Differences in Sleeping Patterns, Stress Levels and General Health between Shift Workers and Fixed Term Day Staff.

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Abstract

The effects of shift work on physiological function through disruption of circadian rhythms, impact on general health and contribution to stress levels are well described. This research was carried out to examine the differences in stress levels, general health and sleeping patterns between shift workers and fixed term day staff. Employees from a major airline and an extremely busy fire station provided the required sample. The specific areas examined, provided significant results between the individual groups. It was noted that there was a significantly higher level of stress endured by shift workers when compared to fixed day time staff. Results also revealed that when compared, the fixed term day staff displayed significantly lower levels of general health and time spent sleeping than shift workers collectively.

The demographic variables of age, gender, hours spent working per week and departments where stationed (fixed term day staff), were also examined and showed no significance in the acquisition of the concluding results.
Introduction

Shift work is associated with a number of negative health outcomes such as higher levels of stress, low levels of general health and more irregular sleeping patterns than day workers. Symptoms are often short term or related to specific phases of work schedule, especially to periods of night work. During day shifts or periods of annual leave, symptoms may disappear. Sometimes, these symptoms may reflect a serious chronic disease process. Over the past 20 years there has been a dramatic increase in the practise of using rotating shifts of workers to cover operations which exceed the length of a working day. Shift work has become very common in the industries of food, health, safety and transportation. The proportion of businesses operating with multiple shifts rose in France from 10% to 22% between 1957 and 1974. In the US manufacturing centres operating with multiple shifts has been rising 3% every 5 years, additionally with staff operating on fixed day shifts. There are numerous reasons why workers on rotating shifts may experience adverse consequences in life and in health as opposed to fixed day workers. Certain physiologic functions such as body temperature and hormonal release vary over the course of the day. These physiologic functions are regulated by the body’s internal clock, which has a longer than 24 hour intrinsic period and which is synchronised to the 24 hour day by environmental cues e.g. light and temperature. Circadian rhythms play important roles in regulating sleep and other physiological processes (Gordon et al, 1986).

When workers are forced to change their sleeping schedule abruptly to accommodate a new work shift, a mismatch between bodily resources and the demands placed upon it can occur. In comparison to day work, shift work usually disrupts social activities and it has been said that this disruption to the quality of one’s social life and interaction is related to poor physical and mental health. Several studies have reported numerous sleeping problems among night
and shift workers in comparison to straight day workers. These include difficulty in falling asleep, shorter duration of sleep, poor sleep quality, and ongoing feelings of fatigue and lethargy. It was also reported that in comparison to straight day workers, rotating shift and night workers have poorer diets, as well as higher ratios of gastric ulcers and constipation (Gordon, et al 1986). According to field studies carried out in the past, disrupted sleeping patterns have shown to prove that loss of attention, slowing of perceptual motor processes and ability to concentrate are among the effects of this problem, resulting in a greater risk of accidents and injuries. In a study of 900 electricity workers in Australia, Wallace, et al, found that shift workers reported higher consumption of tea and coffee, and more frequent use of pain killers, sleeping pills, laxatives and cough medicine than that of fixed day time workers. Both men and women in the shift group of this same study reported higher levels of stress than that on the fixed day working group.

Shift work is now responsible for 20% of job opportunities in the developed nations. But as the onset of serious disturbances occur, 20% of all workers are forced to leave shift work roles in a very short time. Only 10% of all workers do not complain about shift work in their working life. The remaining with stand shift work, using different levels of intolerance that can become more or less manifest in different times, and with different intensity in terms of troubles, disease or discomfort. Problems caused by irregular shift patterns can be devastating not only in developing countries but also in western countries, in terms of social and economic consequences. With regards to developing countries, there is no accurate figure available for such costs but it can be huge in terms of human suffering and production losses. In the United States alone, work related problems in the industries due to employee’s inability to stay awake are estimated at USD 50 billion per year. 4

One such study carried out in a shoe factory in Bangladesh, was to provide information about fatigue associated with the shift workers attitude, job satisfaction, psychosocial problems and
other difficulties. The sample of subjects comprised of 60 adult male workers. 49 of these workers were married and 11 were unmarried, having secondary school to college level education. Subjects worked on a weekly rotating three-shift system. They worked 8 hours per day, 6 days per week. This study was completed by questionnaire. The results showed that a number of subjects did not like this shift system. In total, 73% of subjects disliked and 22% liked the shift systems. Only 3% of subjects expressed their views about how rotating shifts caused potential risk to their working lives. Shift work also caused disturbances in their family lives (75%), social lives (65%) and conjugal lives (72%). Eighty three per cent of subjects suffered from health problems, 85% had sleep disturbances and 78% experienced meal time irregularities (Ahasan. R, et al 1999).

In general, another concern that is increasing about the adverse effects that shift work may have on health is stress, in particular the risk of cardiovascular disease. There are many models that measure stressful components in the workplace for both day and shift workers, one of which is the job strain model. This model posits that a high level of work demands and low job control at work can be a health risk for employees (Kivimaki, 2002). Cardiovascular disease is the leading cause of death in modern civilisations. Models such as work stress models focusing on aspects of the workplace and working hours offer promising opportunities for theory based intervention.

