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The seafaring industry has a number of distinct characteristics which create stressful working conditions and health problems among seafarers. There is a reduction in numbers of crew members and mixed nationality crew, long working hours, increased automation, shorter turnaround time in ports, and a strive to optimize the cargo hold with regards to capacity and logistics due to the requirements for profitability in the shipping industry (Bloor, Thomas and Lane, 2000; Lutzhof et al., 2008). Due to the technical development and increased automation both on bridge and engine department there is a reduction in the number of crew members.

Sąlyga and Kušleikaitė (2011) found that due to decreased number of crew members, increased workload and social isolation, stress is high among seafarers. The psycho-emotional strain was related to evaluation of health disorders like waist and spinal pains, insomnia and depression. The psycho-emotional strain is found to be high among seafarers due to the harmful working conditions at sea like noise, vibrations, thermal working environment, unsuitable lighting and humidity. Living away from home, disturbed working and rest schedule, long working hours at sea remains the main source of stress and work strain, specifically, for the officers at watch (Jensen et. al., 2001). Sleep disturbances were also found among sailors. Poor ability to fall asleep was reported by 24%, wakefulness during sleep by 44.6%, light sleep by 43.4% of seafarers.

Working conditions in the seafaring industry have been associated with fatigue and sleep related problems, disturbed circadian rhythms, and various stress-related issues and psychosomatic health problems (Hetherington, Flin and Mearns, 2006; Wadsworth, Allen and Smith, 2008). Decreased number of seamen per ship and increased automation has been reported as one of the major causes of stress-related psychological problems (Agterberg and Passchier, 1988; Zeitlin, 1995 and Bloor and Lane, 2000). Variation in working hours, long shifts, high levels of perceived work stress, and job demands were strongly associated with higher levels of psychological
problems and self-reported general health problems among merchant navy officers (Wadsworth, Allen and Smith, 2008).

With the new work tasks, discontent among the seafarers has also been previously reported (Lutzhoft, 2008), due to the increased computerization, the increased administrative tasks that have been imposed on them. The further study indicated that many seafarers also felt their skills and education inadequate for the new tasks. The prominent cause behind the relatively high levels of work role conflicts among engineers is this profound and rapid technical, organizational, and economical development in the entire shipping industry.

Safety and health of seafarers working on ships are a major concern for the ship owners as seafaring has been recognized as a high-risk job (International Labour Convention, 1996). Seafarers have a second home on board ships during tours of duty which can last for several months. In a global industry, seafarer’s health and living conditions are influenced by their working environment.

Seafarers due to particular characteristics of their work are affected by work related stress which is often different from stress that can be appreciated in other working activities, which includes many possible dangers in the form of accidents, injuries, and diseases (Shultz and Shultz, 2002).

Many researchers in the past have acknowledged the contradictory and indistinct differences between these officers and have urged to draw measures to cut on specific job stressors and implement suitable coping strategies according to different categories of merchant navy officers (e.g. Carotenuto, 2012, Carotenuto, 2013, Juozulynas et. al, 2007).

Keeping in view the above facts that merchant navy officers are more prone to Depression, Stress, low Quality of life, low Quality of Sleep, poor Subjective well being and low Job satisfaction, it was decided to study differences in Deck and Engine merchant navy officers.

The primary aim of the present investigation was to do a comparative study of Depression, Stress, Quality of life, Job satisfaction and Subjective Well being among
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Deck and Engine merchant navy officers. Quality of Sleep was also measured among the Deck and Engine officers.

The sample included 300 officers and they were selected randomly from both the departments (150 from Deck department and 150 from Engine department). Only middle ranked officers were included, keeping in mind the homogeneity of working conditions, age, salary and work timings of these officers. Within the distribution of 150 officers from Deck wing, 75 officers from each branch namely chief officers and second officers and within the distribution of Engine wing, 75 officers from each branch namely second Engineers and third Engineers constituted the sample.

Both the groups were compared on the measures of Beck’s Depression Inventory (BDI) by Beck, Steer and Brown (1961) for Depression, Perceived Stress scale (PSS) by Cohen, Kamarck and Mersmeltein (1983) for Stress, World Health Organization Quality of life scale (WHOQOL-BREF) viz Physical Quality of life, Psychological Quality of life, Social Quality of life and Environmental Quality of life for Quality of life, Generic Job satisfaction scale by Macdonald & Maclntyre, (1997) for Job satisfaction and to measure Subjective Well being that has three components viz. Positive affect, Negative affect and Satisfaction with life, two scales were used namely Positive and Negative Affect Schedule (PANAS) by Watson, Clark and Tellegen (1988) and Satisfaction With Life Scale by Diener, Emmons, Larson and Griffin (1985). Following formula was used to derive a score of Subjective Well Being:

Subjective wellbeing = Satisfaction with Life + Positive Affect – Negative Affect

For measuring Quality of Sleep, Pittsburgh Sleep Quality index (PSQI) by Buysee, Reynolds, Monk, Berman and Kupfer (1989) was used.

