Cardiff Metropolitan University
Prifysgol Fetropolitan Caerdydd

B.Sc.(Hons) Complementary Therapies

The Effects of Reflexology Treatment on Sleep Quality in Shift Workers

Laura Helen Grady

May 2016

Dissertation submitted in partial fulfilment of the requirements
of the Cardiff Metropolitan University for the degree of
Bachelor of Science
DECLARATION

I hereby declare that this dissertation is the result of my own independent investigation under the supervision of my tutor. The various sources to which I am indebted are clearly indicated. This dissertation has not been accepted in substance for any other degree and is not being submitted concurrently for any other degree.

Candidate's signature: ______________________
Acknowledgement

I would like to thank all of the university lecturers of the Complementary Healthcare programme who have provided exceptional support to myself throughout this degree.

I would like to express my gratitude to Judith Whatley for her guidance and support throughout my dissertation project.

Special thanks go to the participants who partook in this study. I thank you for your time, support and commitment to the project.

Finally I would like to thank my husband Wayne and my family and friends for their patience, support and encouragement throughout my three years of study.
Abstract

Background

Reflexology is based on the ideology that certain points on the feet concur with parts of the body. There is currently no previous research available examining the effects of reflexology on sleep quality in shift workers. A link exists between the pineal gland and the release of melatonin further inducing sleep. By performing reflexology with attention paid to the pineal gland, this study aims to improve sleep quality in night workers who melatonin levels may be inconsistent with their sleeping pattern. This study will add new research to the field

Research Question

Can reflexology treatment improve sleep quality in shift workers?

Method

A single subject design method (SSED) was used to evaluate the use of reflexology performed once weekly for four weeks. Measurements were taken one month prior to intervention, prior to first treatment and following the intervention.

Results

Five out of the six participants saw an overall improvement in sleep quality following intervention. Further analysis of specific sleep quality related questions from both outcome measures displayed an improvement in five out of scores.
Conclusion

Although improvements were found, due to small size of the study, the conclusion that reflexology is effective on sleep quality in shift workers cannot be fully determined. Larger studies will need to be conducted in order to strengthen and support more accurate results.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration</td>
<td>i</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>ii</td>
</tr>
<tr>
<td>Abstract</td>
<td>iii</td>
</tr>
<tr>
<td>Contents</td>
<td>v</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>vi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>viii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>ix</td>
</tr>
</tbody>
</table>
# Table of Contents

1. Literature Review  
   1.1 Sleep Quality and Shift Work 2  
   1.2 Evaluation of anxiety, salivary cortisol and melatonin secretion following reflexology treatment: A pilot study 5  
   1.3 Shift-related sleep problems vary according to work 7  
   1.4 Effects of reflexology on sleep disorder in menopausal women 9  
   1.5 Effects of Reflexology and Footbath on Sleep Quality in the Elderly 11  
   1.6 Summary of Literature Review 14  

2. Method  
   2.1 Introduction 16  
   2.2 Design 16  
   2.3 Sample 16  
   2.4 Data Collection Tools 17  
      2.4a Pittsburgh Sleep Quality Index 18  
      2.4b Insomnia Sleep Index 18  
      2.4c Materials Collected 19  
   2.5 Procedure 20  
   2.6 Ethical Considerations 22  
   2.7 Data Analysis 23  

3. Results  
   3.1 Results of the Pittsburgh Sleep Quality Index (PSQI) 25  
   3.2 Results of Insomnia Sleep Index (ISI) 29  
   3.3 Wilcoxon Test 31  
   3.4 Comparison of ISI and PSQI for all Participants 32  
   3.5 Summary of Findings 33  

4. Discussion 35
<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ISI Scoring System Results</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>Outcome Measure Readings during Each Phase</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Difference in Scores between Each Phase</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>Results from Sleep Quality Related Questions from PSQI</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>ISI results for Sleep Quality Related Questions</td>
<td>31</td>
</tr>
<tr>
<td>6</td>
<td>Descriptive Statistics – Mean and Standard Deviation for ISI and PSQI</td>
<td>33</td>
</tr>
<tr>
<td>List of Figures</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Figure 1: Normal Melatonin, Cortisol and Core Temperature Daily Values</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Figure 2: Total Score for Pittsburgh Sleep Quality Index</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Figure 3: PSQI results for hours sleep (Question 4)</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Figure 4: Sleep Duration Recommendations</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Figure 5: Sleep Quality – Question 6 from PSQI</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Figure 6: Total Score for ISI</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Figure 7: Outcome Measure Comparison</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>
1. **Literature Review**

Reflexology, a Complementary therapy consisting of ancient Chinese, Indian and Egyptian techniques, is based on the ideology that certain points on the feet concur with parts of the body. (Tiran and Mackereth 2011).

Borjigin et al (2012) explains the link between the pineal gland and the release of melatonin which induces sleep.

By performing reflexology with focus on the pineal gland, this study aims to improve sleep quality in night workers who melatonin levels may be inconsistent with their sleeping pattern.

In order to justify the rationale for this study, a literature review was carried out. Journal databases such as Scopus, Pub Med, Science Direct, Google Scholar, NCBI, Ebsco, Cochrane, Medline and Elsevier. were searched. Journals accessed included Complementary Therapies in Clinical Practice, British Medical Journal, Occupational and Environmental Medicine, Pathologie Biologie, Journal of Sleep, Journal of Pshycosomatic Research and Medsurg Nursing.

All sources were dated from 2011 onwards and were limited to English language.

Words used in the search include Reflexology and insomnia, shift work, night shifts, circadian rhythm, reflexology and sleep, night shift and sleep, shifts and sleep, melatonin. In order to obtain further sources, citations in the reference section of papers were scanned.
Government sources were also accessed for information and statistics on shift work, regulations and legislations. These sites included The Department of Work and Pensions, Health and Safety Executive and Health and Social Care Information Team. Books were searched for using the Cardiff Metropolitan University library catalogue and Google Scholar for E-books. D:Space was accessed for previous dissertation studies.

Information regarding the outcome measure Pittsburgh Sleep Quality Index was obtained through The Pittsburgh University site. Permission was not required for use of this questionnaire for a student project.

From the literature review conducted, no papers were found researching the effects of reflexology on sleep quality in night workers. Studies based on the efficacy of reflexology on insomnia with several alternative ailments were found.

### 1.1 Sleep Quality and Shift work

According to a report published by Health and Social Care Information Centre (2014), 55% of the population work shift patterns; 33% men and 22% women. The highest prevalence of shift workers were found to be aged 16-24. Shift work can refer to night shifts, early mornings, late evenings or a rotation of all three. Any shift which falls outside of the hours’ 7am to 7pm pattern is considered a shift. Health risks are increased for those who work shifts. Conditions such as diabetes, obesity, cancer and heart disease are among the health risks involved. Shift workers are also reported to smoke and drink more than non-shift workers and follow a less healthy diet. The most common complaint was reported to be sleep disruption.
With reference to a report published by Health and Safety Executive (2011), there has been a rise in the need for twenty four hour industries. The highest number of shift workers were found to work in healthcare, leisure, transport and communication. There has now been a rise in other industries such as construction, manufacturing and retail.

The Department of Work and Pensions (2016), details that all employers are required to provide health assessments to shift workers. Any queries must be enquired into and acted upon if required. The health of the employee is very important and it is the employers’ responsibility to ensure that they are not in danger.