Shift workers have been reported to have an increased risk in some cancers. Between 1988-1990, a baseline survey was conducted among 14,052 working males in Japan. Subjects were day workers, fixed night workers and rotating shift workers. During 111,974 persons-years, 31 cases of prostate cancer were recorded. The model used to record the findings was the Cox Proportional Hazards Model. Adjustments were made for age, family history of prostate cancer, study area surveyed, body mass index, Smoking, alcohol drinking, job type, physical activity at work, perceived stress, level of education and marital status. The study revealed
that in comparison with day workers, rotating shift workers were significantly at risk for 
prostate cancer, whereas fixed night workers were associated with a small and non significant 
increase in risk.

Shift workers are known to be a high risk population for various biological malfunctions such 
as sleep disturbances, gastrointestinal disturbances, obesity, hypercholesterolemia, 
hypertension and also cancers including breast cancer in women. A systemic review and 
Meta analysis of the previous studies revealed a positive relation between night shift work 
and breast cancer risk in women (Kubo, 2006). Recently, a Danish case control study 
reported an increased risk of breast cancer among 30-54 year old women who predominantly 
worked at night. Results were adjusted for age, social class, age at birth of first child, age at 
birth of last child and the number of children each had. Epidemiological studies of women 
with various kinds of shift and night work have demonstrated an elevated risk of breast 
cancer. These women include flight attendants and nurses. However, factors such as exposure 
to carcinogenic ionizing radiation in both professions could also have had an input into the 
responsibility for the resulting cancers. Speculation on whether low levels of the hormone 
melatonin are also a possibility for increased risk in breast cancer among night shift working 
women is currently being researched. This hypothesis has been supported by studies which 
have shown decreased risk of cancer in blind people (Knutsson, 2003).

Another study carried out on 46 police men, displayed results that the direction of shift 
rotation could affect metabolic variables in the body. During a clockwise shift rotation, serum 
triglycerides, uric acid and glucose were lower in comparison to counter clockwise shift 
rotation. Various epidemiological studies have shown that shift workers have higher levels of 
triglycerides than day workers. Studies on weight and BMI in day and shift workers have 
yielded inconsistencies. One particular study found similar body mass indices in day and shift 
workers. Niedhammar et al followed 469 nurses over a 5 year period and found that weight
gains were more apparent among nurses completing night work than day work. However, a vast number of studies have not been able to distinguish weight differences between shift and day workers. Nagaya et al also conducted a recent study examining the relationship between shift work and markers of insulin resistance. It was found that all markers of insulin resistance were more common in shift workers than day workers among the over 50 age group. Circadian rhythm and disturbed sleeping patterns are a major factor affecting workers health and stress levels. Recent suggestions associating a possible mechanism linking shifted circadian rhythm with metabolic disease and cardiovascular disease have been made. Findings indicate that sleep deprivation could affect glucose tolerance and stress is also a potential mediator of disease in shift workers as opposed to day workers. The model below is a summary of possible mechanisms of disease in shift workers.

(Knutsson, 2003).

Day shift office worker’s, have reported various different reasons for suffering job stress in comparison to shift workers. A questionnaire survey of demographic, psychological, environmental and occupational influences on health was carried out in the UK on 6 office
buildings. Four hundred and eighty six questionnaires were completed and then analyzed. Results from the questionnaires suggested that work related illness suffered by these day shift office staff is strongly associated with self reported job stress and a negative perception of the office environment i.e. dissatisfaction with noise, ventilation, lighting and temperature. As opposed to rotating shift workers, job stress is still suffered by fixed day shift staff but maybe not for the same reasons. (Hedge)

One of the better established findings in stress research is that when stress levels increase, an individual’s thought process and attention span narrow.

In 2005, a study was conducted at Chelmsford Borough Council (CBC) in the UK, to measure a range of sources of pressure at work, as well as health outcomes of permanent fixed shift workers. A questionnaire was issued to all staff members, 75% of which was completed online. Employees were generally interested in the issue of stress. Results of this study indicated that the greatest source of pressure was pay and benefits. There was a perception of inequalities in levels of pay across departments and in comparison to other councils. In contrast to studies carried out on rotating shift workers, work life balance was not considered to be a problem here as the staff felt good about the fixed work shifts available to them. As with many organisations, work overload was mainly seen as a problem at more senior levels. Interestingly, staff at supervisory and management levels, even on fixed shifts, reported poorer health than other staff, sleeping problems, headaches and muscular aches and pains (Robertson Cooper, 2005).
Regarding irregular sleeping patterns in shift workers, shift work disorder (SWD) is a circadian rhythm sleep disorder which is characterised by insomnia and excessive sleepiness. SWD which affects approximately 10% of worker’s who work night or rotating shifts, can have serious consequences such as accidents, loss of productivity and depression. By enlisting family support, identifying and treating these sleep disorders, and appropriately timing dark and light exposure (supplemented by melatonin), doctors and clinicians can help many shift workers improve their ability to sleep, possibly decrease other adverse effects of shift work and maintain wakefulness. If there is a negative response to these simple measures, referral to a sleep specialist should be considered (Krystal, 2012).

