0.19**	0.15**			
8. MSIQ-SE	0.12*	0.32**	0.33**	0.24**	0.18**	0.15**	0.99**		
9. MSIQ-WR	0.12*	0.34**	0.34**	0.29**	0.17**	0.19**	0.89**	0.82**	
10. MASQ-D30-AA	0.19**	0.36**	0.35**	0.37**	0.30**	0.31**	0.29**	0.32**	0.34**

T1 is the baseline level; T2 is the follow-up level. NEO-FFI-N – NEO-Five-Factor Inventory-Neuroticism Subscale; MSIQ – Mental Stressor Investigation Questionnaire; MASQ-D30-AA – Mood and Anxiety Symptoms Questionnaire-30-item-Anxious Arousal Subscale; \* $p < 0.05$ ; \*\* $p < 0.01$

**Table 4.** Measurement model fit index values

Latent variable	$\chi^2$	df	TLI	CFI	SRMR	RMSEA
Neurotic personality	75.842	27	0.959	0.969	0.029	0.067
Ship environment	266.84	119	0.927	0.936	0.040	0.056
Work relationship	5.416	5	0.998	0.999	0.016	0.014
Anxiety symptom	40.913	14	0.972	0.981	0.024	0.069

TLI – Tucker-Lewis index; CFI – comparative fit index; SRMR – standardized root means square residual; RMSEA – root mean square error of approximation

There was a significant interaction (coefficient, 0.111;  $p = 0.032$ ) indicating that ship environmental stress plays a moderating role in the relationship between neuroticism and anxiety symptoms (path analysis in Fig. 2). A simple slope test showed that the regression coefficient of neuroticism affecting anxiety symptoms was significant in both the low environmental stress group ( $\beta = 0.121$ ,  $p < 0.05$ ) and the high environmental stress group ( $\beta = 0.342$ ,  $p < 0.05$ ), as shown in Figure 3.