A journal article written by Boivin and Boudreau (2014) reviewed the effects of shift work on the circadian rhythm. Three factors were taken into consideration with this study; Core body temperature, Cortisol levels and Melatonin levels. Melatonin is the hormone that controls sleep and from looking at Figure 1, melatonin levels rise in the evening and peak throughout the night before reducing by morning. These levels are maintained to allow a person to feel like going to sleep in the evening, remain asleep during the night and wake following eight hours of sleep.

*Figure 1. Normal Melatonin, Cortisol and Core Temperature Daily Values*
During this, the core body temperature lowers during sleep and rises shortly on waking. The cortisol levels lower before regular sleeping times, remaining low throughout the night and peaking upon waking. These three occurrences work together to provide energy and ensure the body is regulating homeostasis. When working a shift pattern, the circadian rhythm becomes confused as it remains the same, yet the body is performing the opposite to what is required. This is when sleep becomes disrupted and health problems begin to occur. The body can take a few days to get used to the new pattern and by then, the sleep pattern alters again due to rest days.

The researcher points out that numerous strategies have been trialled in order to counteract the effects of the circadian rhythm. This includes tinted goggles during the commute home in the morning and the introduction of bright light prior to and during night shifts to improve the workers alertness (Boudreau et al 2012). Melatonin tablets have also been trialled to improve sleep in the day. (Sharket and Eastman 2002) All of these trials were performed with limitations on size and efficacy and further studies need to be carried out in order to improve this research and provide more accurate results. The study found that working shifts can have a very negative effect on health, sleep, concentration and accidents in the workplace and there is not enough evidence to suggest that the effects of the circadian rhythm can be reversed.

As mentioned previously, shift work can have a detrimental effect on one’s health. According to the national Sleep Foundation, sleep disorders which occur due to shift work are called Shift Work Disorder. This generally refers to a disruption of the circadian melatonin pattern. Symptoms can include depression, insomnia, difficulty
concentrating, lack of energy and inability to deal with relationships due to irritability and mood swings. Long term shift work can eventually lead to cancer, heart disease, metabolic problems, ulcers, obesity and gastrointestinal problems. Accidents are more likely to occur during shifts due to drowsiness and fatigue.

1.2 Evaluation of anxiety, salivary cortisol and melatonin secretion following reflexology treatment: A pilot study in healthy individuals

There are limited studies available that research the effect of reflexology directly on melatonin and cortisol levels. One paper dating back to 2006 was found. Due to lack of other research, this paper was chosen due to its relevance to this dissertation. Written by McVicar et al, the objective of this study was to evaluate anxiety levels, cortisol and melatonin secretion following reflexology treatment.

A cross-over experimental design using thirty healthy individuals aged sixteen to thirty nine was conducted. The researchers chose healthy participants as not to involve unnecessary treatment to those experiencing health conditions. By having all volunteers healthy, all participants have a similarity and no bias will occur. Two groups were used; one for reflexology and one for no treatment. To collect the results, a Spielberger STAI Questionnaire was used for anxiety levels, a blood pressure and pulse monitor and concentrations of salivary cortisol and melatonin prior to and following each treatment.

The exclusion criteria included anyone who suffered with a deficiency of steroid secretion. This list consisted of Addison’s disease, adrenal tumours, Adrenocorticotropic hormone deficiency, women on oral contraception and pregnancy.
No eating, drinking or smoking was allowed one hour prior to each salivary collection. Due to factors affecting the endocrine system, further health behaviours were recorded in case the participant needed to be eliminated in order to prevent unrealistic data. Major behavioural factors included caffeine and alcohol consumption, exercise, smoking, diet and sleep quality.

Participants were randomly assigned to two groups. Both received reflexology, however one group provided a saliva sample immediately following treatment and the second group took more than one sample over a longer period of time. The researchers felt this was necessary as it was unknown how long it would take for reflexology to have a diurnal effect on the endocrine system. This ensures a more accurate reading. The first group received reflexology whilst the control group received no treatment, then three days later the groups swapped over. This design was used to provide control data for each participant.

Participants were required to take saliva samples using a swab themselves and deposit them at the research location at timeslots provided. It was very important that this was adhered to as even being slightly outside of these timescales would cause inaccurate readings. Group A provided samples at midday, 1.15pm and 8pm whereas group B provided samples at 1.15pm, 11pm and upon waking the next day. These timings ensured a reading was taken at each natural daily change in cortisol and melatonin levels.

The results of this study showed no statistical significance between melatonin and cortisol levels on rest days and treatment days in either group. Although the results
were negative, this does not mean that no effect took place. Further studies are required to research the effects of reflexology on cortisol and melatonin levels in order to provide evidence of this. The treatment involved in this study consisted of a basic reflexology treatment. The researchers did not mention if the endocrine system was the main point of focus.

The researchers note this study has limitations. They believed the three day gap between treatment times and the sequence itself may have altered the results, meaning the treating was not as effective. The main limitation to this study is the lack of number of treatments. It could be argued that one treatment alone will not have an effect on the body compared to receiving a treatment on a regular basis. To strengthen this study, a greater number of treatments would need to be carried out.

Although the study did not show any change in cortisol and melatonin levels, it did find that blood pressure and trait anxiety were lowered following treatment. This information is essential as a base for further studies.

1.3 Shift-related sleep problems vary according to work schedule

According to a study conducted by Moen et al (2012), conducted a Bergen Shift Work Sleep Questionnaire (BSWSQ) on 1586 nurses who worked shifts and who experienced shift-related insomnia. This study provides a clear statement of the main aims and objectives. The researchers found that shift work was causing sleep disparities of some kind for nurses who worked these shifts and felt it relevant to conduct a study to find how many are affected and in what way. A qualitative survey
method was used. For this type of study, this was considered the most suitable outcome measure. As no treatments were taking place and responses were based merely on opinion, a randomised control trial was not required.

Participants were contacted by post through the Norwegian Nursing Organisation. There was a high response rate to this method. The participants were found to work a variation of patterns with the largest proportion being the three shift pattern. This consisted of working days, nights and afternoons on a rolling basis. The mean age for the participants was 34.2 with 91.2% being female. The BSWSQ was the only data collection method used. The researchers believed that this questionnaire covered all of the information required for the study. This included assessment of symptoms of insomnia for separate shift patterns and on days off. All questions were based on the previous three months.

The exclusion criteria was carried out following the BSWSQ. This included those who answered N/A to any questions. Data was analysed using SPSS. The researchers do not specify which method was used. The results showed that the most problems with sleep latency were those who worked the two or three shift patterns. Waking up mid sleep did not affect any more than 20% of each group, except for those who work a three shift pattern, during their night shifts only. Again when asked if participants woke up at least half an hour before planned, the three shift work pattern were affected most during their night shifts. When asked if participants found they were tired during their shift, 70% of any working night shifts answered yes. The three shift pattern workers were also found to be most affected on their days off. Overall, the study found that night work in general had the most negative effect on sleep disorders.
The study consisted of a large number of participants giving it stronger results than a study with very few participants. The researchers believe that no selection bias occurred due to the vast difference in work patterns and rest days. This study adds strong research to the existing field and holds relevance for future studies.