In America, approximately 8.6 million people perform some type of shift work, whether it is fire fighters, police, airline staff, doctors or nurses. This kind of rotating shift work is associated with increased risk of obesity, diabetes and cardiovascular disease as previously found in other studies. To begin to understand underlying mechanisms, the effects of such misalignments between behavioural cycles and endogenous circadian cycles on metabolic, autonomic and endocrine predictors of obesity, diabetes and cardiovascular risk, determinations were made. Five females and five males endured a 10 day laboratory protocol, where they ate and slept all phases of the circadian cycle. This was achieved by scheduling a recurring 28 hour day. Subjects ate 4 scheduled isocaloric meals each 28 hour day. For 8 days, plasma, leptin, insulin, glucose and cortisol were measured hourly and urine samples were measured every 2 hours. Blood pressure, heart rate, cardiac vagal modulation, oxygen consumption, respiratory exchange ratio and polysomnographic sleep were measured daily. For 10 days, core body temperature was recorded continuously to assess the circadian phase. Results showed that when subjects ate and slept 12 hours out from their usual habitual times, it systematically decreased leptin, increased glucose and despite increasing insulin, it completely reversed the daily cortisol rhythm. Sleep efficiency was reduced and circadian
misalignment caused 3 subjects to exhibit postprandial glucose responses in a range that is
typical of a pre diabetic state. These findings demonstrate the severe cardio metabolic
implications of circadian misalignment which occurs in association with jet lag and
regimentally with shift work (Scheer et al, 2009).

Across the US and Europe, cross sectional studies were carried out to compare the shift
working groups of pilots and medical staff to compare their attitudes concerning the amount
of stress they suffer due to fatigue and how it effects their perceptions of error and teamwork.
1033 doctors and nurses were used along with 30,000 pilots. Pilots were least likely to deny
the effects of fatigue and irregular sleeping patterns caused by shift work on performance
(26% v 70% of consultant doctors). Most pilots (97%) and intensive care staff (94%) rejected
sleep hierarchies, and (55%) of consultant surgeons rejected such hierarchies. Medical shift
working staff have been known to play down the effects of stress and fatigue caused by
irregular sleeping patterns and shifts. Denial of stress and its effect on performance may help
individuals adapt to medical school, but recognising stressor effects caused by these irregular
shifts will reduce the likelihood of error. For example, tired pilots who recognise their own
limitation’s, manage their fatigue by saying that they are tired and ask other crew members to
keep an eye on them, increasing their caffeine intake and distributing their workload as they
see fit during the through the night flights. Irregular sleeping patterns causing fatigue of pilots
endured from irregular shifts have been known to have caused many flying tragedies.

According to aviation research, individuals can be trained to recognise stress and fatigue as
an error inducer by crew resource management training (Sexton et al, 2000).

Recent findings carried out at The University of Surrey in the UK; show that when our sleep
time shifts, it disrupts the daily rhythms of our genes. The study has also found that some
genes follow sleep-wake cycles, and some are regulated by central body clocks. According to
the professor of Sleep and Physiology at Surrey’s sleep research centre, Dr. Derk-Jan Dijk,
“this research may help us to understand the negative health outcomes associated with shift work, jet lag and other conditions in which the rhythms of our genes are disrupted”. Results also indicate that sleep-wake schedules can influence rhythmicity in many biological processes, which may be very relevant for a process such as ageing. Evidence linking nightshifts to a range of health problems and diseases has been classed as a “probable human carcinogen”. This current study involved a group of 22 participants who spent time in a controlled environment without a natural light dark cycle. Participants were placed on a 28 hour day pattern, which delayed their sleep wake cycle progressively by 4 hours per natural day until their sleep was 12 hours of synchronicity with their brain clock, and occurred in the middle of what would ordinarily have been their normal day time. Blood samples were collected from the participants, which enabled researchers to analyze what was happening to the rhythms of gene expression under this altered sleep wake pattern. It was found that there was a six fold reduction in the number of genes that displayed a circadian rhythm which is a pattern that follows a 24 hour cycle. These included many regular genes involved with transcription and translation, indicating widespread disruption to many biological processes. Genes involved with transcription and regulation – the transcriptome, interpret the DNA code for making proteins and controlling cell behaviour. Yielding results from this study suggest that disruption of our sleep wake cycle interferes hugely with the rhythm of genes that switch other genes on and off and fine tune the biological processes in our bodies (Archer, 2014).

In this study, the main focus is on the differences in health risks between day and shift workers and how these risks can affect the lives of individuals. The purpose is to find if there is any truth in my hypothesis, which is that shift work has a worse impact on stress levels, general health and sleeping patterns than that of fixed day shift workers. I consider my proposed research in this area of great importance and value, as it may encourage employers
of shift working groups in the current climate to produce health friendly rosters and review some company policies with regards to sufficient rest time in accordance with the shift that has been completed.

**Method**

**Participants**

This study was conducted using stratified random sampling. Homogenous subgroups comprising of airline cabin crew and fire fighters were participants in this study, both separated into two strata types: shift workers and fixed day time office staff. A total of one hundred people participated in this study, with a split of 50 fixed day time office staff, twenty five cabin crew and twenty five fire fighters. Participants from the fire fighting group comprised of all males and participants from the cabin crew group comprised of all females. The fixed day time office staff group are made up of both male and female participants. In order to recruit participants, random sampling was enforced. The overall age group ranged from twenty to sixty years. Pen and paper surveys were distributed to the three subgroups to gather data and there was a one hundred percent response rate. The quality of data collected was similar to that of face to face interviews.