All subjects were explained about the purpose of the study and their role in the study. The informed consent was taken before they were enlisted as subjects. All the above mentioned scales were applied to derive results. The raw scores consisted of scores on all the above mentioned variables and sub variable: Depression, Perceived Stress, Quality of life (Quality of physical, psychological, social and environmental
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life), Quality of Sleep, Job satisfaction and Subjective Well being (positive and negative attitude and satisfaction with life). The raw scores were analyzed using appropriate statistical analysis i.e. Descriptive statistics (Mean, standard deviation), t-test, Stepwise Discriminant Functional Analysis, Two Analysis of Variance and Mann-Whitney U test, Multiple Comparison analysis and Inter-correlation analysis.

Means and standard deviations were calculated from all the groups. Means and standard deviation of Deck Officers and Engine officers are shown in Table 1. Means and standard deviations of Junior officers and Senior officers are shown in Table 2 and Table 2.1 shows means and standard deviations of Deck Junior and Deck Senior officers. Table 2.2 shows mean and standard deviation of Engine Junior and Engine Senior officers. The graphical presentations of all these tables are presented in figures 2 to 12.

Table 3.1 to Table 3.15 shows 2-way Analysis of variance (ANOVA) among all the variables and sub-variables measured among both Deck and Engine department and the ranks Junior and Senior officers and interaction effect among them.

Table 4 shows Stepwise Discriminant functional analysis among Deck and Engine merchant navy officers on all variables.

Table 5 shows results of Mann-Whitney U test applied on all seven components of Quality of Sleep among Deck and Engine officers.

Inter-correlation analyses (Table 6 and 7) for the total sample on the measured variables i.e. Depression, Job Satisfaction, Quality of Sleep, Quality of Life Domain 1 i.e. Physical, Domain 2 i.e. Psychological, Domain 3 i.e. Social relation, Domain 4 i.e. Environmental, Subjective Well being, Positive affect, Negative affect, Satisfaction With Life and Stress was conducted to delineate correlates of Subjective Well being and Quality of Life with other variables.

A. Depression among merchant navy officers

Following hypotheses were framed:

1. Group Comparisons

Deck merchant navy officers were expected to score higher than Engine merchant navy officers on Depression.
2. **Rank Comparisons**

It was expected that differences would emerge between all ranks and groups i.e Junior Deck officers, Senior Deck officers, Junior Engine officers and Senior Engine officers on Depression, however, in view of paucity of research no direction was specified.

A glance at the t-ratios (Table 1) revealed that Deck officers scored higher than Engine officers on Depression (t = 5.08, p ≤ .01). A glance at t-ratios (Table 2) also revealed that no significant differences emerged between Senior and Junior officers from both Deck and Engine departments and a further glance at t-ratios (Table 2.1) revealed that Deck Senior officers scored higher than Deck Junior officers (t = 1.99, p ≤ .05), whereas a glance at t-ratios (Table 2.2) revealed no significant differences emerged between Senior and Junior Engine officers.

A further perusal of the Analysis of variance (Table 3.1) revealed the following F-ratios for group comparison on Depression (F= 26.19, p ≤ .01) emerged to be significant. Furthermore, F-ratios for the rank comparison were not found to be significant. However, the interaction effect came out to be significant (F= 5.34, P ≤ .05).

Table 3.2 shows multiple comparisons that were conducted with groups and ranks individually for Depression. Scheffe test was employed with all groups and ranks viz. (Deck Junior, Deck Senior, Engine Junior and Engine Senior officers). Scheffe’s post-hoc test revealed the following results: Deck Junior officers scored higher than Engine Senior officers (Mean difference (I-J) = 1.78, P ≤ 01), Deck Senior officers scored higher than Engine Junior (Mean difference (I-J) = 2.49 , P≤ 01) and Engine Senior officers (Mean difference (I-J) = 3.10, P≤ 01). No statistical significant differences were found between Deck Junior officers with Deck Senior officers (Mean difference (I-J) = -1.32, P≥.05) and Engine Junior officers (Mean difference (I-J) = 1.17, P≥.05), Engine Junior officers with Engine Senior officers (Mean difference (I-J) = -.61, P≥.05).
Hence the above results show that the hypothesis regarding Depression among Deck officers is higher than the Engine merchant navy officers has been approved due to the significant differences among them.

In a comparative study between Deck and Engine merchant navy officers was conducted on the parameters of depression, stress and health wherein Elo (1985) revealed that the engine room personnel were found to be more stressed and depressed as compared to those working on bridge. The major reason behind this was the working condition of engine room wherein these officers were exposed to noise, draft and heat whereas deck officers reported troubles with humidity, unclean air and coldness to be more disturbing factors. Whereas officers from the department reported sleep related problems, the engine department showed more problems in connecting with the working conditions of the engine room than other groups.