1.4 Effects of reflexology on sleep disorder in menopausal women

A randomised control study conducted by Asltoghiri and Ghodsi (2011), evaluated the effect of reflexology treatment on sleep disorders in menopausal women, providing positive results. The researchers clearly address the main focus for this study; being the comparison of reflexology and non-specific foot massage on sleep disorders in menopausal women. Only females aged between 45 and 60, currently experiencing early menopause and reported a sleep disorder were initially contacted. Further inclusion criteria excluded those who have taken Hormone Replacement Therapy, history of cancer, severe pathology of the feet or currently receiving other complementary therapy treatment for sleep disorder.

The participants were randomly assigned to the groups. Patients had a similarity between demographics and menopausal complications of the participants. There was no mentioning of how the participants were divided, however due to such a similarity of each case, results would not be affected. The study was patient-blinded with each unaware of which group they were allocated to. It is not known if the study personnel were also blinded.

At the beginning of the trial, 110 participants were recruited, however due to commitments, 10 of these did not go ahead with the study. The remaining 100 were accounted for, however due to a drop in numbers there were 6 more in the reflexology
group than the non-specific massage group. As the number of participants was still quite high for this study, not a lot of difference would have been made to the results.

To measure the outcome, the Pittsburgh Sleep Quality Index (PSQI) was used. This was chosen due to the broad variety of questions which were specific to primary outcome of study. Questions included sleep latency, sleep duration and causes of sleep disorders.

The results showed an improvement in sleep disorders in menopausal women in the reflexology group. At baseline, all participants experienced some form of sleep disorder. Following intervention, 41.5% of women in the reflexology group and 19.1% of the non-specific massage group were experiencing normal sleep. These results show a statistically significant difference between the two groups. As there was an improvement in the non-specific massage group, it could be suggested that foot massage alone can improve sleep, however not as greatly as reflexology.

Although sleep disorders were the main focus in the trial, the researchers did compare the number of hot flashes occurring each day. Prior to intervention, both groups experienced on average, four to nine occurrences per day. Following intervention, the reflexology groups had reduced to two to three times per day and the non-specific massage group had remained the same. It may be possible that the hot flashes may be the cause of the clients sleep disorders, therefore contributing to the positive results from the reflexology group.

The results of this study are relevant to other sleep related studies. The number of participants makes the study stronger than if only a small number of participants had been used. The one factor which limits the outcome of the study and raises concern for further in-depth research was the treatment itself. The reflexology session
consisted of only fifteen minutes duration. Although this was performed every day for three weeks, in reality this would not be achievable due to costs and scheduling of a therapist.

1.5 Effects of Reflexology and Footbath on Sleep Quality in the Elderly

A randomised control study conducted by Valizadeh et al. (2014) researched the effects of reflexology and foot bath on sleep quality in the elderly. The researchers were very clear with the objectives of this study. The data collectors had no involvement in the treatments and patients were not aware of which group they were assigned to. Patients were recruited from one care centre. 75 elderly male subjects were recruited and randomly assigned to one of three groups; two experimental and one control group. The experimental groups consisted of a reflexology intervention and or foot bath intervention. The researchers suggest recruiting from one centre allowed elimination of confounding factors which could affect the patients sleep disorders. All patients were aged between 60 and 75 years.

Patients were excluded if they experienced enuresis, they were receiving complementary therapies or suffering with diabetes for more than ten years. The inclusion criteria consisted of being relatively independent, not working nights, being generally healthy and having up to date mental health records located at the healthcare centre.

Of the 75 participants, 69 were recruited. Four participants were excluded due to diabetes and two were not willing to go ahead with the study. Therefore each group contained 23 participants’.
The study was conducted over six weeks. The reflexology was performed once weekly for ten minutes. The researchers provide details of the treatment consisting of only five minutes of foot massage and five minutes of general massage specifically over the pineal gland. The group receiving the foot bath were required to place their feet in warm water every evening before bed. The control group received no treatment, however were required to complete a PSQI prior to intervention and following the six week timescale. The researchers obtained validity of the PSQI from Tabriz University of Medical Sciences prior to the study.

Once all data was collected, presentation of the results was carried out using mean descriptive index, standard deviation, frequency and frequency percentage. Primarily, an attempt to analyse the data using the Kologorov-Smirnov test was conducted, however parametric conditions were not achieved.

To analyse the data, the seven components of the PSQI were scored. Results from the Wilcoxon showed a statistically significant difference between the scores of sleep quality of both the reflexology and foot bath groups. Both groups had decreased, whereas the control group did not display a statistically significant difference.

On further analysis, the foot bath group had seen an improvement in all components of the PSQI except sleep efficiency and use of sleep medication. Compared to this, reflexology only showed a statistically significant difference between subjective quality of sleep and delay in falling asleep. The components which showed the most improvement in all three groups was for sleep latency and sleep duration.

The researchers concluded from the analysis of the results that both reflexology and regular foot baths could both be introduced as a complementary, non-invasive method to improve sleep disorders in the elderly. The foot bath method is advantageous to this
particular group of individuals as they can administer themselves without help, whereas reflexology requires a trained professional who understands the effects, contraindications and possible side effects of the treatment.

To strengthen this study, further research needs to be conducted. The limitations of this study were due to the use of both patients with and without sleep disorders. To obtain more efficient results, all participants experiencing a sleep disorder could be used. The number of participants did add strength to the study, providing more effective results that if only a small group was used.

As each reflexology participant only received five minutes of reflexology and ten minutes of foot massage, once weekly for six weeks, the effects may not have been as great as a forty minute treatment. By lengthening the treatment time, other components of the PSQI may have shown significant differences. For future reference, studies researching the effects of reflexology should use an increased treatment time.

The study would have benefited from carrying out the PSQI following treatment three. During analysis, the researcher may have been able to find at what timescale sleep disorders improved. This could have been useful for further studies in order to estimate an effective timescale for a study.
1.6 Summary of Literature Review

To provide reasoning for this study, literature was searched on statistics and negative effects that working shifts has on individuals. From searching government websites, it was found that 55% of the workforce work shifts. This varies between night shifts, alternative shifts, early mornings and late nights.

The effects of working shifts on the body were also researched using journals and research papers. It was found that the circadian rhythm is the main control of the body and working shifts can have a detrimental effect resulting in a number of health conditions.

In order to provide a non-drug remedy to shift workers, it was thought from existing evidence, reflexology may benefit and a study designed to trial this to be carried out. If successful, results could provide a base for future research and aim to help reduce sleep disorders and health complaints in shift workers.

From the literature review, it can be seen that reflexology can help to improve sleep disorders. As there is no literature available on the effects of reflexology and sleep quality in shift workers, similar studies which have relevance were chosen to review.

Evidence of changes in cortisol and melatonin levels following reflexology were studied in one paper. Although this paper found no statistically significant results, the design of the study itself was not strong in providing accurate results. One treatment alone was performed during this intervention before readings were taken. By providing three or more treatments, reflexology is more likely to have an effect. This study did not provide a literature review and based their main reason being thirty years of unpublished research carried out by themselves'. During future studies, the use of
participants with endocrine disorders may provide more intensive results to those who are healthy.

A study researching the effects of reflexology on sleep in menopausal women was reviewed due to it's relevance to this study and it's validity of the PSQI. This study found reflexology effective in improving sleep disorders. Participants were assigned to reflexology or foot soaking. Both groups saw an improvement, however reflexology was significantly higher. This study was well structured and provided unbiased, accurate results.