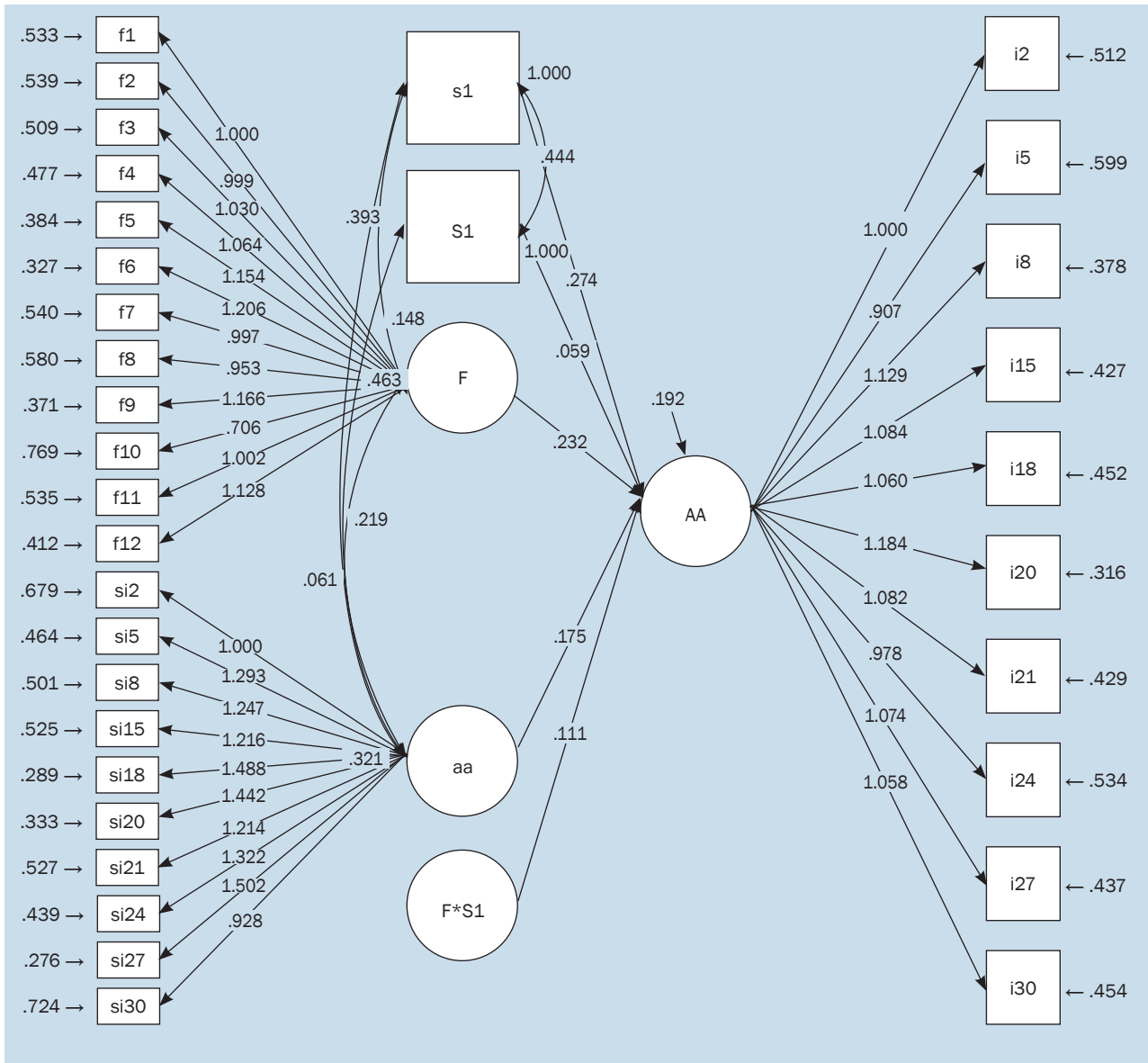
### MEDIATING EFFECT ANALYSIS

The fitting indexes of Model 1 were as follows:  $\chi^2$ /degrees of freedom = 1.860; TLI = 0.934; CFI = 0.939; SRMR = 0.054; and RMSEA = 0.046. All of these indexes met the acceptable standard criteria. Both neuroticism ( $\beta = 0.396$ ,  $p < 0.001$ ) and work-relationship stress ( $\beta = 0.380$ ,  $p < 0.001$ ) had significant positive predictive relationships with anxiety symptoms, while neuroticism also had a significant positive predictive relationship with work-relationship stress ( $\beta = 0.384$ ,  $p < 0.001$ ). As

shown in Table 5, the total effect of neuroticism on anxiety symptoms was 0.542, for which the 95% confidence interval [0.456, 0.628] did not contain 0, the mediation effect was 0.146 [0.089, 0.203], and the direct effect was 0.396 [0.298, 0.494], indicating that work-relationship stress had a partial mediating effect on the relationship between neuroticism and anxiety symptoms, and that mediating effect accounted for 26.94% of the total effect. The associated structural equation model is shown in Figure 4.

### DISCUSSION

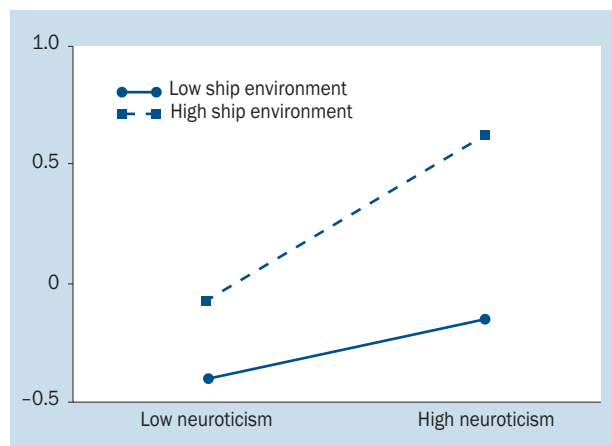
In the present study, we examined the relationship between neuroticism, work stress, and anxiety in a cohort of 397 marine fishermen. Structural equation analysis showed that the relationship between neuroticism and anxiety symptoms could be moderated by work environment stress, and that neuroticism had a direct effect on fishermen's anxiety symptoms and an indirect effect on anxiety through the mediating effect of work-relationship stress.