**Design**

This is an empirical and correlational study which adopted a quantitative, quasi-experimental, cross sectional analysis design. It compares the scores on stress levels, sleeping patterns and general health of two different groups of people. These groups, which are the independent variables, are shift workers and fixed day time staff. The shift workers are split into airline cabin crew and fire fighters and the fixed day time staff are office workers from
administration and human resource areas. The dependent variables are stress levels, sleeping patterns and general health.

The correlational section of this study will look at the relationship between stress levels and general health within the shift working group. The predictor variables are cabin crew and fire fighters and the criterion variables are stress levels and general health. Other tests used in this study are independent samples t-test and one way anova.

**Materials**

Questionnaires were used as a method to extract information from participants involved in this study. Three questionnaires were assembled into booklet form and distributed to specified departments within the shift work and fixed day time staff sections. The chosen questionnaires to measure the independent variables were: The Fifty Two Item Sleep Wake Pattern Assessment Questionnaire (SWPAQ) (Putilov, 2005), The Twelve Item General Health Questionnaire (GHQ12) (Goldberg & Williams, 1988) and The Perceived Stress Scale, (PSS) Ten Item (Cohen, S., Kamarck, T., Mermelstein, R. 1983). Overall, questions collectively covered a multitude of issues such as perceived health status and health practises, self worth, daily routine and approximate hours worked on a weekly basis.

The Fifty Two (SWPAQ) (Putilov, 2005) was created to evaluate psychometrically, the self assessment of individual profile and adaptive traits of the sleep wake cycle. There are five scales upon which sleeping patterns are measured. Scale M, which measures morning lateness or inability of morning wakening. Scale E, which measures evening lateness or ability to of evening night wakening. Scale S, which measures night time sleep ability or ability of night time sleeping. Scale W, measuring anytime wake ability or ability to stay awake at unusual hours. Scale F, which measures anytime sleep ability or ability to fall asleep at unusual hours. The M, E and S scores are calculated as the sums of twelve responses
whereas the scores for scales W and F are calculated as the sums of eight responses. During a previous study conducted by Putilov & Onischenko, the results on factor structure and internal consistency of the scales of the fifty two item questionnaire confirmed its reliability and validity, which is one of the main reasons why I chose this questionnaire to complete my study.

The GHQ-12 (Goldberg & Williams) is a common procedural tool used to measure mental health and consists of 12 questions. Examples of questions asked are “have you recently felt that you are playing a useful part in things” and “have you recently been losing confidence in yourself”. Four choices are given to participants to indicate their answer. The scale on which the answers are based upon is the Likert scale. In this survey, positively worded questions are followed by answer options such as “more so than usual” and “less so than usual”. Negatively phrased questions are followed by answer options such as “not at all” and “much more than usual”. Scores from 0 to 3 are assigned to the answers that are given and based on those answer’s, the total score is then calculated. The maximum possible score is 36, while the minimum possible score is 0. If a score is greater than 20, it is indicative of psychological problems. Low scores indicate minimal signs of distress. The average score for the GHQ 12 test usually lies between 10 and 12. The GHQ 12 test has been identified as a valid measurement of psychological well being according to recent research (Goldberg & Williams, 1988).

The perceived stress scale (PSS), asks questions about feelings and thoughts one may have had during the past month. Each question is designed to extract information about how often an individual felt or thought a certain way. Even though some of the questions are similar, there are small differences between them. Questions that are asked as part of the (PSS) include “in the past month, how often have you felt nervous or stressed” and “in the past month, how often have you been able to control the important things in your life”. Each item
is rated on a 5-point scale ranging from never (0) to very often (4). Total scores are obtained by reversing the scores on the four positive items, for example, 0=4, 1=3, 2=2 and so on. The positively phrased questions are: 4, 5, 7 and 8. Calculation of all questions is then carried out once the score reversal has been completed. Average scores for the (PSS) are approximately 13. High stress groups would usually score an average of 20. A previous study carried out in the USA, determining the stress levels of students, showed that the (PSS) provides adequate reliability (Cohen, S., Kamark, T., & Mermelstein, R., 1983) and this is one of the main reasons why I chose to carry out this test on my own sample.

Procedure

As per ethical procedure, a research proposal of the intended work to be carried out was drawn up and successfully passed. The organisations to which employee access was needed were contacted and permission to distribute surveys to a portion of the workforce was granted. Three surveys with an additional cover letter was assembled and distributed. The cover letter contained information about who was conducting the research, the areas from which information was to be extracted and that the obtained information would remain totally anonymous. An email address was also provided in the event that participants needed to clarify any issues or ask any questions regarding the study. A representative for each group was assigned, and this representative distributed questionnaires among their colleagues. When the questionnaires were returned, data extracted from them was then used and input into SPSS in order for the researcher to analyse the result in relation to the proposed hypothesis.
Results

Aims

The purpose of this study was to investigate how general health, sleeping patterns and stress levels are affected in shift working employees. In order to gain this information, shift working employees were compared with fixed day time staff by way of information extraction from questionnaires. Analyses were carried out using this information by way of independent samples t-test. Results were further analysed by using a One Way Analysis of Variance (ANOVA) to gain a more in depth examination. A Pearson’s correlation coefficient was utilised to examine demographic information such as the relationship between hours worked per week and current stress levels across the board. SPSS version 21.0 was used to examine the data that was collected.