The effects of reflexology on sleep disorders in elderly patients was studied providing statistically significant results, however the researchers divided the PSQI components to provide detailed results of sleep disparities. It was found that reflexology was only statistically significant in improving sleep efficiency and sleep disturbances. The study had limitations which could have affected the results. The reflexology treatment only consisted of a five minute foot massage and five minutes of stimulation over the pineal gland. Results may have been more effective if a full treatment had been performed. Realistically for an elderly patient to upkeep their treatments, cost implications would occur.

At present, research shows that reflexology can have an effect on sleep disorders. Further studies need to be conducted in order to provide strong evidence of this. The design of this study aims to add new research to the field as no study has been conducted based specifically on the effects of reflexology on sleep quality in shift workers. This study builds a foundation for future studies.
2. **Method**

2.1 Introduction

The aim of the study was to research the effects of reflexology on sleep quality in night workers. Four reflexology treatments were performed on six participants. Each treatment was performed once weekly on the participants last working day. The decision to perform four treatments was decided due to evidence from recent studies suggesting presenting conditions begin to improve following treatment three. It was felt that this was the most appropriate pattern of treatments required to test for a change in sleep quality.

2.2 Design

A single subject experimental design (SSED) was used to demonstrate the effects of the independent variable (reflexology) on the dependent variable (sleep quality in shift workers). An SSED was chosen to look for a clear difference between the outcome prior to and following treatment. This method controls the measurement effect of the reflexology without allowing any factors to influence the results increasing confidence in the findings.

2.3 Sample

Eight participants were originally sought and recruited through opportunistic sampling via personal contact.

Once recruited, participants were required to fulfil an inclusion criteria consisting of:

- Over the age of 18,
- Working a minimum of three shifts per week,
• Not currently taking any medication or receiving alternative therapies for sleep disorders,

• Currently experiencing shift work related sleep disparities,

• Not presenting with any contra indications including serious medical conditions including:
  
  o Deep Vein Thrombosis,
  
  o recent heart conditions,
  
  o fever,
  
  o recent fracture to the foot,
  
  o contagious foot conditions,
  
  o recent infections.

If the participants passed the inclusion criteria, an information sheet was provided to them during a one to one meeting, four weeks prior to intervention (Appendix 1). The purpose of this document was to inform the participants of the details of the study and their requirements.

2.4 Data Collection Tools

To collect the data, two outcome measures were used; A Pittsburgh Sleep Quality Index (PSQI) (Appendix 2) and Insomnia Severity Index (ISI) (Appendix 3). The use of both outcome measures did not require permission and were chosen based on their efficacy from other studies. The PSQI and ISI were completed three times in total. The first time, one month prior to intervention, the second time, immediately prior to intervention and a third time, immediately following intervention.
2.4a Pittsburgh Sleep Quality Index (PSQI)

The PSQI was developed in 1989 by Buysee et al. at Pittsburgh University. It is one of the most widely used outcome measures used in sleep studies and has been published in fifty seven languages. Permission for students was not required for use of the PSQI and a copy of the questionnaire with scoring system was provided at no cost. (Pittsburgh University Webpage accessed on 18 April 2016).

Validation of the PSQI has been reviewed by many papers, however these publications were found to be over fifteen years old. One review published in by Mollayeva et al (2015) found the PSQI to be a reliable outcome measure for assessing the sleep quality in individuals in a clinical and non-clinical situation. The researchers found that the PSQI covered a broad range of questions covering the causation of sleep disorders. For clinical observation, the researchers advise that further research would need to be conducted on each participant to find if circadian rhythm or medication effects are the reason for the sleep disorder.

The questionnaire covers nineteen questions divided into seven components; Sleep quality, sleep latency, sleep duration, habitual sleep, sleep disturbance, medication and daytime dysfunction. All questions are self-rated. Five of the questions are based on answers from a bed partner and are scored separately. These questions were not used as part of the analysis of this study. Each component is scored separately and a total scored is given which ranges from 0 – 21. The higher the number, the worse the sleep quality.

2.4b Insomnia Severity Index (ISI)

The ISI was developed by C Morin at the University of Laval. The ISI is very often used as an outcome measure for sleep disorder related studies. An overview of several
sleep studies conducted at Laval University was performed to validate the efficacy of the ISI. The findings concluded that the ISI is a reliable and valid instrument especially relevant to insomnia. (Morin et.al 2011).

Like the PSQI, the ISI consists of a scoring system. The ISI is shorter and consists of only seven questions, each one self-rated. A score is given for each answer which is then totalled up to give a final score. Please see Table 1 for scoring system.

*Table 1. ISI Scoring System Results*

<table>
<thead>
<tr>
<th>Total Score</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 7</td>
<td>No clinical significant insomnia</td>
</tr>
<tr>
<td>8 – 14</td>
<td>Subthreshold insomnia</td>
</tr>
<tr>
<td>15 – 21</td>
<td>Clinical insomnia (moderate severity)</td>
</tr>
<tr>
<td>22 – 28</td>
<td>Clinical insomnia (severe)</td>
</tr>
</tbody>
</table>

(Benuto 2012).

### 2.4c Materials Required

In order to carry out the intervention phase of the study, materials and equipment were an essential requirement. This included:

- Reflexology Lafuma chair
- Reflexology record sheet
- ISI and PSQI (Treatment one and four)
- Pen
- Foot lotion
- Towels
- Blanket
- Couch roll
• Cushions
• Foot wipes
• Clock
• Music/mp3 player

2.5 Procedure

The experiment consisted of three phases - ABA. Phase A consisted of completion of the PSQI and ISI one month prior to intervention. Phase B consisted of a second PSQI and ISI followed by the four week reflexology intervention. The final phase involved completion of the PSQI and ISI for a third time following intervention. This design was chosen to strengthen the study by providing an extra baseline for comparison. Table 2 displays the outcome measures within each phase.

*Table 2. Outcome Measure Readings During Each Phase*

<table>
<thead>
<tr>
<th>Phase A1</th>
<th>Phase B</th>
<th>Phase A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSQI</td>
<td>PSQI (treatment one only)</td>
<td>PSQI</td>
</tr>
<tr>
<td>ISI</td>
<td>ISI (weekly)</td>
<td>ISI</td>
</tr>
</tbody>
</table>

**Phase A: One Month Prior to Intervention**

A month prior to the study, participants were required to complete a PSQI and ISI which was forwarded to them through the post or via email. This was returned to the researcher before the intervention began.
Phase B: Intervention

Prior to the first treatment, the second PSQI and ISI was completed. A total of four reflexology treatments including light touch therapy were performed once weekly in the participants' own home. Each treatment, lasting approximately forty-five minutes, was performed on the same day of the participants' last working day of the week.

Prior to each treatment, the participants were required to remove clothing and footwear from their feet. The feet were cleaned using an antibacterial wipe. During this, observation of the feet took place and recorded on the reflexology foot chart. (Appendix 4). This included colour, temperature or any markings on the feet. To ensure the participants were comfortable, pillows and a blanket were provided. During the treatment, the participants were asked to report any soreness or sensitivity which was then recorded on the foot chart. An ISI was performed weekly.

