In Search of a Linkage Between Personality Traits and Interpersonal Behaviour During the COVID-19 Pandemic: A Case Study on Indian Marine Engineers Using Structural Equation Modelling

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Abstract

Building and maintaining social and interpersonal relationships are crucial for mental health. However, due to the unique characteristics of jobs, building and maintaining such interpersonal relationships with colleagues as well as others may not be as similar to off-shore employees like shore-based ones. On the contrary, preference towards exhibiting interpersonal relationship behaviour is another area that needs attention in the maritime sector. Such preferences may be unique while individuals pass through uncertain situations like the coronavirus disease-2019 (COVID-19) pandemic. Against the backdrop of the COVID-19 pandemic, this study investigates the linkages between personality traits and interpersonal relationship behaviours among Indian marine engineers. Data was gathered through snowball sampling from 385 marine engineers utilising the Big Five Inventory and the Fundamental Interpersonal Relationship Orientation-Behavior™ framework after necessary adaptations of these instruments. Results show that conscientiousness is linked to expressed inclusion and wanted control. Extraversion is linked with all behaviours except wanted control, while agreeableness is associated with expressed control. Neuroticism shows linkages with wanted inclusion, expressed control, and wanted control. This study fills critical research gaps by examining the missing links between personality traits and interpersonal relationships in a high-stress environment like the maritime sector and that too during the COVID-19 pandemic. These insights emphasise the need for effective communication and teamwork in high-stress maritime environments.

Keywords: Personality traits, Interpersonal relationship, COVID-19, Structural equation modelling

1. Introduction

Since the beginning of human civilisation, building relationships with others has been considered to be an important aspect of survival. There are diverse opinions towards the developing relationships among people. While some people can establish relationships with others at ease, others may struggle to do so. Cheek and Buss [1] have shown that sociability and the development of interpersonal relationships are linked to emotional wellbeing. Though the mechanisms behind it are not clear, it is generally accepted that interpersonal relationship has an impact on an individual's health [2].

Martino et al. [3] carried out a thorough review of existing literature and concluded that building and maintaining relationships with others has significant impacts on health and weight management, diabetes, cardiovascular diseases and even cancer. However, with the advent and mass penetration of the internet and smartphones, connecting with others has become far easier than in earlier days. The massive usage of social networking sites accelerated the pace of getting connected further. At the same time, social media has been found to be responsible for degrading social skills and, thereby, avoidance of face-to-face interactions [4]. Research also indicates that the use of social media impacts the interpersonal relationships of individuals [5,6]. Two studies by Humphreys and Hardeman [7] and Bhattacharjee and Begum [8] indicated that the use of mobile phones significantly impacts interpersonal communication as well as the quality thereof.

While interpersonal relationships have been adversely impacted nowadays, Sullivan [9] viewed "personality",

To cite this article: T. Mitra. "In Search of a Linkage Between Personality Traits and Interpersonal Behaviour During the COVID-19 Pandemic: A Case Study on Indian Marine Engineers Using Structural Equation Modelling." *Journal of ETA Maritime Science*, vol. 12(3), pp. 263-276, 2024.

which is a unique way of thinking, feeling and behaving, as a relatively stable pattern of interpersonal behaviours arising from interaction with others, especially during critical developmental periods. Such personality gradually develops since their childhood and through the interactions between their biological, environmental and psychological factors. While people carry out day-to-day activities associated with their jobs in an organisational setup, their personality traits play crucial roles in creating and maintaining connections with others.

The maritime industry is one of the oldest industries in human history and operates, among others, through different types of merchant ships, sailing of which largely depends on proper intra-department as well as inter-department coordination and cohesive teamwork. The Director General of Shipping, Government of India, has indicated two types of commercial ships, viz., "cargo ship" and "passenger ship" [10]. While the passenger ships are broadly divided into (i) ferry ships and (ii) cruise ships, which carry passengers [11], the cargo ships are broadly categorised as (i) dry cargo ships, which are used to transport dry cargo of different kinds, (ii) liquid cargo ships for carrying liquid bulk cargo including liquid gases like LNG, and (iii) specialised cargo ships for transporting extremely heavy or bulky objects [12]. Like an organisation, a cargo ship also sails due to the concerted effort of seafarers of three departments, viz., (i) deck department, in which the deck officers are responsible for the safe navigation of the ship; (ii) engine department, where the marine engineers are responsible for repair and maintenance of ship's engines and equipment and (iii) saloon department, which takes care of preparation and serving food and allied services to the crew members. On the other hand, while for a cruise ship, the functioning of the deck department and engine department are similar, the hotel department, which is not seen on cargo ships, is the largest department and takes care of food, entertainment, medical necessities, etc., for the passengers [13]. Therefore, working on a ship is associated with certain unique features which are rarely alike shore-based jobs. In this backdrop, the present study is an attempt to explore the association between personality traits and interpersonal relationships in an onboard environment.

1.1. Review of Literature

The job characteristics of maritime professionals are unique in nature. They need to sail the ships with a handful number of personnel without holidays/leave and stay away from family members for months together. Day-to-day interactions are mostly among the onboard fellow seafarers only, who are generally multinational as well as multicultural in nature. At the same time, seafarers join ships on short-period contracts, which mostly vary between 3 to 6 months. According to Staniulienė and Kučinskaitė [14], the personal relationship among employees, which develops over time while working together, has a greater impact on the employees and organisation compared to working relationships. However, the development of such personal relationships onboard may not be easy as crew members keep on signing off after the completion of respective short contract periods.