**Figure 2.** Moderating effect path diagram; F is neuroticism; s1 is baseline of ship environmental stress; S1 is follow-up of ship environmental stress; aa is baseline of anxiety symptom; AA is follow-up of anxiety symptom; F\*S1 is the interaction term

### ANXIETY SYMPTOMS IN FISHERMEN

Our descriptive analysis results were consistent with prior work indicating that negative emotional reactions, such as anxiety, appear to be connected to neuroticism levels and can lead to emotional disorder pathology [31]. In this context, anxiety symptoms refer to anxiety-specific symptoms, including indices of physical such as an accelerated heartbeat and shortness of breath. Distinguishing anxiety-specific symptoms reduces interference from similar mood disorders. A link between neuroticism level and anxiety vulnerability highlights the potential value of therapeutic strategies that target neuroticism control to prevent the onset of anxiety-specific symptoms, such as physiological hyperarousal.



**Figure 3.** Moderating effect simple slope test results



**Table 5.** Moderating effect analysis

Path	Effect type	Value	95% Confidence interval	
			Lower limit	Upper limit
Neuroticism → anxiety symptom	Total effect	0.542	0.456	0.628
	Mediating effect	0.146	0.089	0.203
	Direct effect	0.396	0.298	0.494

## NEUROTICISM, WORK-ENVIRONMENT STRESS, AND ANXIETY SYMPTOMS

The results of this study support the applicability of the diathesis-stress model in anxiety research. According to the diathesis-stress model, stress interacts with individual susceptibility traits to affect anxiety symptoms. He et al. [32] obtained concordant results in a study that used a tripartite model to examine whether neuroticism may be a predictor of anxiety-specific symptoms. In the hierarchical linear model presented in their study, neuroticism had a significant interaction with stress caused by exposure to increased levels of daily hassles and was found to be a predictor of anxiety-specific symptoms. Partially consistent with He et al.'s [32] results, in a study in which a hierarchical model of neuroticism was developed, Uliaszek et al. [22] found that only some facets of neuroticism were related to anxiety symptoms, although no singular facet of neuroticism had a specific predictive ability for anxiety. Uliaszek et al.'s [22] results, which are not inconsistent with the present results, have led us to hypothesize that perhaps it was only certain facets of neuroticism that interacted with environmental stress in the development of anxiety in our sample of fishermen. Examination of this possibility through the diathesis-stress model in future work may help clarify the pathogenesis of fishermen's anxiety.

Regarding the potential mediating role, fishermen with high neuroticism may be more likely to experience work-relationship stress, further aggravating their anxiety symptoms. High neuroticism favours hyper-focusing on stressful events, including objective stressors, such as a quarrel with a colleague, as well as subjective stressors, wherein one interprets neutral events as stressful [33]. Bolger et al. [34] showed that individuals with a high level of neuroticism were more likely to experience stress from colleagues, work, and other aspects of life, with conflicts and tensions with other people being a major source of daily stress that promotes the emergence of anxiety symptoms. And Song [35] reported recently that, compared to individuals with low neuroticism, highly neurotic individuals were more likely to attend to negative emotional stimuli, to interpret ambiguous information negatively, and to accept negative explanations. These findings suggest that fishermen with high levels of neuroticism may be more likely to interpret

ordinary work-relationship phenomena as interpersonal conflicts and tensions due to a negative cognitive bias, thus favouring anxiogenesis. It remains to be examined directly whether cognitive bias may also be a mediator between neuroticism and work-relationship stress.