An aftercare leaflet was provided following each treatment to advise the participant of the possible side effects of the treatment and how to ensure they enhance the benefits following treatment. (Appendix 5)

No pilot study was conducted during the intervention stage or prior to this study.

Phase A: Post treatment PSQI and ISI

A week following the final treatment, a PSQI and ISI was completed. This was forwarded to the participants via post or email for completion and return. All participants completed the three phases.

Issues during data collection: Two of the eight participants failed to respond to contact following cancellation of their first appointment due to personal reasons. The six
remaining participants completed all phases you can take this out, as they have given consent.

2.6 Ethical Considerations

In order to carry out this study, approval was sought through the Health Sciences Healthcare and Food ethics board at Cardiff Metropolitan University. (Appendix 6) An introduction to the study and a more detailed outline of the research design used was included in the application along with extra details required; for example, project title, duration of the study, applicant name and supervisor. Once submitted, the ethics form was approved within two weeks. To ensure both parties were protected, a risk assessment form was also completed outlining the possible safety issues, the level of risk and the likelihood of occurrence. Details regarding the prevention of risk was also included.

Once the study was approved, the participants were contacted individually. A participant information sheet was provided to ensure that expectations of the study were clear to the participants. This document held great importance as information was provided here essential to the study. This included:

- The aim of the study
- Treatment details
- Timescale of the study
- Inclusion criteria
- Potential risks
- Withdrawal of data
- Anonymity of data and the Data Protection Act 1998
- Contact details for the researcher and project supervisor
Written consent was required by each participant prior to the study taking place (Appendix 7). This document covered the participants understanding of the study, confirmation that they had read and understood the information provided on the information sheet, agreement to take part in the study and a signature. Each participant was required to complete a full consultation highlighting medical conditions, medications and presenting conditions. (Appendix 8) The completion of these forms not only covered ethical considerations, they ensured the inclusion criteria was also checked. Contact details were made available to the participants if any further information was required on the study.

3.7 Data Analysis

The Outcome measures used were completed following a scoring system. For the data analysis, the final score was used. To strengthen the results and provide answers particularly relevant to sleep quality, specific questions were chosen and analysed from both outcome measures. The questions chosen were:

- **PSQI:**
  - During the past month, how many hours of actual sleep did you get at night?
  - During the past month, how often have you had trouble sleeping because you cannot get to sleep within thirty minutes?
  - During the past month, how often have you had trouble sleeping because you wake in the middle of the night or early morning?
  - During the past month, how would you rate your sleep quality overall?

- **ISI:**
  - Difficulty falling asleep
○ Difficulty staying asleep
○ Problems waking up too early
○ How satisfied are you with your current sleep pattern?

The Wilcoxon test was primarily chosen to be used. Eight people were initially required, however only six completed the study. This means that validity and accuracy of this method may not be clear, however this test will still be conducted. Data was displayed in two forms: -

- Graph form using Microsoft Excel. This form was used for analysis of the final score of both outcome measures for all participants.

- Descriptive statistics using SPSS (Statistical Analysis Software Package).

Chart form using Microsoft Excel. This form was used for analysis of specific questions separately chosen from both outcome measures for all participants.
3. **Results**

Those who met the inclusion criteria for the study were recruited. Six of the eight participants completed the study in full. Two participants left the study due to personal reasons. All remaining participants worked night shifts and experienced shift work related sleep disorders. No participants had taken any time off work during the study and continued to work their regular night shifts throughout.

3.1 **Results of the Pittsburgh Sleep Quality Index (PSQI)**

Following the scoring system provided alongside the PSQI, the total score of each participants’ questionnaire was calculated. The scoring system excludes question 10 as these are based on a bed partner/roommate. Figure 2 provides results for each participant at each stage of the study.

*Figure 2. Total Score for Pittsburgh Sleep Quality Index*

From these results, an improvement can be seen in all participants’ scores between Baseline B and the final phase. The greatest overall improvement can be seen in
participants’ 1, 3, 4 and 5. Participants’ 2 and 6 only saw a small improvement in their scores. Although these scores provide accurate results, without going into more detail, improvements between sleep quality, duration and latency cannot be analysed. This is carried out in more detail in figures 3, 4 and 6.

For participants 1, 3, 4 and 5, the scores improved by 7-9 points. This may suggest a trend, however, further participants would be needed to strengthen this analysis. Table 3 provides details of each participants score.

Table 3. Difference in Scores between Each Phase

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline A</th>
<th>Baseline B</th>
<th>Final Phase</th>
<th>Difference in Score Between B and Final Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>13</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>14</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>12</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>16</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>12</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Four sleep quality related questions were chosen from the PSQI for further analysis. This was decided upon to provide a more detailed result for the study. The questions chosen included: -

- During the past month, how many hours of actual sleep did you get at night?
- During the past month, how often have you had trouble sleeping because you cannot get to sleep within thirty minutes?
- During the past month, how often have you had trouble sleeping because you wake in the middle of the night or early morning?
- During the past month, how would you rate your sleep quality overall?
Table 4 displays the results from these questions. Results were based on comparison between Baseline B and the Final phase

Table 4. Results from Sleep Quality Related Questions from PSQI

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours sleep (Question 4)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>66%</td>
</tr>
<tr>
<td>Trouble getting to sleep (Question 5a)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>83%</td>
</tr>
<tr>
<td>Waking up too early (Questions 5b)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>83%</td>
</tr>
<tr>
<td>Sleep Quality (Question 6)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>83%</td>
</tr>
</tbody>
</table>

The table has been divided into each participant with a yes or no for improvement in scores. The very last column provides the percentage of improvement between all participants. The only participant to see no improvement was participant 6. Participant 2 improved on all factors except for hours of sleep.

Questions 4 focuses on hours of sleep and is looked at in more detail in figure 3.

Figure 3. PSQI results for hours sleep (Question 4)

From figure 4 it can be seen that an improvement is seen in all participants apart from 2 and 6. Using descriptive statistics, the mean value for hours sleep prior to
intervention was calculated to see how affected shift workers are by sleep related disorders. Participant 4 saw the largest improvement in sleep hours which doubled from 4 hours to 8. The participants with the lowest change, which saw no improvement were participants 2 and 6. The mean value was calculate prior to, following intervention and the difference between the two. Calculations are provided in the appendix.

Prior to intervention the average sleep time was 4.83 hours. Following intervention 7.16 hours. The difference between this scores was 2.33 hours. Overall, an improvement in sleep hours is seen.

It is recommended that on average, an adult aged 26 – 64 should maintain 7 – 9 hours sleep per night. (Sleep Foundation 2016). Using this information, it can be seen that the participants in this study began to experience the recommended number of hours sleep following the intervention. Beforehand, the average hours of 4.83 fall over 2 hours short suggesting a sleep deficiency. See figure 4.

Figure 4. Sleep Duration Recommendations

(Sleep Foundation 2016)
Participants were asked to score their sleep quality between 0-3 prior to and following intervention. This higher the number, the worse the sleep quality. Figure 5 displays the results from these questions.

*Figure 5. Sleep Quality – Question 6 from PSQI*

This question was asked prior to and following the intervention and was based on the participants' opinion of their own sleep quality. From this chart it can be seen that an improvement was made from each participant apart from participant 6. Most participants scored themselves a difference of 2 points following intervention.