On the other hand, several researchers have highlighted seafaring profession is associated with a higher level of psychological stress [15-18]. Studies also confirmed that healthy interpersonal relationships among employees could contribute towards lowering stress levels [19,20]. According to Bowlby [21], developing and maintaining positive interpersonal relationships are important determinants of mental wellbeing. Stewart and Harkness [22] opined that poor interpersonal relationships are responsible towards developing negative emotions. Therefore, based on the above studies, it can be presumed that positive interpersonal relationships may play an important role in reducing stress levels among seafarers and helping them towards positive mental health.

As indicated above, a healthy interpersonal relationship may lead to reduced levels of stress; several studies have also found that an important factor which impacts organisational teamwork is the opportunity for interaction among team members [23-25]. Interpersonal relationships have been found necessary for fostering teamwork, sharing ideas and overcoming unpleasant work experiences [26]. As the number of onboard seafarers is limited and there is an utmost necessity to sail the ship in time time-bound manner, proper teamwork among the employees of all departments is an absolute necessity.

In continuation to the positive aspects of healthy interpersonal relationships, several studies indicate that positive interpersonal relationships at workplaces improve job satisfaction, job commitment, perceived organisational support, etc. [27-32].

As interpersonal relationships have been found to be a strong determinant of psychological stress, teamwork, job statifaction as well as job commitment, Stoetzer [33] argued that personality traits of the employees majorly govern interpersonal relationships in the workplace. Some of the studies have indicated that while some personality traits are responsible for forming unhealthy relationships, others intend to form positive ones [34-36].

Previous studies have shown that a person with a dominant extraversion trait develops positive interpersonal relationships compared to other traits [37-41]. According to Craenen et al. [42], personality traits influence human-human interactions through engaging and disengaging behaviours. Based on several studies, it is argued that while some personality traits

contribute towards healthy interpersonal relationships, others lead to unhealthy/toxic relationships [41,42]. Lewis [39] opined that while friendship between two individuals with dominant extrovert personality traits may develop to have fun together, such a friendship between two introverts may develop to share their emotions and feelings. Bang and Sim [43] researched nursing students who experience a higher level of occupational stress and found a significant correlation between personality and interpersonal relationships.

The interpersonal relationship has been seen to be affected during the coronavirus disease-2019 (COVID-19) pandemic situation by some of the studies. According to Lee [44], the social and interpersonal relationship was found to be tense. A survey conducted by the University of Minnesota revealed that 39% of the respondents felt that the COVID-19 pandemic had influenced their interpersonal relationships with family members and friends to some extent, while 30% of respondents felt such influence to a great extent [45]. Ades [2] has identified that during the pandemic, interactions were affected, including among family members. Existing studies also reveal that as the duration of the COVID-19 pandemic extended, social connections and social capital declined [46,47].

Though the maritime sector was one of the least disrupted compared to many other industries during the COVID-19 pandemic, the seafarers, who are the backbone of this industry, had to go through a series of unhappy moments. As it is well established that seafarers lack the opportunity to interact with the people at the shore in general, the COVID-19 pandemic snatched away whatever little opportunity they have by way of restrictions on shore leave as well as crew changes. A number of studies conducted on the impacts of the COVID-19 pandemic on seafarers clearly indicate their plights. 40% of the respondents in a study stated that they felt symptoms of depression, and 50% reported that they experience anxiety on a regular basis almost every day [48]. On the other hand, studies also indicate that during the pandemic, seafarers were anxious about getting infected by their fellow crew members [49]. Thereby, seafarers were in a situation where, due to restrictions on shore leaves, neither they could disembark during port stays nor they could go back to their families, and on top of that, the anxiety of getting infected was always there. Another study by Erdem and Tutar [50] found that anxiety among seafarers during the COVID-19 pandemic significantly impacts work stress. Therefore, there are enough pieces of evidence to cite that the COVID-19 pandemic posed a number of ill effects on seafarers worldwide.

1.2. Research Gaps

The existing studies elaborated that personality traits are associated with developing interpersonal relationships among individuals. Most of the studies focus on either individuals in general or employees performing jobs with moderate levels of stress. On the other hand, the prevalent studies directed towards personality and interpersonal relationships are carried out during situations under normal circumstances. Though some of the studies aimed at finding out the impact of the COVID-19 pandemic on interpersonal relationships, such studies are scanty in the maritime sector. At the same time, though some of the studies in this area, i.e., the linkages between personality and interpersonal relationship [Fundamental Interpersonal Relationship Orientation-Behavior™ (FIRO-B®)], are available and are conducted based on responses from students, the linkages are rarely explored for working professionals.

In view of the above, the researcher has identified the following research gaps.

• Existing studies support the theory that interpersonal relationship has an impact on lowering stress levels, but studies on whether, during stressful situations, people tend to develop better interpersonal relationships are hardly available.

• Research in the areas of personality and interpersonal relationship behaviours involving employees engaged in jobs responsible for higher levels of occupational stress, like seafaring, is limited, and

• The linkage between personality traits and interpersonal relationship behaviours among seafarers during uncertainties like the COVID-19 pandemic is hardly explored.

1.3. Objectives of the Study

This study aims to identify linkages between the personality traits of Indian marine engineers and their interpersonal relationship behaviours during uncertain periods. In the present study, the period of the COVID-19 pandemic has been considered an uncertain period.

1.4. Research Question

The following research question is framed with reference to the COVID-19 pandemic period.

RQ_1: Do interpersonal relationship behaviours among Indian marine engineers differ across job ranks?

RQ_2: During the COVID-19 pandemic, do Indian marine engineers' personality traits have a significant linkage with their interpersonal behaviours?