Hypothesis 1

This states that stress levels are higher in shift working staff than in fixed day time staff. A scatter plot was used to determine the distribution of the data. Following this, an independent samples t-test was conducted to analyse the levels of stress between shift workers and fixed day time staff. The scores for cabin crew (M= 17.5, SD= 3.21) and fire fighters (M= 15.9, SD= 5.5) were found to show a significantly higher result in stress levels compared to that of fixed day time staff (M=13.0, SD 4.3) with conditions t (73) =4.7, p=.001 between cabin crew and fixed day time staff and conditions t (73) = -2.6, p=0.012 between the fire fighter group and fixed day time staff. The independent t-test results show that collectively, the shift working groups of cabin crew and fire fighters suffer significantly higher levels of stress than fixed day time workers and within the shift working area, cabin crew suffer higher levels of
stress than fire fighters. Therefore, with regards to the collective shift working group suffering significantly higher levels of stress than the fixed day time group, the null can be rejected. Results of the independent samples t-test can be found in Table 1.

Table 1. An Independent Samples t-test analysing the differences in levels of stress between shift workers and fixed day time staff.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels of Stress</td>
<td>Fire Fighters</td>
<td>15.9</td>
<td>5.5</td>
<td>73</td>
<td>95</td>
<td>.001*</td>
</tr>
<tr>
<td></td>
<td>Cabin Crew</td>
<td>17.5</td>
<td>3.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FDT Staff</td>
<td>12.9</td>
<td>4.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p is significant at .05 level.

A one way analysis of variance (ANOVA) was conducted to gain further information about the levels of stress within the groups. Results of the One Way ANOVA can be found in table 2

Table 2. A One Way Analysis of Variance of stress levels between groups of cabin crew, fire fighters and fixed day time staff.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Stress</td>
<td>Fire Fighters</td>
<td>15.9</td>
<td>5.5</td>
<td>10.12</td>
<td>2</td>
<td>.001*</td>
</tr>
<tr>
<td></td>
<td>Cabin Crew</td>
<td>17.5</td>
<td>3.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FDT Staff</td>
<td>12.9</td>
<td>4.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p is significant at .05 level.
It was found that there was a significant effect of stress on shift workers in comparison to fixed day time staff at the p<.05 level for the three conditions [f(2,97)=10.12, p=.001]

As the results were significant, a post hoc analysis using tukey HSD was carried out. The test indicated that the mean score for cabin crew (M= 17.52, SD= 3.21) and fire fighters (M=15.9, SD= 5.5) were significantly different individually. Collectively as a shift working group, scores were significantly higher than that of fixed day time staff (M= 12.9, SD= 4.3) Taken together, results suggest that the cabin crew group suffer greater levels stress due to the nature of their work than fire fighters, but shift workers collectively suffer higher levels of stress than fixed day time staff.

**Hypothesis 2**

This hypothesis states that General Health is better in fixed day time staff than in the Fire Fighting and Cabin Crew section of shift workers. A histogram confirmed the normal distribution of the data and an independent samples t-test was employed to analyse the levels of general health between shift workers and fixed day time staff. In order to obtain an in depth analysis, the shift working group were separated into the respective groups of fire fighters and Cabin Crew. Fire Fighters (mean= 11.9, SD= 4.9) showed a significantly higher level of general health than Fixed Day Time Staff (mean= 8.5, SD= 2.41) recorded lower levels of general health than the shift working group. Results display that there is a significant difference between the two groups conditions, t (73) = -4.32, p=.001 with a 95% confidence limit showing that the population mean difference of the variables lying somewhere between -5.02 and -1.85. In this test there were 50 fixed day time staff as opposed to 25 shift workers,
yet the fixed day time staff showed significantly lower levels of general health, therefore the null hypothesis cannot be rejected.

Cabin Crew (mean= 10.8, SD= 2.9) and FDT Staff (mean= 8.5, SD= 2.4) show that there is a significant difference between these two groups with the FTD Staff showing lower levels of general health than the Cabin Crew group, conditions present $t(73)=3.63, p= .001$. The 95% confidence limit shows that the population mean difference of variables here lies somewhere between 1.03 and 3.52. Therefore the null hypothesis cannot be rejected.

A One Way Analysis of Variance (ANOVA) was carried out on the respective groups to confirm the significance of the results. This test confirmed that there was a significant difference in the levels of general health between the groups, displaying that the FDT Staff displayed lower levels of general health than the Shift working groups, enabling a tukey post hoc analysis of the scores to be conducted. This test highlighted the differences between the groups [$F (2, 97) = 11.7) P= .001$].

**Hypothesis 3**

States that fixed day time staff get more sleep than Shift Workers. A histogram displayed a normal distribution of data and an independent t-test was utilised to reveal the sleeping patterns of the groups. In order to gain an in depth evaluation, the shift working groups were respectively divided into their individual sections of cabin crew and fire fighters and compared to the fixed day time staff. Cabin Crew (mean= 4.28, SD=7.44) obtained significantly more sleep than FDT Staff (mean= -3.22, SD= 12.89) when tested. Conditions between the two groups reveal ($t (73) = 2.68, p= .009$), therefore displaying a significant result. Fire fighters (mean=0.72, SD= 6.85) was tested in comparison with the fixed day time group. Results revealed conditions ($t (73) = -1.42, p= .158$), showing little or no significance. During this in depth analysis it was revealed that the fixed day time staff sleep the least
therefore the null cannot be rejected. A follow up comparison test using a One Way Analysis of Variance (ANOVA) revealed that the shift working groups collectively gained significantly more sleep than the FDT Staff, [F(2,97)=4.47, P= .014] Therefore the null can be rejected here.