### 3.2 Results for Insomnia Sleep Index (ISI)

The ISI consisted of only 7 questions and was not as detailed as the PSQI. The total score for this questionnaire was calculated based on the results from Baseline A, B, week 2, week 3 and the final phase. These results are displayed in figure 6.
From the results it can be seen that all participants saw an improvement in the final scores following intervention. Leading up to this score, 5 of the participants saw a slight improvement following week 2 and an increased improvement following week 3. The questions in the ISI are based on several sleep related complaints, therefore further analysis of individual questions would provide more detailed results. Four elements were chosen based on their relevance to the research study. These consisted of:

- Difficulty falling asleep
- Difficulty staying asleep
- Problems waking up too early
- How satisfied are you with your current sleep pattern?

The table displayed in Table 5 provides results for these questions prior to and following intervention. Baseline A was not used for this part of the data analysis as a difference following the intervention was only required.
### Table 5. ISI results for Sleep Quality Related Questions

<table>
<thead>
<tr>
<th>Prior to Intervention</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falling Asleep</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Staying Asleep</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Waking up Early</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Quality of Sleep Pattern</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Following Intervention</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falling Asleep</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Staying Asleep</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Waking up Early</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Quality of Sleep Pattern</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

The results are shown separately for each participant. Each question was given a score of 0 -3, with 3 being the worst. It can be seen that all participants’ scores decreased apart from participant 6. The participant with the largest decrease in score was participant 3 with every aspect of sleep decreasing by 2 points.

### 3.3 Wilcoxon Test (Non Parametric)

The scores from Baseline A and the final phase for both the ISI and PSQI were analysed using SPSS (Statistical Analysis Software Package) to find if the results from the study were statistically significant. The Wilcoxon test was chosen due to ordinal data and repeated measures being used. This test normally requires 8 participants to provide more plausible result, however this was still carried out.

The results from the Wilcoxon found a statistical difference of 0.027, therefore a statistical significance was found between the Baseline A scores and the final phase. (Appendix 9)

### 3.4 Comparison of the ISI and PSQI for all Participants
The final scores for both outcome measures are displayed in figure 7. This chart was produced to compare these scores against each other and look for any familiarity in score changes. From this chart, a similarity in shape can be seen for all participants regardless of the difference in scoring systems for the PSQI and ISI. The difference in scores for both outcome measures are displayed in the data table below.

Figure 7. Outcome Measure Comparison

Using descriptive statistics, the mean and standard deviation were calculated for both outcome measures prior to Baseline A and the final phase. These are displayed in Table 6.

Table 6. Descriptive Statistics – Mean and Standard Deviation for ISI and PSQI
<table>
<thead>
<tr>
<th></th>
<th>Mean Phase A</th>
<th>Mean Final Phase</th>
<th>Standard Deviation Phase A</th>
<th>Standard Deviation Final Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISI</td>
<td>15.67</td>
<td>7</td>
<td>4.179</td>
<td>2.28</td>
</tr>
<tr>
<td>PSQI</td>
<td>12.33</td>
<td>6.83</td>
<td>1.862</td>
<td>2.317</td>
</tr>
</tbody>
</table>

It can be seen from this table that the mean score for both outcome measures has dropped meaning an overall improvement in sleep quality had occurred.

### 3.5 Summary of Findings

Statistical significant difference is suggested but not clear due to low numbers. The results of this study found:

- Four out of the six participants demonstrated a vast improvement in sleep quality. The remaining two participants showed less improvement, however, none of the participants found any factors of sleep disturbances to worsen throughout or following the intervention.

- Particular elements of both the PSQI and ISI were chosen for further analysis due to their relevance to the study. These questions focused on quality of sleep, duration of sleep and sleep latency. Results for five of the participants for all elements improved. The sixth participant showed no improvement at all.

- It was found by calculating the mean sleep duration, five of the participants went from sleep deprived to efficient sleep amounts. The average increase of hours was calculated as 2.83 hours. Many of these increments included an improvement in sleep latency and an undisturbed sleeping pattern.
• By comparing the two outcome measures, the patterns of results were very similar. (Figure 10). The fact that these outcome measures provide similar results suggests they are both valid and effective outcome measures. The PSQI was more detailed, however eliminating some of the irrelevant questions provided a more realistic result.

• The only participant who showed no improvement following intervention was participant 6. The participant did not differ from others in any part of the inclusion criteria. Further studies requiring more details regarding working hours may be required to seek more thorough results

4. Discussion
Together with the intervention, collection of data and analysis, this study has introduced further research into the field. The aim of the study was to determine the effects of reflexology on sleep quality in night workers. The results of this study have provided

4.1 Sleep Quality and Shift Work

It is evident from previous studies and national statistics that an issue exists between sleep quality and shift work. (Niu et al., 2011) As mentioned in the literature review, 55% of the population now works on a shift pattern. (NHS Choices, 2015) These shift patterns can consist of night work, early mornings, late nights or rotating shifts. Working hours which do not begin and end between 7am and 7pm are considered a shift. (Worrell, 2016)

From conducting the consultations, it was clear that all of the participants were experiencing shift work related sleep disorders. Some reported that sleep deprivation was leading to other medical conditions such as stress, migraines, depression and back pain. Due to the size of the study and financial restrictions, only sleep quality was analysed. Further studies researching the effects of reflexology on other shift work related illnesses would add valuable research to the field.

Poor sleep quality in shift workers has now been named as Shift work-related sleep disorder or Shift Work Disorder (SWD) (Wright, Bogan, & Wyatt, 2013). Studies have researched the effects of shift work on the circadian rhythm. Evidence has been found that melatonin which is produced by the pineal gland is produced at certain times throughout the day to induce sleep. Alongside this, temperature and blood pressure
changes. Attempting to sleep when these levels are not consistent causes over time, sleep disorders. (Zee, 2016).

A detailed review of literature found no evidence specific to the effects of reflexology on sleep quality in shift workers. Other studies have found that reflexology can improve sleep quality in other categories of participants. This includes students, elderly and menopausal women. (Lee, Han, Chung, Kim, & Choi, 2011). Although these studies were thorough and well structured, they lacked strength when it came to the treatments itself. Very brief treatments were performed with unrealistic planning. It was hard to determine how effective the treatment was.

All participants involved in this study had been affected by shift work-related sleep disorders. From conducting the Baseline A readings, it became apparent of how poor the quality of sleep had become and its’ effects on each individual.

4.2 Result Findings

4.2a Baseline A

The results from this first set of data of both outcome measures showed that all participants had a poor quality of sleep. The sleep durations varied from four to six hours of interrupted sleep. During this phase, it was also found that all participants experienced broken sleep with poor sleep latency. Although the hours sleep required for each individual vary (NHS Choices, 2016), it is recommended that at least six hours per sleep are maintained. (Nevid, 2014). This information suggests that all participants were sleep deprived prior to the study.
4.2b Baseline B

Similar results were provided during the Baseline B phase. No intervention had taken place, therefore if the results had been different to Baseline A, it would be difficult to explain the factors that caused it using the ISI. The PSQI covers a number of questions that could suggest a cause. This includes factors such as temperature changes, getting up to use the toilet, having bad dreams, being in pain or loud snoring. This would have been analysed more closely if there had been a significant difference of scores between Baseline A and B.