Being at sea for days or weeks, seafarers have a very little contact with rest of the world and are the most isolated group. A major cause of psychological problems is social isolation and this has caused a decrease in the number of seafarers in Western countries. Isolation can lead to despair and depression. It has also been reported to be a cause of suicide in some situations and in vulnerable individuals (Oldenburg, Baur and Schlaich, 2010). Various factors, such as social relationships, physical heaviness, and lack of monitoring and support are linked with stress and increase the vulnerability of an individual to stress in the workplace (Jezewska, Leszczynska and Jermin., 2006). Problems may arise from the presence of people from different nationalities and speaking various languages on board. This not only increase communication problems and but also leads to isolation.

Dascalu (2016) in his study on ‘The impact of artificial lighting on the crew of the maritime transport ships’ argued that the deck officers work on deck area and bridge are still exposed to the natural day light as compared to the engine room officers who perform all tasks of repairing and watch-keeping in the engine room. But due to the development of the automated equipments on ship for the safety and control, the engine room officers do not have to work over night like the deck officers. The engine room officers work only from 8 am to 5 pm in the evening and
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for the later emergency alarms are set in their personal cabins. They are only required when the alarms rings. But on the other hand, deck officers have to be there on the bridge for their night shift and have to ensure permanent service. This affects their circadian rhythms and among the psychological effects that are caused from this environment are lack of interest for learning, self-improvement, loss of self-esteem and depression. This may affect their quality of physical as well as psychological life.

B. Job satisfaction among merchant navy officers

Following hypotheses were framed:

1. Group Comparisons
Deck merchant navy officers were expected to score lower than Engine merchant navy officers on Job satisfaction.

2. Rank Comparisons
It was expected that differences would emerge between all ranks and groups i.e Junior Deck officers, Senior Deck officers, Junior Engine officers and Senior Engine officers on Job Satisfaction, however, in view of paucity of research no direction was specified.

A glance at the t-ratio’s (Table 1) revealed that Deck officers scored lower than the Engine officers on Job satisfaction (t = 4.50, p ≤ .01). A glance at t-ratios (Table 2) revealed that Junior officers scored higher than Senior officers on Job satisfaction (t = 4.57, p ≤ .01) and a further glance at t-ratios (Table 2.1) revealed that Deck Junior officers scored higher than Deck Senior officers on Job satisfaction (t = 4, p ≤ .01), whereas a glance at t-ratios (Table 2.2) revealed that Engine Junior officers scored higher than Engine Senior officer on Job satisfaction (t= 2.6, p ≤ .05).

A further perusal of the Analysis of variance (Table 3.3) revealed the following F-ratios for group comparison on Job satisfaction (F = 21.81, p ≤ .01) emerged significant. Furthermore F-ratios for the rank comparisons came out to be significant (F-ratio = 22.42, p ≤ .01). However, F-ratio for the interaction effect was found to be insignificant.
Hence the above results show that the hypothesis regarding Job satisfaction among Deck officers is lower than the Engine merchant navy officers has been approved due to the significant differences among them.

Helmreich, Wilhelm and Runge (1981) conducted a comparative study on life satisfaction, job satisfaction and work related attitude between deck officers and engine merchant navy officer and between senior and junior officers from both the departments. The survey was conducted on 350 crew members working on 37 ships. According to them, the deck merchant navy officers were found to be low on Job satisfaction as compared to engine merchant navy officers. The senior deck officers specifically chief officers were found to be less satisfied with their life and were found to be low on job satisfaction due to the increased automation of the ships (Smith & Roggema, 1980). Deck officers reported less flexibility in working and were unable to use their skills and abilities. Deck officers showed less satisfaction with the salaries they get as comparative to the officers working in engine department.

Guo, Liang and Ye (2005) conducted a comparative study on 146 Taiwanese merchant navy officers between both Deck department and Engine department on Job satisfaction, job commitment and the intent to turnover. It was found that Taiwanese ship officers who worked in deck departments have lower levels of job satisfaction and organizational commitment as compared to those working in engine department, though the coefficients calculated in the results do not reach a significant level but statistical differences exist.

McKay and Wright (2007) studied various reasons for the dissatisfaction of seafarers at work that lead to stress and fatigue in them. According to them, merchant navy officers face a range of specific problems such as separation from family, inability to maintain shore-based routines, intense closeness to colleagues on ship, limited opportunities to spend time away from work/ship, and a dangerous working environment where accidents and mortality rate is high (Roberts, 2000). There is a lack of opportunity for the shore leaves due to the increased work on ship such as short turn around, inspections, dealing with cargo at ports etc which affects the
physical and mental health of seafarers, and contribute to isolation, fatigue, depression and stress among them (ILO, 2004: 107). In a survey by ITF, it was found that 62% of seafarers work between 8 and 12 hours per day, 11% work up to 18 hours every day and 3% more than 18 hours. Senior officers work for longer hours with 21% of senior deck officers working for more than 12 hours per day. The greatest cause of dissatisfaction among UK officers is workload leading to fatigue, stress, low morale (National Union of Marine, Aviation and Shipping Transport, 2002) and there are evidences that excessive working hours are under-recorded by the seafarers due to falsification of records (Smith, Allen 2006).