Demographic variables of current stress levels, hours worked per week, age, gender and department where stationed (fixed term day staff), were compared using a series of independent t-tests and correlation coefficient tests. These tests revealed that there were no significant differences in stress levels when compared with gender and completed weekly hours among shift and fixed day time staff.

**Discussion**

The effects of shift work on physiological function through disruption of circadian rhythm and increased stress levels (Knutsson, 2003) are the main aspects that encouraged a more in depth analysis for this current research. The main aim of this study was to investigate the differences in sleeping patterns, general health and stress levels of shift workers in comparison to fixed day time staff. It was expected that when analysis of variables was carried out, shift workers would produce a higher stress rate, lower levels of general health and experience less sleeping hours than fixed day time staff. Demographic variables such as age and hours worked per week were also examined for differences between the groups.

**Hypothesis One - Stress levels are higher in Shift Workers than in Fixed Day Time Staff.**

Previous research investigating the levels of stress experienced among shift working revealed consistent results. A study carried out by Olsson et al, (1990), yielded high scores of stress
among groups of nurses in irregular shifts when compared to paper workers in regular shifts. Similarly, a study conducted by Jamal, (2004), found that employees on non-standard work shifts (shift that is not 9am-5pm) reported significantly higher overall burnout, emotional exhaustion, job stress and health problems than employees on a fixed day shift. These findings are in line with this current study, as shift workers reported significantly higher levels of stress when compared to fixed day time staff. This current finding supports the hypothesis that shift workers suffer higher levels of stress than that of fixed day time staff. Stress levels were assessed by answering questions such as “In the past month how often have you felt nervous and stressed” and “in the past month how often have you felt that you were unable to control the important things in your life”.

A statistically significant result was found between the shift group and the fixed working group, with the fixed day time workers suffering significantly lower levels of stress in comparison to shift workers. In relation to the two groups within the shift working section, the cabin crew suffer significantly more stress than the fire fighters. This may be due to the different nature of the two types of jobs and the amount of employee flexibility, the organisation of rosters and the way in which time off is given, i.e.: split days off as opposed to consecutive days off. During the acquisition of demographical information, it was found that cabin crew are predominately females whereas fire fighters are predominately male. This may also be a contributory factor in the result yielding that cabin crew suffer higher stress levels than fire fighters. Further research may need to be conducted to investigate in more detail the definitive reasons for the differences in the levels of stress between the two shift working groups.

Lusa et al, (2006), carried out a study researching the stressors that may have caused the work of 632 Finnish Fire Fighters to become more mentally stressful. Compared with fire fighters less than 31 years of age, older fire fighters reported that their work had become more
Stressors were items such as: dissatisfaction with leadership, poor co-worker relationships, problems with team work and receiving very little respect for their job outside of the workplace. This current study reveals findings that are in line with the study carried out by Lusa et al, (2006), with regards to age, as per the demographic information in this current study, fire fighters over the age of 35 report higher levels of stress than those that are younger. Further research to gain an in depth analysis of stressors would be advisable to study this area more thoroughly.

Hypothesis Two – General Health is better in Fixed Day Time Staff than in Shift Workers

Research into the general health of shift workers and fixed term day workers in the past has revealed that both present and former shift workers who left their jobs due to ill health, showed a higher degree of prolonged ill health when compared to never shift workers. However, a rapidly rotating 12-hour shift system (rotating every 2 to 3 days) in comparison to a slower rotating 8 hour shift system (rotating every 5-7 days) showed no significant difference in workers ill health when stress at work was controlled (Frese & Semmer, 2010). Further research carried out by Knutsson, (2003), revealed an increase in the rise of breast cancer among women who worked predominately at night. Another such study carried out by Knutsson, (2003), yielded results that found nurses who work night shifts proved to acquire more frequent weight gain when compared to nurses who work day shifts. This current study displays conflicting evidence against the findings by (Frese & Semmer, 2010) as shift workers display a significantly lower level of general health in comparison to fixed term day staff. This current study did not differentiate between working patterns that are available to staff such as full time, part time and flexi time. The proposed hypothesis is not supported by
current findings for this study, therefore the null cannot be rejected. Suggested areas for a more in depth analysis when carrying out future research into this topic would be to revise working patterns available to staff and assess the stressors within the fixed term day staff environment so that they may be controlled to prevent high levels of general health and to yield a more promising and ambiguous result. It may also be suggested that if the shift working group were a sample from the same organisation, results may have proved to be different and may have supported the proposed hypothesis.