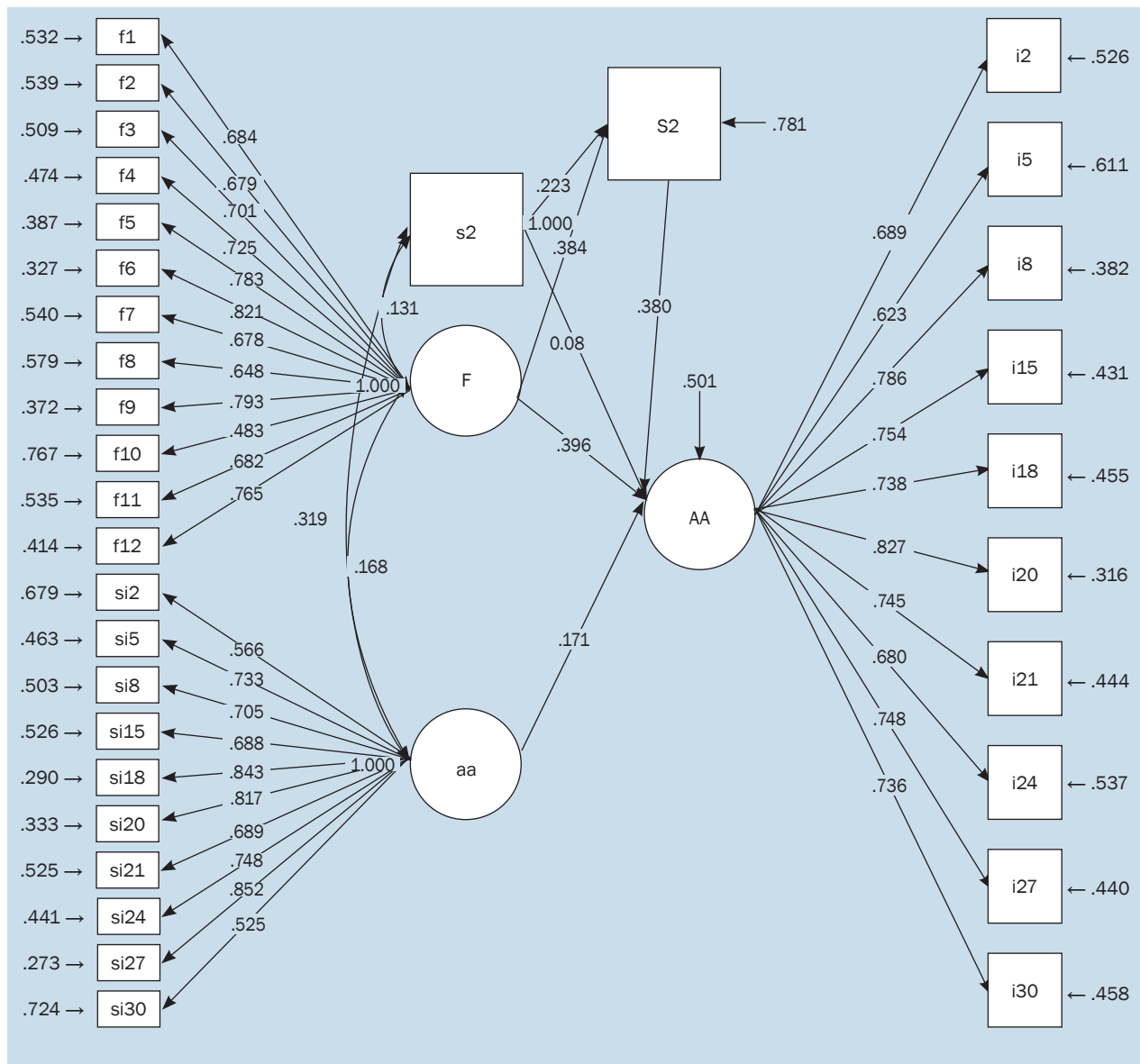
## LIMITATIONS OF THE STUDY

Several limitations of this study should be considered when interpreting the results. Firstly, only 397 subjects participated in this study, and all of the participants were from Hainan Province though China has thousands of fishermen from different regions. Thus the current sample cannot be considered representative of fishermen in general. Our sample size was constrained by the fact that marine fishermen go on multi-month voyages, and it is often difficult to re-establish contact with them for post-voyage surveys upon their return in a timely manner. Enlisting the help of the fishery association and the local government, which receive information on each port-incoming and port-outgoing ship's identification, is crucial to establishing such contacts. In addition, stress level and anxiety symptoms were each evaluated with only a single psychometric scale, which may limit the reliability and validity of this study. In future studies, multiple psychometric scale scores and physiological indicators of stress and anxiety (e.g. hair cortisol and blood catecholamine level) will be examined.

## CONCLUSIONS

Neuroticism was found to be a facilitator of the development of anxiety symptoms in fishermen in the context of environmental and social stresses associated with fishing expeditions. The present results provide some reference information for nations' policies regarding marine fishermen. Based on the diathesis-stress model, the present findings suggest that there is a need to improve fishermen's work environments to reduce anxiety, including the improvement of ship conditions by reducing noise exposure and increasing living space tidiness. Moreover, opportunities for fishermen to alleviate boredom on their voyages may be beneficial to the mental and physical health of fishermen.

Fatigue is an important contributory factor to stress in fishermen in different countries [34, 36]. In one study of British fishermen, for example, fishermen reported that



**Figure 4.** Structural equation modelling intermediary role diagram. F is neuroticism; s2 is baseline of work-relationships stress; S2 is follow-up of work-relationships stress; aa is baseline of anxiety symptom; AA is follow-up of anxiety symptom

fatigue was widespread; 41% of fishermen had fallen asleep at the wheel, and 43% had been so tired that they had slept on the deck or in the gangway [36]. Therefore, in addition to improving the working environment, policies that ensure that fishermen will have enough rest and sleep may enable them to better cope with work-related stressors.