2. Materials and Methods

2.1. Sampling and Data Collection

Given the specialised nature of marine engineering as a profession and its global dispersion, as well as the absence of a defined sample frame, the researcher opted for the snowball sampling method. The snowball sampling method

has been recognised as a viable method of collecting data if the target participants are not easily accessible or not known to the researcher [51-54]. In the case of snowball sampling, new respondents are included in the sample by the existing respondents. Following the ethical research practices, prior to data collection, consents from the respondents were obtained, and a questionnaire was shared with them. While sharing the questionnaire, details about the use of the data were clearly stated, and the respondents voluntarily participated in the survey.

The major limitation of snowball sampling is that those who have a network are included in the survey, and excluding those who do not have a network, thereby, there can be a chance of biases among the respondents while responding. With an intention to overcome such an issue, this study considers respondents who have a large network and who do not have that large network. Therefore, this study attempts to limit biases found in results, which are generally found in studies based on snowball sampling. On the other hand, as the sample distribution follows a normal curve (the distribution of the data has been indicated at a later stage of this paper), the parametric statistical tests, which in general are more powerful than non-parametric tests [55], are applied to achieve the study objectives.

As the population is large, Cochran's formula, which is considered especially appropriate in situations with large populations [56], is used in the present study to determine sample size. According to Cochran, the minimum sample size should be 385 (95% confidence interval and 5% margin of error), as calculated below.

$n = \{p (1 - p) z2\}/e2$

n = sample size

p = the population proportion (if unknown, p=0.50) [57]

e = acceptable sampling error (e=0.05)

z = z value at reliability level or significance level. Reliability level 95% or significance level 0.05; z = 1.96.

An online survey was carried on, and data was collected from 385 Indian marine engineers during February 2021 and July 2022 who had experience on various types of vessels and had sailed both before and during the COVID-19 pandemic. Each rank, including "Chief engineer", "Second engineer", "Third engineer", and "Fourth engineer", contributed responses.

While responses are obtained from all job ranks, their representations in the sample are carried out keeping in mind the day to day interactions they need to carry out due to the nature of the job and responsibilities. Though the chief engineers are overall in-charge of the ships' engine departments, in practice, it is the second engineers who are continuously in direct contact and interaction with all employees of the engine department, and the chief engineers

rely heavily on the second engineers. On the other hand, as the third engineers are next in the rank to second engineers as well as more experienced than the fourth engineers, interactions between them are also more compared to the fourth engineers, who are junior most in the ranks and are mostly engaged with maintenance of a limited number of equipment/machine.

2.2. Tools Used for Data Collection

The following instruments were used to collect data:

i) Socio-demographic variables:

Data on age, gender, marital status, job experience, and more were gathered through a structured questionnaire focusing on socio-demographic aspects. Descriptive statistics were applied to analyse the collected data.

ii) The Big Five Personality Traits:

The Big Five Inventory, also known as the OCEAN model of personality, is the most widely used and empirically supported model of personality traits [58-60], which consists of 44 items, employs a five-point Likert scale (ranging from 1, "Strongly Disagree", to 5, "Strongly Agree"). According to the theory, individual differences in five personality dimensions account for the ways people think, feel, and interact with others. This instrument was developed by Goldberg [61] and assessed an individual's personality across five dimensions: (i) "Extraversion", encompassing qualities such as assertiveness and sociability; individuals with lower extraversion tend to be more reserved. (ii) "Agreeableness", reflecting friendly behaviour and flexibility in interactions; individuals with lower agreeableness may display rigidity in their dealings with others. (iii) "Conscientiousness", characterised by qualities like orderliness, responsibility, and dependability. (iv) "Neuroticism", which pertains to emotional stability and the extent to which individuals experience stress, anxiety, anger, and depression. (v) "Openness", encompassing attributes such as acceptance of new ideas, curiosity, and imagination. Researchers are increasingly using the Big Five factors to gain insights into psychological disorders like anxiety and depression.

The present study uses the above Big Five Inventory in an adapted form after identifying factor loads, internal consistency and validity of the scale, which are shown in the next section. The adapted form of the Big Five Inventory used in the present study consists of 35 items.

iii) Fundamental Interpersonal Relationship Orientation-Behavior™ (FIRO-B®):

The theory of Fundamental Interpersonal Relationship Orientation focuses on the interpersonal relationships of individuals based on their intention to interact with others. The FIRO-B®, developed by Schutz [62], a widely used six-

point Likert scale tool [63], has garnered recognition and acceptance among scholars, researchers, and practitioners for comprehending how individuals manifest behaviour driven by their interpersonal behaviours. This assessment evaluates an individual's interpersonal conduct by considering their inclination to engage with others, as proposed by Schutz [62] in 1958. The FIRO-B assesses behaviours related to interpersonal needs, as outlined by Hammer and Schnell [64], focusing on three distinct dimensions: (1) inclusion, (2) control, and (3) affection, which can sufficiently explain most of the human interactions [65]. Such needs are again driven by an individual's two different interpersonal behaviours, viz., "expressed behaviours" and "wanted behaviours", while the expressed behaviours reflect the extent an individual shows such behaviour, e.g., "affection" towards others, wanted behaviours are the manifestation of that individual to what extent he/she expects others to show affection towards him/her. Thereby, the FIRO-B® instrument can reveal three different interpersonal needs and six interpersonal behaviours associated with such needs.

The researcher in the present study adapted the FIRO-B® instrument after assessing its factor loads, reliability and validity, which are shown in the next section. The adapted form of this instrument used in this present study consists of 45 items.