Pauksztat (2017) studied effects of job demands and social interactions on fatigue in seafarers and found that deck officers, specially the higher rank officers perceived higher work pressure than the engine officers.

C. Quality of Sleep among merchant navy officers

Following hypotheses were framed:

1. Group Comparisons

Deck merchant navy officers were expected to score lower than Engine merchant navy officers on Quality of Sleep.

2. Rank Comparisons

It was expected that differences would emerge between all ranks and groups i.e Junior Deck officers, Senior Deck officers, Junior Engine officers and Senior Engine officers on Quality Of Sleep, however, in view of paucity of research no direction was specified.

A glance at the t-ratios (Table 1) revealed that Deck officers scored higher than Engine officers on poor Quality of Sleep (t-ratio = 3.56, p ≤ .01). A glance at the t-ratios (Table 2) revealed that Senior officers cored higher than Junior officers on poor Quality of Sleep (t-ratio = 3.71 , p ≤ .01). A further perusal of t-ratios (Table 2.1) revealed Deck Senior officer scored higher than Deck Junior officers on poor Quality of Sleep (t = 6.53 , p ≤ .01 ), whereas no significant differences emerged between Engine Junior and Engine Senior officers.
A glance at the Analysis of variance (Table 3.4) revealed the following F-ratios for the group comparisons on Quality of Sleep (F-ratio = 14.56, p ≤ .01). Furthermore, F-ratios for rank comparisons (F-ratio = 15.75, p ≤ .01) were also found to be significant. The F-ratio for the interaction effect also came out to be significant (F-ratio = 29.10, p ≤ .01).

Table 3.5 shows multiple comparisons that were conducted with groups and ranks individually for Quality of Sleep. Scheffe’s post-hoc test revealed the following results: Deck Senior officers scored higher than Deck Junior officers (Mean difference (I-J) = 2.45, P≤ .01), Engine Junior officers (Mean difference (I-J) = 2.04, P≤ .01) and Engine Senior officers (Mean difference (I-J) = 2.41, P≤ .01). No statistical significant differences were found between Deck Junior officers with Engine Junior officers (Mean difference (I-J) = -.41, P≥ .05) and Engine Senior Officers (Mean difference (I-J) = -.04, P≥ .05) and Engine Junior officers with Engine Senior officers (Mean difference (I-J) = -.37, P≥ .05).

To assess significant differences in the seven components of Quality of Sleep measured on an ordinal scale, Mann Whitney U test was applied. Significant Differences were found between Deck and Engine departments (Table 5), Deck officers scored higher on Component 1 i.e. subjective Sleep Quality (Mean rank = 167.12; p value ≤ .01), Component 4 i.e. habitual Sleep efficiency (Mean rank = 164.23; p value ≤ .01), Component 5 i.e. Sleep disturbances (Mean rank = 161.00; p value .014 ≤ .05), Component 6 i.e. use of Sleeping medication (Mean rank = 160.00; p value ≤ .01), Component 7 i.e. daytime dysfunction (Mean rank = 158.50; p value = .044 ≤ .05) than Engine officers. No significant differences were found on Component 2 i.e. Sleep latency and Component 3 i.e. Sleep duration.

A glance at the Stepwise Discriminant functional analysis (Table 4) reveals that Quality of Sleep emerged as a predictor variable when Deck and Engine officers were compared. The mean scores of the Quality of Sleep revealed that the Deck officers scored higher than the Engine officers. (Higher scores on Quality of Sleep = Poor Quality of Sleep)
Hence the above results show that the hypothesis regarding Quality of Sleep among Deck officers is lower than the Engine merchant navy officers has been approved due to the significant differences among them.

King (2000) stated that due to increased automation, deck officers spend more time working on ship than the engine officers. Engine officers do not have much to do at night so they get enough time to sleep but deck officers have to perform watch-keeping activities both at day and night time. This affects their quality of sleep.

Grech et al (2003) studied the Royal Australian Navy and found fatigue to be reported as a major problem. With a sample of 79 crew from 6 patrol boats, data were collected showing approximately 44% of participants worked more than 80 hours a week and 62% reported not getting enough sleep.

Thiruvasagam and Rengamani (2015) in a study on Indian seafarers found that engine room seafarers had a lower fatigue level than deck side officers. The deck officers have to react to permanently changing Job demands such as port clearance, navigation and watch-keeping at sea. 72% of the sample reported poor to very poor quality sleep which contributed highest to the ill physical health of the seafarers.

Very recently, Hystad, Nielsen and Eid (2017) studied the psychological safety environment, fatigue and quality of sleep of 165 seafarers wherein engine department reported less fatigue than the deck department. The study also focused on the risk perceptions of seafarers and it was found that higher levels of fatigue increased the perceived risk of both personal injuries and ship accidents. Risk perceptions are related to actual accident involvement. Quality of sleep has been affected due to the 24 hours working environment of ship, especially deck officers working during night watches.