Fishermen experience unexpected events, such as encounters with aquatic life and capsized boats that require strong cooperation among crew members. In the current study, we found that work relationships can be an anxiogenic factor for highly neurotic fishermen. Stress alleviating measures, such as entertainment, may help to improve these interpersonal relationships and thus support the abili-

ty of stressed fishermen to cooperate. Therapeutic interventions that target neuroticism directly may also be beneficial in terms of reducing anxiety symptoms. Moreover, a combination of clinical psychology and neuroscience approaches may help to identify behavioural indicators and biomarkers that are directly related to anxiety.

In addition to reducing anxiety symptoms by improving the work conditions of marine fishermen, a more systematic view of the problem is needed. In accordance with Engel's [37] medical model of bio-psycho-society, fishermen have occupationally elevated risks of cardiovascular diseases, skin diseases, and nicotine dependence [1, 38]. Both psychological and biological factors can contribute to psychosomatic



and somatopsychic diseases. Therefore, it is our view that fishermen should receive holistic healthcare that addresses both psychological and physical symptoms. Upon their return, fishermen should be seen by physicians for medical physical examinations as well as by clinical social workers or psychologists for mental health screening. Interactions between physiological and psychological factors should be considered in the treatment planning and clinical follow-up of fishermen exhibiting signs of potential physical disease or mental illness.

### COMPLIANCE WITH ETHICAL STANDARDS

All procedures for this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

### FUNDING

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### INFORMED CONSENT

Commercial fishermen were recruited from Mandarin Chinese in Tanmen Town, Qionghai, China. Signed consent forms were obtained from fishermen who expressed interest in participating in the study.

**Conflict of interest:** None declared

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