**Hypothesis Three – Fixed Day Time Staff get more sleep than Shift Workers.**

Previous research into the sleeping patterns of shift workers by Akinori et al, (2001), reported that lower social support in the workplace was significantly associated with a greater risk of insomnia than higher social support. Further studies by Knutsson, (2003), yielded results that found sleep disturbances are symptoms that are associated with shift work, and that during day shifts these symptoms are not usually present. In 2012, an in depth study into the sleeping patterns of shift workers in Pittsburgh, USA, was carried out by Monk et al, (2012). Results of this study concluded that prior exposure to shift work is related to currently reported sleep problems during retirement. In this current study it has been found that the amount of sleep obtained by fixed term day staff is significantly less than the amount of sleep obtained by the shift working group, which is a contrasting result to what was originally predicted in the hypothesis. These current findings are not in line with the findings by Knutsson, (2003). As an in depth analysis into the sleeping disturbances of retired staff was not carried out in this current study, the results cannot be completely compared with the results yielded by Monk et al, (2012). This current study demonstrates that the mean score for cabin crew obtaining sufficient sleep is significantly higher than the mean score for the other shift working group.
(fire fighters). Furthermore, the mean score for the amount of sleep obtained by fire fighters is significantly higher than the mean score for fixed term day staff. Collectively, results conclude that shift workers obtain more sleep than fixed term day staff which does not support the proposed hypothesis, therefore the null cannot be rejected. It would be advisable to suggest that future research into this topic should include the effects of disturbed sleeping patterns in retired shift working staff, and the volume of social support received by all staff groups, to enable a more in depth insight into sleeping patterns and to gain more recent results to build on the research of Monk et al, (2012) and Akinori et al, (2001). It may be said that due to cabin crew and fire fighters working irregular hours, including shifts that are through the night in comparison to fixed term day staff, they may be more heath aware due to the knowledge of the physical impacts of the nature of their physically demanding work and may take more time to look after their health and include sufficient sleep time straight after their shifts in contrast to fixed term day staff. These are also factors that need investigation and may be included into further research into the sleeping patterns of staff groups to enable a more exact and precise conclusion.

**Demographic variables**

This current study included demographic variables such as age, gender, hours worked per week and department where stationed (fixed term day staff). No significant results were found between hours worked per week and gender, or between fixed term day staff who work in different office departments.
**Limitations**

During this current study, the majority of participants used were from the one organisation (n=75), with fixed term day staff being (n=50) and shift workers being (n=25). The fire fighting sample were from a separate organisation (n=25). A different result may have been obtained if all the shift workers were from the one organisation, as different organisations operate different working conditions which contribute to stress, general health and sleeping patterns of their employees. As the shift working participants knew the researcher, their true feelings may not have been disclosed during the questionnaire process. This current study did not specify to include employees work patterns, i.e. full time, part time, flexi time staff from participants or to include retired staff. Future research would benefit greatly to include these factors as a more specific result may be gained. The above items are limitations to this study and their inclusion to a similar study in the future would be hugely insightful to the differences in stress levels, general health and sleeping patterns between shift workers and fixed day time staff.
Conclusion

This study concluded that there was a significant difference in stress levels between shift workers and fixed day time staff, with shift workers suffering higher levels of stress when compared to fixed day time staff. Identifications were made when the two collective groups were compared in the area of general health levels, with fixed day time staff suffering significantly lower levels of general health than that of shift workers. It was revealed that within the shift working group, fire fighters displayed a higher level of general health than the cabin crew. When an investigation into the area of sleeping patterns was conducted, it was revealed that fixed day time staff endured less sleeping time in comparison to that of the shift working groups collectively. Within the shift working groups, a display of conflicting sleeping patterns was revealed, with cabin crew gaining significantly more sleep than fire fighters. This current research yields similar and conflicting results to previous studies that were carried out on the same topic. Given some of the contrasting findings, and implementation of further analysis into these specified areas is needed, to gain appropriate resolutions for both employers and employees alike. Further in depth analysis of demographics may also be sought to include factors such as employment status, such as retiree, full time, part time, if employees are on a permanent contract and how many children employees may have in comparison to employees with no children. This current study has identified that there is a need for further research into the investigation of these differences between shift workers and fixed term day staff.
References


My name is Louise Carthy and I am a final year psychology student at Dublin Business School. As part of my final year research project I am investigating the difference in stress levels, sleeping patterns and general health levels between shift workers and day workers.

In total the questionnaire should take no more than 20 minutes to complete. It will ask questions related to the areas of stress, sleep and health.

The information provided will remain completely anonymous and confidential. If you have an issue with any of the questions you are not obliged to answer them. If you have any queries or questions regarding this study please do not hesitate to e-mail me at

You may also contact my supervisor Dr. Louise Hopper at

Thank you for your input.
Demographical Information

1. Age: ___

2. Sex (circle the correct response)
   - Male
   - Female

3. Dept you work in (if office staff) _________

4. If you are a shift worker are you:  fire dept  cabin crew (circle correct one)

5. How many hours per week do you work
   - 10-20
   - 20-30
   - 30-40
   - 40-50

6. On a scale of 1-100 how would you rate your level of job stress at present ____
Stress

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how you felt or thought in a certain way.

For each question fill in the appropriate response.