Scores for the ISI varied between 13 and 22 during Baseline B. Using the ISI scoring system, the participants were divided into categories or insomnia. From following this scoring system, it was noted that all participants experienced insomnia. One participant had severe clinical insomnia, two had moderate insomnia and three had threshold insomnia. Although insomnia can be caused by a number of factors, it is more likely that these participants were experiencing Shift Work Sleep Disorder. (Brodsky & Brodsky, 2010)

The PSQI did not have the same scoring system, however the higher the score, the worse the sleeping disorder. From the readings taken at Baseline B, all scores varied and fell between 9 and 16. The highest possible score for the PSQI was 22. As the questions for this outcome measure were scored on a number of varying and non-relevant factors, the overall final score is not as accurate as the ISI.

4.2c Final Phase (A)

From the results of the final phase, it could be seen that reflexology had a positive effect on the participants' sleep quality. All participants involved in the study saw some kind of improvement in sleep quality following intervention.
4.3 PSQI Findings

The PSQI was a lot more detailed with some questions not being relevant to this study. The four questions chosen for further analysis were found to be more relevant to the aims of the research than some questions. The main focus of these questions was to analyse sleep duration, sleep latency, interrupted sleep and the participants’ opinion on their sleep quality; the main factors involved in sleep quality.

The findings from the difference in sleep duration before and after intervention showed a mean average of 4.83. Following the intervention, the mean average increased to 7.16 hours. Sleep duration increased by 2.33 hours throughout the participants. Two participants did not see an improvement in sleep duration, however one did feel the quality improved and reported sleep following intervention as uninterrupted. Four positive results does not necessarily suggest that reflexology has been effective as many more participants would be required to provide a more accurate result. If all participants had seen an improvement, effectiveness may have seemed more likely than coincidence.

The participants were asked to score their sleep quality between 0 – 3. Four participants scored an improvement of 2 points and one participant 1 point. The 6th participant scored no improvement. This variation of results suggests that reflexology may be efficient in improving sleep quality, however further participants may be required with further details of the cause of sleep quality issues.

4.4 ISI Findings

The ISI was not as detailed as the PSQI. The data was collected five times; Baseline A, Baseline B, week 2, week 3 and following intervention. The ISI was designed to be completed weekly. This provided a weekly analysis of changes in sleep pattern and
factors causing sleep quality issues. The findings from the ISI found that a slight improvement was made following treatment two and a substantial improvement following treatment three. By the final reading, five of the six participants had seen an improvement in scores. From these results, it can be seen that reflexology has been effective from treatment one and causes a greater improvement by treatment three.

Some questions were not specific for this particular study. Therefore, four questions were chosen for further analysis and to provide an answer to the research question. These questions focused specifically on the same elements taken from the PSQI, however, rather than asking the participants to score sleep quality, satisfaction of sleep pattern was asked. For this part of the data analysis, only Baseline B and the final phase were compared.

For each question, the participant was asked to score themselves from 0 – 4 with 4 being the most severe. Data obtained from Baseline B found five of the participants scoring themselves between 3 and 4. The sixth participant scored 2. Following the intervention, five of the participants’ scores had decreased. These results varied between 1 and 4 points. The sixth participant’s score remained at 2 for all of these questions. These result may not necessarily mean that reflexology has been effective. Although five out of six results improved, no pattern exists from one participant to the next.

4.5 Wilcoxon Findings

Originally eight participants were recruited for the study, however two could not continue after the first treatment due to personal reasons. For the Wilcoxon test, it is recommended that at least eight participants are analysed. (Winter, 2013). The test was still conducted with six participants. The result obtained was p = 0.027. This
indicates that the results may be statistically significant and not due to chance. However due to low numbers, this statistical significance is not clear.

### 4.6 Comparison of the ISI and PSQI Findings

To test the validity and efficacy of the ISI and PSQI outcome measures, both final scores were compared. Results were found to be very similar. Elements of both questionnaires were the same, however scoring systems different. The patterns found in the graph suggest that both outcome measures were suitable outcome measures for the study all participants displayed similar improvements in each element.

### 4.7 Strengths and Limitations

The size of the study allowed a quick selection and obtainment of participants. This also allowed the research question to be addresses in a shorter amount of time. Ethical approval was a lot simpler to obtain than a complex study with a large number of participants. As the aim of this study was unique, cost effectiveness and duration was trialled before investing more time and money in a larger confirmatory research study.

Although this study has provided valid results, the small number of participants makes interpretation and analysis less reliable.

Each participant was required to work night shifts, however details of their shift patterns was not looked at in great detail. As some participants were full time night workers and some early mornings or rotating shifts, these factors could have influenced the results. From the literature review, it was found that those working a three shift work pattern were the most effected by sleep disorders compared to those who work full time nights. The one participant who showed no improvement was not
as affected by sleep disorders as the other five, therefore, the results were not as statistically significant.

Another limitation was the duration of the study. Four weeks was chosen on the assumption that improvement would be following the third treatment. The results showed five out of the six participants improved by treatment three. Further studies carried out over a longer period of time may result in a different outcome. This may be due to interrupting factors such as holidays or illness. There were no interruptions in this study meaning the night shift pattern was maintained.

Although it was ensured that both outcome measures were valid and efficient prior to use, other methods of obtaining data would be useful in future studies. For example, salivary swabs to collect melatonin samples and blood pressure monitoring. A study conducted by McVicar et al (2006), did not show positive results, however very short treatments were used. No study has been performed since 2006 like this, therefore incorporating the two studies may find more accurate results.

As there are no other studies available based specifically on the effects of reflexology on sleep quality in shift workers, this study provides a new piece of research to the field. It also provides a base for further studies to be developed around.

4.8 Suggestions for Further Research

Further research is required to provide more detailed and accurate results for the effects of reflexology on sleep quality in shift workers. Larger studies aimed at specific working shift patterns may be beneficial.

Other studies could be conducted specifically to those with sleep disorders with a specific score on the outcome measures. For example, with regards to the ISI, those
with a score over 22 were considered to have severe clinical insomnia. Using these participants alone may provide the most effective results.

Further to this, researching the effects of reflexology on other health conditions in shift workers would be beneficial. As previous research has shown, shift work can result in a number of serious health conditions. If reflexology could improve this, introduction of this treatment through an occupational therapy route could be beneficial to employers.

Although the PSQI and ISI proved effective in collating the data for this study, the introduction of a third or fourth outcome measure may strengthen the results. A sleep diary would be effective in providing patterns in sleep quality and find the causation of the sleep disorder.

4.9 Conclusion
The aim of the study was to research the efficacy of reflexology treatment on sleep quality in shift workers. Prior to this study, relevant literature was limited. Similar studies have researched the effects of reflexology on insomnia and sleep quality in the elderly and menopausal women, providing positive outcomes.

In conclusion to the study, reflexology may be an effective treatment for sleep quality disorders in shift workers. Although the data presented provides a good result, the size of the study limits its' accuracy.

Sleep quality was addressed not by providing an overall result from the PSQI and ISI, but by carefully selecting specific elements of these outcome measures relevant to the aims of the research. Results from both outcome measures found that the participants view on their own sleep quality had improved in five out of six cases. Sleep duration and latency were also addressed specifically where four out of the six participants saw a dramatic improvement.