**D. Subjective wellbeing among Merchant Navy Officer**

**Following hypotheses were framed:**

1. **Group comparisons**

   Deck merchant navy officers were expected to score lower than Engine merchant navy officers on Subjective well being.
2. **Rank Comparisons**

It was expected that differences would emerge between all ranks and groups i.e Junior Deck officers, Senior Deck officers, Junior Engine officers and Senior Engine officers on Subjective Well being, however, in view of paucity of research no direction was specified.

A glance at the t-ratios (Table 1) revealed that Deck officers scored lower than Engine officers on Subjective well being (t-ratio= 4.21, p ≤ .01). A further glance at t-ratios (Table 1) revealed that Deck officers scored higher than Engine officers on Positive affect (t = 2.10, p ≤ .05) and Satisfaction with life (t = 2.02, p ≤ .01) and lower on Negative affect (t = 2.05, p ≤ .05). A glance at t-ratios (Table 2) revealed no significant differences between Junior and Senior officers on Subjective well being. A glance at t-ratios (Table 2) revealed that Junior officers scored higher than Senior officers on Positive affect (t-ratio = 2.59, p ≤ .01). Whereas, no significant differences were found between the components of Subjective well being among Junior and Senior officers. A perusal of t-ratios (Table 2.2) revealed that Engine Junior scored higher than Engine Senior officers on Positive affect (t-ratio = 2.66, p ≤ .01), whereas no significant differences emerged between other ranks in both the departments on the components of Subjective well being.

A further perusal of Analysis of variance (Table 3.6) revealed the following F-ratios for the group comparisons on Subjective well being (F-ratio = 17.80, p ≤ .01) emerged significant. Whereas, F-ratios for rank comparisons and interaction effect were not found to be significant.

A glance at Analysis of variance (Table 3.7) revealed the following F-ratios for the group comparisons on Positive affect (F-ratio = 4.51, p ≤ .05). Furthermore, F-ratios for rank comparisons (F-ratio = 6.83, p ≤ .01) were found to be significant. F-ratio for the interaction effect was found to be insignificant.

A glance at Analysis of variance (Table 3.8) revealed that F-ratios for Negative Affect for the group comparison and rank comparisons were not significant. Furthermore, the interaction effect was also found to be insignificant.
A further perusal of Analysis of variance (Table 3.9) revealed that the F-ratios for the group comparisons on Satisfaction with life (F-ratio = 4.11, p ≤ .05) were significant. Whereas, F-ratios for the rank comparisons and interaction effect emerged to be insignificant.

A glance at the Stepwise Discriminant functional analysis (Table 4) reveals that Subjective wellbeing emerged as a significant predictor when Deck and Engine officers were compared.

Hence the above results show that the hypothesis regarding Subjective wellbeing among Deck officers is lower than the Engine merchant navy officers has been approved due to the significant differences among them.

So far there is only one study conducted by Roberts et al. (2014) who reported that differences emerge between deck and engine merchant navy officers. They found that half of the occupational accidents affected the physical health and wellbeing of seafarers from deck department as compared to engine department where injuries were reported to be less. According to them, deck department carries the highest risk of indulging in on-duty accidents. Deck department is highly exposed to risk at work such as cargo operations in bad weather, entering enclosed spaces such as cargo hold and tanks and mooring operations and towing. Operations that affect the well being of the seafarers at the sea are mooring and towing that involves high risk, leading to fatal injuries and accidents particularly when ropes break under stress (Roberts and Marlow 2005).

In general many studies have identified a large number of stressors and risks faced by seafarers, such as long time away from home, social isolation, extended working hours, lack of shore leaves, fatigue, high work-related stress, collisions and maritime disasters, exposure to hazardous substances, communicable disease and danger for piracy. These can lead to impaired physical health and psychological well-being of the seafarers (Sliskovic and Penezic, 2015).

Also, Haroardottir (2015) conducted a study on life satisfaction among merchant navy officers from Iceland and found them to be low on life satisfaction,
well-being and quality of life. According to him, there are various psychological and social factors that affect the life onboard and decrease the subjective well being of the seafarers. The working conditions, separation from near and dear ones and poor sleep quality were found to be the contributing factors in poor life satisfaction and quality of life.

E. Quality of life among merchant navy officers

Following hypotheses were framed:

1. Group comparisons

Deck merchant navy officers were expected to score lower than Engine merchant navy officers on Depression on Quality of Life.

2. Rank Comparisons

It was expected that differences would emerge between all ranks and groups i.e Junior Deck officers, Senior Deck officers, Junior Engine officers and Senior Engine officers on Quality of Life, however, in view of paucity of research no direction was specified.

A glance at the t‐ratios (Table 1) revealed that the Deck offices scored lower than Engine officers on all the domains of Quality of life: Physical Quality of life (t‐ratio= 6.75, p ≤ .01), Psychological Quality of life (t‐ratio= 6.68, p ≤ .01), Social Quality of life (t‐ratio= 7.55, p ≤ .01) and Environmental Quality of life (t‐ratio= 2.40, p ≤ .01). A perusal of t‐ratios (Table 2) revealed that Junior officers scored higher than Senior officers on Physical Quality of life (t‐ratio = 2.96, p ≤ .01), Psychological Quality of life (t‐ratio = 3.06, p ≤ .01) and Environmental Quality of life (t‐ratio = 2.71, p ≤ .01). No significant differences were found between both ranks on Social Quality of life.