2.3. Internal Consistency and Validity of the Instruments

While using the Big Five Inventory and FIRO-B® scales for this present study, the respective instrument's reliability and validity were assessed and compared the same with the original scales. Such a task led towards the exclusion of items that did not meet the validity criteria from the final questionnaire. The Cronbach's alpha score for the reliability of the scale BFI with its original data for all dimensions was

above 0.90 [61], and that for FIRO-B® was between 0.85 to 0.96 [62]. The final questionnaire comprises questions and statements related to (i) socio-demographic variables (consisting of 5 questions), (ii) the Big Five Inventory (comprising 35 items), and (iii) the FIRO-B® (comprising 45 items). Confirmatory factor analysis was carried on, and the factor loadings are shown in Tables 1A and 1B. Items having a factor loading of 0.50 or higher were retained in the instrument, with the exception of item 21 in the Big Five personality traits instrument, where the factor loading was almost 0.50. The reliability and validity scores for the validated instruments are presented in Tables 2A and 2B.

All variables exhibit Cronbach's alpha values exceeding 0.70, thereby confirming the strong internal consistency of both instruments. As per the criteria outlined by Fornell and Larcker [66], it is acceptable for the Average Variance Explained (AVE) to be below 0.50 as long as the Composite Reliability (CR) exceeds 0.60. The scores for CR, AVE, and Heterotrait-Monotrait Ratio of Correlations collectively demonstrate satisfactory discriminant and convergent validity.

2.4. Data Analysis Using "R"

In the present study, the programming language "R" is used to analyse the data. R is a programming language used generally for statistical analysis. For the purpose of answering the research question RQ_1, ANOVA is performed to understand if significant differences exist with regard to interpersonal relationship needs among Indian marine engineers across job ranks. On the other hand, to answer the research question RQ_2, Structural Equation Modelling (SEM) with Diagonally Weighted Leasts Square is used.

Table 1A. Factor loads of big five personality instrument

Item no.	Factor	Factor load	Item no.	Factor	Factor load	Item no.	Factor	Factor load	Item no.	Factor	Factor load
1	E	0.71	12	A	0.63	23	C	0.70	34	N	0.60
2	A	0.31	13	C	0.64	24	N	0.30	35	O	0.73
3	C	0.33	14	N	0.72	25	O	0.59	36	E	0.65
4	N	0.66	15	O	0.55	26	E	0.43	37	A	0.67
5	O	0.83	16	E	0.51	27	A	0.88	38	C	0.67
6	E	0.67	17	A	0.73	28	C	0.54	39	N	0.62
7	A	-0.43	18	C	0.55	29	N	0.57	40	O	0.58
8	C	0.59	19	N	0.67	30	O	0.54	41	O	0.65
9	N	-0.26	20	O	0.21	31	E	0.51	42	A	0.63
10	O	0.32	21	E	0.49	32	A	0.56	43	C	0.65
11	E	0.50	22	A	0.78	33	C	0.31	44	O	0.70
E: Extraversion, A: Agreeableness, C: Conscientiousness, N: Neuroticism, O: Openness											

Table 1B. *Factor loads of FIRO-B® instrument*

Item no.	Factor	Factor load	Item no.	Factor	Factor load	Item no.	Factor	Factor load	Item no.	Factor	Factor load	Item no.	Factor	Factor load	Item no.	Factor	Factor load
1	eI	0.78	10	wC	0.85	19	eA	0.37	28	wI	0.76	37	wI	0.84	46	wA	0.44
2	wC	0.79	11	eI	0.88	20	wC	0.71	29	wA	0.90	38	wA	0.82	47	eC	0.63
3	eI	0.80	12	eA	0.73	21	eA	0.65	30	eC	0.85	39	wI	0.38	48	wI	0.60
4	eA	0.61	13	eI	0.56	22	wC	0.34	31	wI	0.73	40	wA	0.60	49	wA	0.74
5	eI	0.55	14	wC	0.14	23	eA	0.74	32	wA	0.93	41	eC	0.19	50	eC	0.53
6	wC	0.81	15	eI	0.87	24	wC	0.62	33	eC	0.83	42	wI	0.73	51	wI	0.71
7	eI	0.76	16	eI	0.77	25	eA	0.79	34	wI	0.83	43	wA	0.33	52	wA	0.71
8	eA	0.63	17	eA	0.26	26	wC	0.77	35	wA	0.88	44	eC	0.82	53	eC	0.70
9	eI	0.86	18	wC	0.79	27	eA	0.77	36	eC	0.89	45	wI	0.24	54	eC	0.79

eI: Expressed Inclusion, eA: Expressed Affection, eC: Expressed Control, wI: Wanted Inclusion, wA: Wanted Affection, wC: Wanted Control, FIRO-B®: Fundamental Interpersonal Relationship Orientation-Behavior™

Table 2A. *Reliability and validity of big 5 personality questionnaire*

Variables	Cronbach's alpha	AVE	CR	HTMT				
				Extravert	Agreeableness	Conscientiousness	Neuroticism	Openness
Extravert	0.74	0.41	0.82					
Agreeableness	0.81	0.35	0.81	0.64				
Conscientiousness	0.83	0.38	0.84	0.77	0.69			
Neuroticism	0.85	0.48	0.85	-0.60	-0.59	-0.62		
Openness	0.78	0.48	0.82	0.69	0.51	0.50	-0.50	

Table 2B. *Reliability and validity of FIRO-B® questionnaire*

Variables	Cronbach's alpha	AVE	CR	HTMT					
				eI	eA	eC	wI	wA	wC
eI	0.906	0.54	0.91	0.74					
eA	0.888	0.62	0.92	0.74	0.41				
eC	0.869	0.52	0.88	0.41	0.41	0.44			
wI	0.958	0.72	0.72	0.96	0.72	0.44	0.73		
wA	0.822	0.59	0.88	0.63	0.87	0.42	0.73	0.05	
wC	0.865	0.46	0.87	0.02	0.04	0.15	0.05	0.04	

HTMT: Heterotrait-Monotrait Ratio of Correlations, AVE: Average Variance Explained, CR: Composite Reliability

As described by Bentler and Chou [67], SEM is a statistical approach which adopts a hypothesis-testing perspective for the examination of a structural theory pertaining to a particular phenomenon. SEM encompasses two key facets: (i) the use of a series of regression equations to depict the causal processes under investigation and (ii) the ability to visually model these structural equations to enhance the conceptualisation of the theory being studied. The constructed model undergoes testing, and if it demonstrates satisfactory goodness of fit, it suggests reasonable relationships among the variables.