0 = never    1 = almost never    2 = sometimes    3 = fairly often    4 = very often

1. In the last month, how often have you been upset because of something that happened unexpectedly ____
2. In the last month, how often have you felt that you were unable to control the important things in your life__
3. In the last month, how often have you felt nervous and stressed__
4. In the last month, how often have you felt confident about your ability to handle your personal problems__
5. In the last month, how often have you felt that things were going your way__
6. In the last month, how often have you found that you could not cope with all the things you had to do__
7. In the last month, how often have you been able to control irritations in your life__
8. In the last month, how often have you been angered because of things that happened that have been outside of your control__
9. In the last month, how often have you felt that you were on top of things__
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them__
**52 item Sleep-Wake Pattern Assessment Questionnaire (SWPAQ).**

This questionnaire is for self assessment of individual profile and adaptive traits of the sleep-wake cycle. Response may be YES or NO. Please mark X under the appropriate heading.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1. If I get up to early several days in a row, I need to make up for lost sleep.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>2. I seldom feel sleepy late in the evening.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>3. Sometimes I can’t sleep because I’m worried.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>4. I’m always sure that I will get up at the scheduled time in the morning.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>5. It is easy for me to change the time that I go to sleep or get up (to either earlier or later hours).</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>6. Sometimes I wake up too early in the morning and I can’t fall back asleep.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>7. Usually I wake up quickly and easily in the morning.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>8. Sometimes it is easy for me to get some work done in the beginning of the night.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>9. If I lie down in the daytime I can quickly fall asleep.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>10. Sometimes, before falling into a sound sleep, I wake up a couple of times.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>11. I like to get up very early in the morning.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>12. Sometimes it is difficult for me to get things done in the evening.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>13. When I’m sleepy, neither coffee nor strong tea can prevent me from falling asleep quickly.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>14. Some mornings it takes me a long time to wake up.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>15. Frequently I’m in a bad mood because I don’t get enough sleep.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>16. If I’m awakened from sleeping, it is easy for me to fall back asleep again.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>17. Frequently I don’t wake up in the morning.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>18. Sometimes it is hard for me to work in the late evening.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>19. Very rarely do I take a nap after lunch, even if I have the opportunity.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>20. I usually “sleep like a log” at night.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>21. If I don’t get enough sleep one night, I can very easily catch up on my sleep the following night.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>22. I’m usually in a better mood in the evening than during the daytime.</td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>23. I can usually fall asleep after something has upset me.</td>
<td><strong>YES</strong></td>
</tr>
</tbody>
</table>
24. I’m easily awakened in the morning by an alarm clock. __ __
25. It is difficult for me when I have to change my normal sleeping schedule. __ __
26. If I’m awakened during the middle of the night, I can easily get back to sleep. __ __
27. I rarely wake up with the unpleasant thought that it is time to get up. __ __
28. If the work is interesting, I’m happy to work at night and rest during the day. __ __
29. Sometimes sleeping in the daytime gives me a headache. __ __
30. If I go to bed at my usual time, I fall asleep very quickly. __ __
31. If I have to wake up early during the week, I wake up early on the weekends as well. __ __
32. Often in the evening I feel very tired. __ __
33. If I worry about something during the evening, I cannot sleep well at night. __ __
34. It is difficult for me to wake up by myself at a certain designated time. __ __
35. Missing sleep doesn’t usually put me in a bad mood. __ __
36. If I wake up too early in the morning, it is difficult for me to fall back asleep. __ __
37. I don’t feel well in the morning, even after a long nights sleep. __ __
38. It is always hard for me to work late at night. __ __
39. If I don’t get enough sleep at night, I can always make up for it with a nap after lunch. __ __
40. At the beginning of the night I’m easily awakened by any noise. __ __
41. It is rather easy for me to shift the time I wake or sleep. __ __
42. Usually, just before the time I go to sleep, my performance is still rather high. __ __
43. If it is possible, I enjoy taking a nap. __ __
44. I’m in a bad mood when I have to alter my normal sleeping schedule. __ __
45. It is easier for me to finish my work early in the morning than late at night. __ __
46. For me, a nap is a poor alternative for a night’s sleep. __ __
47. I’m OK on the day after only half a night’s sleep. __ __
48. Frequently, my alertness level in the evening is higher than in the morning. __ __
49. During the day I can fall asleep almost as quickly as at night. __ __
50. If my normal sleeping schedule is altered, I nod throughout the following day. __ __
51. In the evening, my thinking is usually worse than in the morning. __ __
52. If I sleep enough every night, it’s hard for me to fall into a sound sleep during the day. __ __
General Health Questionnaire

We want to know how your health has been in general over the last few weeks. Please read the questions below and each of the four possible answers. Circle the response that best applies to you.

Thank you for answering all the questions.

Have you recently:

1. been able to concentrate on what you’re doing?
   better than usual    same as usual    less than usual    much less than usual

2. lost much sleep over worry?
   Not at all    no more than usual    rather more than usual    much more than usual

3. felt that you are playing a useful part in things?
   more so than usual    same as usual    less so than usual    much less than usual

4. felt capable of making decisions about things?
   more so than usual    same as usual    less than usual    much less than usual

5. felt constantly under strain?
   Not at all    no more than usual    rather more than usual    much more than usual

6. felt you couldn’t overcome your difficulties?
   Not at all    no more than usual    rather more than usual    much more than usual

7. been able to enjoy your normal day to day activities?
   more so than usual    same as usual    less so than usual    much less than usual

8. been able to face up to your problems?
   more so than usual    same as usual    less than usual    much less than usual

9. been feeling unhappy or depressed?
   not at all    no more than usual    rather more than usual    much more than usual

10. been losing confidence in yourself?
been thinking of yourself as a worthless person?
been feeling reasonably happy, all things considered?