A further perusal of t‐ratios (Table 2.1) revealed that Deck Junior officers scored higher than Deck Senior officers on Physical Quality of life (t‐ratio = 3.40, p ≤ .01), Psychological Quality of life (t‐ratio = 3.92, p ≤ .01) and Environmental Quality of life (t‐ratio = 2.15, p ≤ .05), whereas in Table 2.2, no significant differences were found between Junior and Senior Engine officers on all Domains of Quality of life.
A glance at Analysis of variance (Table 3.10) revealed the following F-ratios for the group comparisons on Physical Quality of life (F-ratio = 47.34, p ≤ .01) and rank comparisons (F-ratio = 10.23, p ≤ .05) were significant. F-ratio for the interaction effect emerged to be insignificant.

A glance at Analysis of variance (Table 3.11) revealed the following F-ratios for the group comparisons on Psychological Quality of life (F-ratio = 47.02, p ≤ .01). Furthermore, F-ratio for the rank comparisons (F-ratio = 11, p ≤ .01) were significant. However, F-ratio for the interaction effect (F-ratio = 6.58, p ≤ .05) also emerged to be significant.

Table 3.12 shows multiple comparisons that were conducted with groups and ranks individually for Psychological Quality of life. Scheffe test was employed with all groups and ranks viz. (Deck Junior, Deck Senior, Engine Junior and Engine Senior officers). Scheffe’s post-hoc test revealed the following results: Deck Junior officers scored higher than Deck Senior officers (Mean difference (I-J) = 1.77, P≤ 01), Engine Junior scored higher than Deck Junior (Mean difference (I-J) = 1.29, P≤ 01) and Deck Senior officers (Mean difference (I-J) = 3.06, P≤ 01). No statistical significant differences were found between Engine Senior officers with Deck Junior officers (Mean difference (I-J) = 1.06, P≥ 05) and Engine Junior officers (Mean difference (I-J) = -.22, P≥.05).

A glance at Analysis of variance (Table 3.13) revealed the following F-ratios for the group comparisons on Social Quality of life (F-ratio = 56.82, p ≤ .01) were significant. Whereas, F-ratios for rank comparisons and interaction effect emerged to be insignificant.

A glance at Analysis of variance (Table 3.14) revealed the following F-ratios for the group comparisons on Environmental Quality of life (F-ratio = 5.87, p ≤ .05). Furthermore, F-ratios for rank comparisons (F-ratio = 7.48, p ≤ .01) were significant. Whereas F-ratios for the interaction effect emerged to be insignificant.

A glance at the Stepwise Discriminant functional analysis (Table 4.2) reveals that Quality of Life Domain 2, Domain 3 and Domain 4 emerged as predictor
variables when Deck and Engine officers were compared. The mean scores of showed that the Deck officers were found to be low on Quality of life than the Engine officers.

Hence the above results show that the hypothesis regarding Quality of life among Deck officers is lower than the Engine merchant navy officers has been approved due to the significant differences among them.

A survey conducted by International Maritime Organisation (2005) revealed that 589 ship accidents and 101 lives that were lost in maritime accidents in 2004. Among the accidents that took place, 21% were reported from deck officers, 16% from crew, 4% from shore personals and 2% from pilot or engine officers. So the accidents due to human error that originated from deck department were reported to be highest among other departments. 60% to 90% marine accidents were reported due to human error (UK’s P&I Club, 2005).

Eyferth (2006) in his book ‘How China Works: Perspectives on the Twentieth-Century Industrial Workplace’ has talked about the different working conditions of merchant navy officers from both departments. According to him, the working conditions of engine-room officers is better than deck officers which further affects their quality of physical and psychological life. The engine rooms have become less difficult to operate than before and the noise and temperature levels have also been reduced. The night watches of the engine room officers have been completely abolished and are required to come only when there is any alarm emergency. Whereas deck officers have their regular watches and have to be there on the bridge all time. They are required to hold strenuous cargo handlings at the port. He also emphasised upon the less availability of shore leave leading to social isolation, stress and depression among these officers.

Starren et al. (2008) in their TNO report on quality of life stated that the chief officers are more stressed. The work of chief officer is more effortful than the lower rank officers, it involves not only watch-keeping, loading, discharging and cargo care. Fatigue levels of deck officers are generally higher during work than during off-duty time and highest during port calls. Engine room officers spend less time in safety,
security and training than deck officers. Senior officers in both the departments were found to be involved in more effortful activities both on and off shore as compared to junior officers.

Andersson et al. (2016) studied the work environment and safety climate of 5608 Swedish seafarers found that seafarers face physical problems like strain on neck, arm or back and heavy lifting and major work problems like noise, risk of collision and vibrations from the ship’s hull further it was found that deck officers suffer more from these problems as compared to the engine officers. During loading and unloading deck officers are more exposed to conditions such as direct contact with the chemicals, oils on skin and dust. Deck officers were higher on isostrain and psychosocial problems.