3. Results

3.1. Descriptive Statistics

3.1.1. Demographic profile of the respondents

Table 3 below shows the demographic profile of the participants. Except for 1 female, all 384 respondents were male only.

Table 4 below shows that skewnesses of almost all of the variables are less than 1, and all are below 2. According to George and Mallery [68], the value of skewness and kurtosis ± 2 is accepted to be considered a normal distribution. Table 4 below indicates that skewness and kurtosis are close to zero; hence, the responses are considered a normal distribution [68,69].

Table 3. Descriptive statistics of the respondent's demographic profile

	Job rank							
	Chief engineer		Second engineer		Third engineer		Fourth engineer	
Age (Years)	Count	%	Count	%	Count	%	Count	%
21-25	0	0.00	0	0.00	1	0.26	17	4.42
26-30	2	0.52	30	7.79	48	12.47	50	12.99
31-35	14	3.64	94	24.42	34	8.83	2	0.52
36-40	31	8.05	32	8.31	3	0.78	0	0.00
41-45	9	2.34	2	0.52	0	0.00	0	0.00
46-50	8	2.08	1	0.26	1	0.26	0	0.00
51-55	3	0.78	1	0.26	0	0.00	0	0.00
56-60	1	0.26	0	0.00	0	0.00	0	0.00
61-65	0	0.00	0	0.00	0	0.00	0	0.00
66-70	1	0.26	0	0.00	0	0.00	0	0.00
Total	69	17.92	160	41.56	87	22.60	69	17.92
Source: Table adapted from primary data collected by the author								

Table 4. Skewness and kurtosis of data (n=385)

	Job ranks →	Chief engineer		Second engineer		Third engineer		Fourth engineer	
	Variables ↓	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Big Five Personality Traits	Openness	-0.37	0.15	0.00	-0.25	-0.40	-0.14	-0.18	-0.15
	Conscientiousness	-0.22	-0.88	-0.53	-0.54	-0.51	-0.14	-0.23	-0.50
	Extraversion	-0.32	-0.17	-0.58	0.94	-0.17	-0.73	-0.14	0.06
	Agreeableness	-0.41	-0.09	-0.61	0.88	-0.51	-0.29	-0.19	-0.35
	Neuroticism	0.27	-0.51	0.35	-0.33	0.65	0.37	0.21	-0.55
FIRO-B®	Expressed inclusion	-0.32	-0.38	-0.65	0.18	-0.20	-0.65	-0.69	0.47
	Expressed affection	-0.46	-0.48	-0.27	-0.43	0.23	-0.68	-0.38	-0.50
	Expressed control	-0.18	0.04	-0.40	0.20	0.08	-0.28	-0.07	-0.22
	Wanted inclusion	-0.18	-0.67	-0.56	0.15	-0.21	-1.01	-1.05	1.79
	Wanted affection	-0.24	-0.37	-0.19	0.03	0.23	-0.38	-0.02	-0.87
	Wanted control	0.72	0.46	0.54	-0.15	1.18	1.94	0.18	-0.39
Source: Developed by the author from proprietary datasets FIRO-B®: Fundamental Interpersonal Relationship Orientation-Behavior™									

Table 5. *Levene's test of homogeneity of variance*

Variable	Df	F	p-value
Expressed inclusion	3	2.2169	0.0857
Expressed control	3	1.3087	0.2712
Expressed affection	3	0.7982	0.4954
Wanted inclusion	3	1.1156	0.3426
Wanted control	3	1.2662	0.2857
Wanted affection	3	0.8278	0.4792

3.1.2. Interpersonal relationship needs across job ranks

RQ_1: Do interpersonal relationship needs among Indian marine engineers differ across job ranks?

Levene's test for homogeneity of variance as shown in Table 5 above indicates test statistics in connection with "inclusion", "control" and "affection" across job ranks.

Based on the F values and corresponding p-values in Table 5 above, the assumption of homogeneity of variances is established. Thereby, ANOVA is performed to obtain the answer to the above research question, and the test result is shown in Table 6A below.

Except for expressed control, the p-values (Pr>F) associated with the ANOVA, as shown in Table 6A, are all well above 0.05, revealing no significant difference among Indian marine engineers with regard to their interpersonal relationship behaviours on expressed inclusion, expressed affection, wanted inclusion, wanted control and wanted affection across job ranks. As a significant difference is identified regarding expressed control behaviour on the basis of job ranks, a post-hoc test is carried on to identify the specific job ranks in this regard and the output is shown in Table 6B, which indicates that chief engineers and fourth engineers differ significantly in their expressed control behaviours.

Table 6A. *ANOVA on interpersonal needs based on job ranks*

Expressed inclusion	Df	Sum. Sq	Mean. Sq	F.value	Pr(>F)
Job rank	3	339	113.12	1.597	0.19
Residuals	381	26993	70.85		
Expressed control	**Df**	**Sum. Sq**	**Mean. Sq**	**F.value**	**Pr(>F)**
Job rank	3	526	175.50	3.908	0.00
Residuals	381	17106	44.90		
Expressed affection	**Df**	**Sum. Sq**	**Mean. Sq**	**F.value**	**Pr(>F)**
Job rank	3	121	40.26	0.755	0.520
Residuals	381	20327	53.35		
Wanted inclusion	**Df**	**Sum. Sq**	**Mean. Sq**	**F.value**	**Pr(>F)**
Job rank	3	141	47.12	0.537	0.657
Residuals	381	33458	87.82		
Wanted control	**Df**	**Sum. Sq**	**Mean. Sq**	**F.value**	**Pr(>F)**
Job rank	3	266	88.60	1.549	0.201
Residuals	381	21790	57.19		
Wanted affection	**Df**	**Sum. Sq**	**Mean. Sq**	**F.value**	**Pr(>F)**
Job rank	3	316	105.24	2.571	0.054
Residuals	381	15596	40.93		
ANOVA: Analysis of Variance					

Table 6B. *Post-hoc test for expressed control behaviour*

Job ranks	Difference	Lower bound	Upper bound	p-value
Second eng. Viz-a-viz. Chief eng.	-0.68	-3.17	1.81	0.89
Third eng. Viz-a-viz. Chief eng.	-2.47	-5.25	0.32	0.10
Fourth eng. Viz-a-viz. Chief eng.	-3.14	-6.09	-0.20	0.03
Third eng. Viz-a-viz. Second eng.	-1.78	-4.09	0.52	0.19
Fourth eng. Viz-a-viz. Second eng.	-2.46	-4.96	0.029	0.05
Fourth eng. Viz-a-viz. Third eng.	-0.68	-3.47	2.11	0.92

In addressing RQ₂, the current research examines the linkages between five distinct personality traits and three different interpersonal relationship needs among Indian marine engineers during the period of the COVID-19 pandemic.

RQ₂: During the COVID-19 pandemic, do Indian marine engineers' personality traits have a significant linkage with their interpersonal behaviours?

R programming language is used to perform Structural Equation Modeling (SEM) along with creation of a path diagram, and the results are displayed in Figure 1 and Table 7 below.

Opn: 'Openness'
Con: 'Conscentiousness'
Ext: 'Extraversion'
Agr: 'Agreeableness'
Ner: 'Neuroticism'
eI: 'Expressed Inclusion'
eA: 'Expressed Affection'
eC: 'Expressed Control'
wI: 'Wanted Inclusion'
wA: 'Wanted Affection'
wC: 'Wanted Control'

Model fit indecies:
Chi sq/df=1.82, CFI=0.96, AGFI= 0.92, TLI=0.96, RMSEA=0.05, SRMR= 0.07
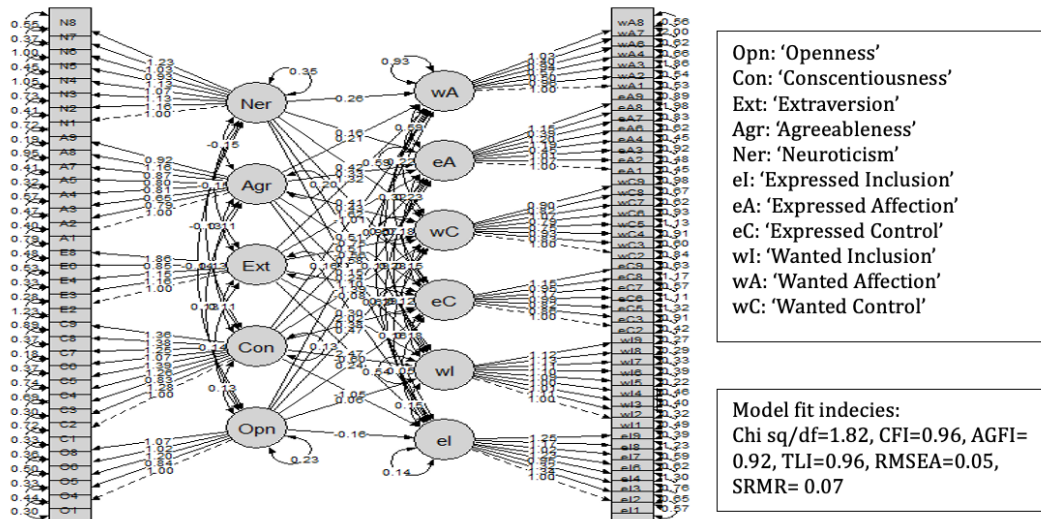
Figure 1. *Structural Equation Path model: Linkages between personality traits and interpersonal relationship needs*

Table 7. *Regression coefficients of personality traits (independent variables) and interpersonal relationship behaviours (dependent variable)*

Independent var.	Dependent var.	Estimate	Std. Err.	z-value	p-value	Std	Std.all
Openness	eI	-0.164	0.260	-0.632	0.527	-0.099	-0.099
	wI	0.062	0.283	0.219	0.827	0.031	0.031
	eC	0.245	0.250	0.978	0.328	0.131	0.131
	wC	0.469	0.307	1.529	0.126	0.223	0.223
	eA	-0.081	0.269	-0.300	0.764	-0.042	-0.042
	wA	0.579	0.344	1.682	0.093	0.257	0.257
Conscientiousness	eI	-1.052	0.480	-2.192	0.028	-0.481	-0.481
	wI	-0.599	0.522	-1.147	0.251	-0.229	-0.229
	eC	0.383	0.503	0.763	0.446	0.155	0.155
	wC	-1.394	0.650	-2.145	0.032	-0.504	-0.504
	eA	-0.556	0.556	-1.001	0.317	-0.220	-0.220
	wA	-1.011	0.645	-1.568	0.117	-0.340	-0.340
Extraversion	eI	2.474	0.544	4.547	0.000	1.242	1.242
	wI	2.025	0.541	3.742	0.000	0.849	0.849
	eC	1.105	0.407	2.716	0.007	0.492	0.492
	wC	0.510	0.426	1.199	0.230	0.202	0.202
	eA	1.619	0.439	3.686	0.000	0.702	0.702
	wA	1.320	0.500	2.637	0.008	0.487	0.487