Very recently, Pauksztat (2017) studied effects of job demands and social interactions on fatigue in seafarers and found that quality of social interaction was low among deck officers than engine officers. Supportive interactions were associated significantly with lower levels of fatigue, whereas fatigue was higher for those reporting less supportive interactions. Irregular working hours caused circadian disruption, resulting in higher levels of fatigue among the officers.

F. **Stress among merchant navy officers**

**Following hypotheses were framed:**

1. **Group Comparisons**

Deck merchant navy officers were expected to score higher than Engine merchant navy officers on Depression on Stress.

2. **Rank comparisons**

It was expected that differences would emerge between all ranks and groups i.e Junior Deck officers, Senior Deck officers, Junior Engine officers and Senior Engine officers on Stress, however, in view of paucity of research no direction was specified.

A glance at the t-ratios (Table 1) revealed that Deck officers scored higher than Engine officers on Stress (t-ratio = 5.66 , p ≤ .01). A further glance at t-ratios
(Table 2) also revealed that no significant differences emerged between Junior and Senior officers from both the departments. A glance at t-ratios (Table 2.1) revealed that no significant differences emerged between Deck Junior and Deck Senior officers on Stress and a further glance at t-ratios (Table 2.2) revealed that no significant differences emerged between Engine Junior and Engine Senior officers on Stress.

A further glance at Analysis of variance (Table 3.15) revealed the following F-ratios for the group comparisons on Stress (F-ratio = 31.72, p ≤ .01) emerged significant. However, F-ratios for the rank comparisons and interaction effect emerged to be insignificant.

A glance at the Stepwise Discriminant functional analysis (Table 4) reveals that Stress emerged as a predictor variable when Deck and Engine officers were compared. The mean scores revealed that the Deck officers were found to be high on Stress as compared to Engine officers.

Hence the above results show that the hypothesis regarding Stress among Deck officers is higher than the Engine merchant navy officers has been approved due to the significant differences among them.

King (2000) stated that on unmanned ships (UMS), deck officers spend more time working on ship than the engine officers. Engine officers work more during ongoing voyage and less during port calls whereas deck officers work more both during underway as well as at the ports. This affects their sleep and fatigue. Deck officers were found to be more fatigued than the engine officers.

Oldenburg, Jensen and Latza (2009) compared deck and engine officers and found that engine room personnel had a lower Stress level than deck officers due to long working days and time pressure or hectic activities. Deck personnel have to react to permanently changing Job demands (port clearance, district routes and watch-keeping at sea). Correspondingly, these activities were considered to be the most Stressful Job activities.

Rengamani and Murugan (2012) found that the deck officers stated a higher stress level due to the time pressure and hectic activities on board. This can be
attributed to their frequently extremely long working days due to unexpected situations and to the increasing amount of administrative duties. Extremely high number of working hours over a lengthy period of time combined with a lack of sleep can elicit chronic fatigue, health problems and safety risks on the vessels.

Thiruvasagam and Rengamani (2015) in a study on Indian seafarers found that due to stressful job activities such as watch-keeping on the bridge, navigation through highly frequented routes, port clearance like loading and unloading, safety techniques and hygiene control measures, port manoeuvres during arrival and departure, administrative tasks, and routine activities during the voyage leads to fatigue in seafarers. Due to time pressure and hectic activities on board, the deck officers stated higher levels of stress. This can be attributed due to unexpected situations during the voyage and increased amount of administrative duties which further combines with lack of sleep, chronic fatigue, health problems and safety risks during sail. The study showed that engine room seafarers had a lower fatigue level than deck side officers. The deck officers have to react to permanently changing Job demands such as port clearance, navigation and watch-keeping at sea. 72% of the sample reported poor to very poor quality sleep which contributed highest to the ill physical health of the seafarers.

Very recently, Pauksztat (2017) studied effects of job demands and social interactions on fatigue in seafarers and found that deck officers specially the higher rank officers perceived higher work pressure than the engine officers.

G. Correlation of Subjective well being and Quality of life with Depression, Stress, Job satisfaction and Quality of Sleep

Inter-correlation analysis (Table 6) for the total sample on the measured variables i.e. Depression, Job satisfaction, Quality of Sleep, Quality of life domain 1 i.e. physical, domain 2 i.e. psychological, domain 3 i.e. social relation, domain 4 i.e. environmental, Subjective Well being, positive affect, negative affect, satisfaction with life and Stress was conducted and conducted correlates of Subjective Well being and Quality of Life with Depression, Quality of Sleep, Job Satisfaction and Stress were computed.
**Discussion**

A glance at the inter-correlation matrix (Table 6) for the total sample (300 subjects from both the departments i.e. Deck and Engine) revealed that Subjective Well being was significantly and positively related with Job satisfaction and negatively related with Depression and Stress. A further perusal of the Inter-correlation matrix (Table 6) revealed that Positive Affect was significantly and positively related with Job satisfaction and significantly and negatively related with Depression, Quality of Sleep and Stress. A glance at the Inter-correlation matrix (Table 6) revealed no significant inter-correlation among Negative affect and other variables.