					Table 7. Continued		
Independent var.	**Dependent var.**	**Estimate**	**Std. Err.**	**z-value**	**p-value**	**Std.lv**	**Std.all**
Agreeableness	eI	0.296	0.280	1.058	0.290	0.167	0.167
	wI	0.237	0.286	0.828	0.408	0.112	0.112
	eC	-0.753	0.277	-2.720	0.007	-0.377	-0.377
	wC	0.432	0.337	1.283	0.199	0.193	0.193
	eA	0.333	0.306	1.088	0.276	0.162	0.162
	wA	0.210	0.338	0.623	0.534	0.087	0.087
Neuroticism	eI	0.149	0.132	1.121	0.262	0.110	0.110
	wI	0.506	0.158	3.199	0.001	0.314	0.314
	eC	0.406	0.137	2.968	0.003	0.267	0.267
	wC	0.422	0.153	2.760	0.006	0.248	0.248
	eA	0.165	0.138	1.193	0.233	0.106	0.106
	wA	0.256	0.153	1.675	0.094	0.140	0.140
Source: Author-generated estimates based on structural equation modelling var.: Variables, Std. Err.: Standard error							

The above path diagram and Table 7 show, during the period of the pandemic,

• Openness is the only personality trait which is not liked with any of the interpersonal relationship behaviours.

• Conscientiousness has significant linkages with expressed inclusion and wanted control behaviours.

• Extraversion trait is linked with all interpersonal relationship behaviours except wanted control.

• The agreeableness trait is linked to expressed control behaviour.

• Neuroticism personality trait is linked to wanted inclusion, expressed control as well as wanted control.

4. Findings and Discussion

One of the findings of the study is that, except one, for all interpersonal relationship behaviours, viz., expressed inclusion, expressed affection, wanted inclusion, wanted control and wanted affection, there is no significant difference among the Indian marine engineers across job ranks. However, significant differences are visible across job ranks with respect to expressed control behaviours. Such a finding partially supports an existing study which found a significant difference across job ranks with regard to expressed inclusion, wanted inclusion, expressed control and wanted control [70]. The findings also reveal that the highest difference with regard to expressed control behaviour is between fourth engineers and chief engineers, while the least is between second engineers and chief engineers, as well as between fourth engineers and third engineers. The job rank of "Chief Engineer" onboard is similar to a Head of the Department, and that of "Second Engineer" is second in

command. They both work in a managerial capacity, actively associated with onboard problem-solving and decision-making. It is already established that onboard activities are carried out in coordination with all team members, in which their active participation is an absolute necessity. The persons who are responsible for getting the job done through the team members, i.e., the chief engineers and the second engineers, take utmost care in proper coordination of the team and continuously keep track of the team functioning. On the other hand, as the fourth engineers and third engineers carry out the instructions given by the chief engineers and second engineers and rarely make crucial decisions, the expressed control behaviour is found least for the fourth engineers and also less for the third engineers.

The number of studies available in the areas of exploring the interplay between personality traits and interpersonal relationship behaviours is scanty. This present study is probably the first of its kind, which reveals the linkages between Big Five personality traits and FIRO-B® constructs among Indian marine engineers. A study on 192 students by Mahoney and Stasson [71] found extraversion personality trait is a pervasive aspect of relationships. The study also revealed a positive relationship between neuroticism and wanted control. Such a finding supports the present study, which explored significant linkages between extraversion and almost all interpersonal relationship behaviours, except wanted control. Furnham and Crump [72] in a study on MBTI personality types and FIRO-B®, found positive correlations between extraversion and expressed inclusion, wanted inclusion, as well as expressed affection. Hence, it supports the present study. Therefore, it can be concluded that irrespective of the situation, Indian marine engineers

with dominant extraversion traits behave in similar ways regarding their interpersonal relationship behaviour, i.e., uncertainties like the COVID-19 pandemic do not impact the way they behave. On the other hand, characteristics like assertiveness, which is a byproduct of the dominant extraversion trait, may be responsible towards a non-significant impact on wanted control behaviour. The result of this study also matches to a great extent with an earlier study by Furnham [73], which was carried out on middle to senior-level managers of a multinational communication organisation. The said study found, similar to the present one, that a significant linkage between the openness trait and any of the FIRO-B® constructs is absent. In the case of extraversion trait too, the findings of the present study exactly match with Furnham [73], i.e., except "wanted control", all interpersonal relationship behaviours are linked to a positive extent with extraversion.