A further perusal of the Inter-correlation matrix (Table 6) revealed that Satisfaction with life was significantly and positively related with Job satisfaction and significantly and negatively related with Depression, Quality of Sleep and Stress.

A glance at the Inter-correlation matrix (Table 6) revealed a significant and positive relation of physical Quality of life with Job satisfaction and negatively with Depression, Quality of Sleep and Stress.

A further perusal of the Inter-correlation matrix (Table 6) revealed that Physical Quality of life was significantly and positively related with Job satisfaction and significantly and negatively related with Depression, Quality of Sleep and Stress.

A glance at the Inter-correlation matrix (Table 6) revealed that Social Quality of life was significantly and positively related with Job satisfaction and significantly and negatively related with Depression, Quality of Sleep and Stress.

A further perusal of the Inter-correlation matrix (Table 6) revealed that Environmental Quality of life was significantly and positively related with Job satisfaction and significantly and negatively related with Depression, Quality of Sleep and Stress.

While reviewing the literature of merchant navy officers, it was found that there is a paucity of research investigating relationship of their Well being and Quality of life with Depression, Stress, Job satisfaction and Quality of sleep, however, findings of the present investigation are corroborated by past researches in other domains.
Discussion

Demura and Sato (2003) conducted a study to measure relationships between depression and the characteristics of lifestyle and quality of life. For this purpose, 1302 elders (657 males and 645 females) were compared on the basis of age and gender. According to the results, depression was found more among older people as compared with the young-old elderly. The extent of social activities decreased depression, more the number of friends lower the depression symptoms. A social network is an important factor in the level of quality of life (Masuchi and Kishi, 2001).

Iliescu et. al., (2003) conducted a cross-sectional study on 89 patients undergoing haemodialysis. To find the correlation between quality of sleep and health related quality of life. There was a strong relationship between quality of sleep and mental and physical health related quality of life. Mental health related quality of life was associated with subjective sleep quality, sleep disturbance, use of sleep medications and daytime dysfunction, while physical health related quality of life was associated with sleep efficiency, sleep disturbance, use of sleep medications and daytime dysfunction. As compared with ‘good sleepers’ the ‘poor sleepers’ had lower health related quality of life in all domains.

Carlson, Speca, Patel and Goodeya (2004) studied correlation between quality of life and stress among breast and prostate cancer outpatients. 59 patients with breast cancer and 10 with prostate cancer were assessed on both the variables on pre and post interventions. In this study it was found that there is a strong correlation between quality of life and stress. In the post intervention tests significant improvements were seen in overall quality of life, symptoms of stress, and sleep quality. Improvement in quality of life was found to be associated with decreases in cortisol levels of the patients. With the decrease in the stress, the quality of life of the patients increased.

Wright and Bonett (2007) conducted a study on 123 employees of customer services–oriented organization. In this survey they assessed the job satisfaction and psychological well-being of the employees and found a positive relationship between psychological well-being and job satisfaction. The employees who are psychologically well were “nicer” people and were more fun to be around. Job satisfaction was most negatively related to turnover when well-being was low among the employees. A
similar positive correlation was found by Wright and Cropanzano (2000), psychological well-being was positively related to job performance.

Derdikman-Eiron et. al., (2011) studied gender differences in subjective well being and psychosocial functioning of 8704 Norwegian adolescents with and without anxiety and depression. A strong correlation was found between depression, anxiety and subjective well being. Higher subjective well being was found among boys without symptoms of anxiety and depression than girls without symptoms. A strong correlation between depression and lower subjective well being and more academic problems and social functioning were found in boys than for girls.

Por, Barriball, Fitzpatrick and Roberts (2011) studied 130 nursing students on their perceived stress, emotional intelligence, coping strategies and subjective well being. Their perceived nursing competency and academic performance were also measured and a negative correlation was found between stress and subjective well-being. It was further, found that increased feelings of control and emotional competence helped nursing students to adopt effective coping strategies while dealing with stress, which later increases their subjective well being.

Kermansaravi, Navidian, Rigi and Yaghoubinia (2014) studies 202 faculty members of Zahedan University of Medical Sciences to measure correlation between quality of work life and job satisfaction. A strong positive correlation was found between both the variables. The results indicated that better quality of work life is associated with more job satisfaction in the subjects. There was a strong and significant relationship between aspects of social dependency, life space and social integration. With the establishment of a balance between work life and other parts of life such as leisure time, education, family life and reduction of job Stress can strengthen the aspects of work life space.

Sandhu (2014) conducted a study on sleep disturbances among 250 adolescents and found correlation among sleep and subjective well being and tested subjective wellbeing by assessing satisfaction with life, positive affect and negative affect and a positive correlation was found among sleep and positive affect and subjective well being. Adolescents with sleep disturbances were found to be low on subjective well being.