The agreeableness trait is represented through characteristics like being sympathetic, cooperative, etc. The findings of the present study with respect to the "agreeableness" trait also align with the above study of Furham [73], wherein the "expressed control" behaviour is negatively linked, which implies Indian marine engineers with agreeableness traits exhibit similar kinds of interpersonal behaviour with respect to expressed control even during the pandemic. However, there are certain findings which contradict the above study. A high level of conscientiousness trait of the Indian marine engineers is found to have a negative linkage with wanted control behaviour, which does not support the above study by Furnham [73]. The said study did not find any significant relationship between neuroticism traits and any of the FIRO-B® constructs. However, the present study revealed positive linkages between neuroticism and "wanted inclusion", "expressed control" and "wanted control". The conscientiousness traits are expressed as being responsible, careful, diligent, etc. The COVID-19 pandemic posed itself as an unprecedented, extraordinary situation for which human civilisation was not prepared at all. The guidelines for safe sailing issued from time to time by the respective shipping companies were often not consistent. The chief engineers, though, were always in touch with their companies at the shore for necessary instructions; however, such instructions were often difficult to implement due to higher levels of diligence and orderliness, which is the probable reason that a higher level of conscientiousness leads to a significantly lower level of wanted control among Indian marine engineers. On the other hand, a higher level of conscientiousness trait leads to a higher level of sense of responsibility, and the majority of the respondents (almost 60%) are in the job ranks of either chief engineers or second engineers, who are working in the managerial capacity,

carrying out their jobs in a responsible way during such an uncertain situation. The habit of being responsible and adhering to the guidelines may put extra pressure on Indian marine engineers with dominant conscientiousness. Apart from that, maintenance of the COVID-19 protocol may be another area of concern for them. Such factors may have contributed to a significantly negative impact on expressed inclusion behaviour.

Another study by Sharma [74], which was conducted on 912 management students, revealed that except for wanted inclusion, significant positive correlations exist between extraversion and interpersonal relationship behaviours. The said study also found a positive significant correlation between neuroticism traits and wanted control. Such a finding matches to a great extent with the present study. The neuroticism trait is associated with negative emotions like distress, dissatisfaction, self-doubt, etc. The resemblances of the findings of this study with the above one indicate that Indian marine engineers with dominant neuroticism personality traits continue to exhibit wanted control behaviour towards others even during the pandemic. At the same time, new dimensions in their interpersonal relationship behaviours, viz., "wanted inclusion" and "expressed control", have been seen during the pandemic. However, the present study contradicts the said study in certain dimensions, viz., while in the present study, conscientiousness has been found to be negatively linked with expressed inclusion and wanted control, Sharma [74] found a positive correlation among them.

On the other hand, the present findings align to some extent with a study carried out on 219 students of business courses [75], which found positive correlations between extraversion and expressed as well as wanted inclusion and expressed affection. Similarly, the openness trait did not get any statistical significance towards any of the FIRO-B® constructs. Similarity is also seen in the relationship between agreeableness and expressed control.

The above findings can be seen as opportunities for intervention by the shipping companies towards better utilisation of the onboard manpower. As it is clear from the above findings, which either strengthen the existing body of knowledge or, while contradicting existing literature, bring out new theories, particularly during the COVID-19 pandemic and Indian context, can be examined by the shipping companies in devising plans and strategies while selecting marine engineers based on their personality traits and interpersonal relationship skills. Such an act may facilitate the marine engineers in culminating cohesive teams onboard and thereby carrying out their day to day activities with ease [76]. On the contrary, a good blend of personality traits onboard may facilitate the marine engineers to interact with each other especially during the

periods like the COVID-19 pandemic. Such interactions may act as social buffer and assist them in reducing their anxiety and stress to a great extent [77]. Similarly, a team consisting of marine engineers collating complementary interpersonal relationship behaviours may be fruitful during crises in improved job performance [25] as well as emotional support [78] onboard.

5. Study Limitations

Like many other studies, this study is also not free from limitations. First of all, due to the lack of a sample frame, a non-random sampling method was followed for data collection, and hence, the findings of this study may not be generalised. Secondly, the responses are based on the perception of the respondents, which may be subject to bias, such as social desirability or memory bias, which may affect the accuracy of the results obtained.

This present study is probably the first of its kind, which reveals the linkages between personality traits and interpersonal relationship behaviours of Indian marine engineers during the COVID-19 pandemic. Thus, this study can be a guiding star for many researchers to explore further. This study, being exploratory in nature, has identified available linkages between personality traits and interpersonal relationship behaviours and points out some of the probable reasons. Therefore, future studies in this regard can lead to acceptance/rejection of the stated reasons as well as identifying additional factors in this regard. Further, considering this study as a point of reference, a similar kind of study can lead towards revealing the fact whether the interpersonal relationship behaviours of Indian marine engineers are consistent or not irrespective of external situations, i.e., during periods of normalcy and periods of uncertainty. In addition, in continuation to the present study, the perception of the shipping companies on the suggestions prescribed can be explored.

6. Conclusion

While seafarers are the backbone of international trade, the seafaring profession is characterised by a number of unique features. The optimum utilisation of the onboard resources largely depends on effective teamwork, while such an effective, to a great extent, depends on interpersonal relationships among the team members. This present study reveals significant linkages between certain personality traits and interpersonal relationship behaviours exhibited by Indian marine engineers. In this regard, while selecting a marine engineer for an onboard job, this study can assist the recruiter in understanding the way the prospective marine engineer can exhibit interpersonal relationships onboard. The recruiter can have guidance from this study

regarding placing the "right person at the right place", which is expected to form a more cohessive team onboard. On the contrary, measures of shipping companies may be focussed towards providing marine engineers with necessary training like, on relationship building, teamwork and team building, cultural competency, emotional intelligence, conflict resolution, etc. At the same time, especially during uncertain periods like the COVID-19 pandemic, the seafarers who are away from their families need to be taken care of with compassion, and every possible support should be provided to them and their family members, which in turn makes the seafarers feel satisfied and less anxious. Such a mental state is likely to contribute towards a better interpersonal relationship onboard.

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