Sleep quality is an issue for shift workers and introducing larger studies researching the effects of reflexology may provide more valid and accurate results. Further to this, a positive effect could be advised and introduced through an occupational therapy route to improve health and wellbeing in shift workers, especially as the number of these employees is increasing.

5. References


Appendices

Appendix One
Title of project: The Effects of Reflexology Treatment on Sleep Quality in Shift Workers

1) I would like to invite you to take part in a research study as part of the final year of my degree. Please take time to read the following information so that you understand why this study is being conducted and the part you will play. If you have any questions regarding the following information or the study itself, please contact myself or my supervisor using the details at the end of this document. Please understand that as a participant, you will be partaking on a voluntary basis.

2) The aim of the study is to expand our understanding on the effects of regular reflexology treatments and sleep quality of shift workers who work outside of the 9-5 working day.

3) As one of eight participants, the requirement will be that one reflexology treatment per week will be received for four weeks. This will be conducted in the participants own home. The treatment will take approximately forty-five minutes and will be carried out following the last shift of the week. Completion of two outcome measures – Pittsburgh Sleep Quality Index and Insomnia Severity Index will be carried out prior to and following the treatments. A sleep diary will also be provided for completion by the participants prior to and throughout the study.

4) You will not be eligible to take part if you: -
   
   - are under the age of eighteen
   - cannot be available for required treatment times and days
   - start your shift after 5am or finish before 10pm
   - work less than three shifts (of at least six hours each) a week
   - have not received reflexology within the two months prior to the study. Participants must not receive reflexology during the study.
   - are not currently take any medication to enhance sleep quality.

5) There are some mild risks that could occur during this study: -
• Some clients may experience mild side effects such as a slight headache or increase in urine production. Clients will be advised to drink water, rest and contact their G.P if symptoms persist. An aftercare advice leaflet will be provided for the client to refer to.
• During treatment, a lotion or cream will be applied to the feet. It is important that any allergies are discussed during consultation in order to avoid allergic reaction.

Please note that participants can withdraw their data up until analysis has been completed on 31/3/2016. Participants are free to withdraw the study without giving explanation.

6) Although there is no guarantee that the study will be beneficial, the information gathered will contribute the understanding of the effect of reflexology on sleep quality in shift workers.

7) As this study is part of a student project, recompense for time commitment will not be offered. All treatments will however, be of no cost to the participant.

8) In accordance with the Data Protection Act 1998, compliance of anonymity and confidentiality of data gathered during this study will be adhered to at all times. During the study:

• Client coding will be used on all paperwork to avoid identification of participants. This includes consultation form and outcome measures used.
• Details of names and addresses will be recorded on the consent form only which will be kept in a secure and locked location and stored for up to ten years due to university requirements. Access will only be allowed by authorised personnel (researcher and supervisor). All other documents will be destroyed following completion of the study.

Further Information:
If you have any questions about the study, please contact:-

Laura Grady, Researcher: st20047418@outlook.cardiffmet.ac.uk
Judith Whatley, Project Supervisor: JWhatley@Cardiffmet.ac.uk
Appendix Two

Pittsburgh Sleep Quality Index

Participant No. Date:

1) During the past month, what time have you usually gone to bed at night? (Non-working night)

2) During the past month, how long (in minutes) has it taken you to fall asleep?

3) During the past month, what time have you usually gotten up in the morning? (Non-working day)

4) During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours spent in bed.)

5) During the past month, how often have you had trouble sleeping because you:-

   a) Cannot get to sleep within 30 minutes

   Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

   b) Wake up in the middle of the night or early morning

   Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

   c) Have to get up to use the bathroom

   Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

   d) Cannot breathe comfortably

   Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

   e) Cough or snore loudly

   Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]
f) Feel too cold
Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

f) Feel too hot
Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

h) Had bad dreams
Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

i) Have pain
Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

j) Other reason(s), please describe ________________________________
______________________________________________________________

How often during the past month have you had trouble sleeping because of this?
Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

6) During the past month, how would you rate your sleep quality overall?

| Very good | [ ] |
| Fairly good | [ ] |
| Fairly bad | [ ] |
| Very bad | [ ] |

7) During the past month, how often have you taken medicine to help you sleep (prescribed or over the counter)?
Not during the past month [ ]  Less than once a week [ ]  Once or twice a week [ ]  Three or more times a week [ ]

8) During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
9) During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

- No problem at all
- Only a very slight problem
- Somewhat of a problem
- A very big problem

10) Do you have a bed partner or a roommate?

- No bed partner or roommate
- Partner/roommate in other room
- Partner in same room but different bed
- Partner in same bed

If you have a roommate or bed partner, ask him or her how often in the past month you have had…

a) Loud snoring

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

b) Long pauses between breaths while asleep

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

c) Legs twitching or jerking while you sleep

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

d) Episodes of disorientation or confusion during sleep

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week
Appendix Three

Insomnia Severity Index

Scoring: -
0 = None   1 = Mild   2 = Moderate   3 = Severe   4 = Very Severe

1) Difficulty falling sleep

0 [ ]  1 [ ]  2 [ ]  3 [ ]  4 [ ]

2) Difficulty staying asleep

0 [ ]  1 [ ]  2 [ ]  3 [ ]  4 [ ]

3) Problems waking up too early

0 [ ]  1 [ ]  2 [ ]  3 [ ]  4 [ ]

4) How satisfied/dissatisfied are you with your current sleep pattern?

Very Satisfied [ ]  Satisfied [ ]  Moderately satisfied [ ]
Dissatisfied [ ]  Very dissatisfied [ ]

5) How noticeable to others do you think your sleep problem is in terms of impairing the quality of your life?

Not at all [ ]  Little [ ]  Somewhat [ ]  Much [ ]  Very much [ ]

6) How worried/distressed are you about your current sleep pattern?

Not at all [ ]  Little [ ]  Somewhat [ ]  Much [ ]  Very much [ ]

7) To what extent do you consider your sleep problem to interfere with your daily functioning currently? (E.g. mood, fatigue, perform chores, concentration, memory etc.)

Not at all [ ]  Little [ ]  Somewhat [ ]  Much [ ]  Very much [ ]
Appendix Four

Client Ref: ____________________________
Treatment number: ______________________
Date of treatment: ______________________

Key of Symbols

S – Sharp
G – Grit
B – Bruise
D – Dull
L – Lump
O – Other (see notes)

Notes:
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
Appendix Five

Aftercare Advice

Following Reflexology Treatment

• Allow ten minutes before driving a vehicle. As you may be drowsy, it is advised that you take in some fresh air and wake yourself up first.

• Try to relax for the rest of the day. Reflexology has a relaxing effect – try to enhance this by not participating in any strenuous activities.

• Drink plenty of water, avoid alcohol and caffeine. Nausea or dizziness may occur following a treatment due to dehydration.

• Try to avoid eating a heavy meal following treatment

• Avoid smoking or drinking alcohol for 24 hours

Following a treatment, you may experience a temporary increase in urination frequency, runny nose, fatigue/sleepiness, cold symptoms, heightened emotions, increased thirst or increased sweating. These are part of the healing process and may occur for up to 48 hours. If symptoms reoccur, please contact your doctor.
Appendix Six

Wednesday, 25 November 2015

Grady, Laura
BSc (Hons) Complementary Therapies
Cardiff School of Health Sciences

Dear Applicant

Re: Application for Ethical Approval: The Effects of Reflexology Treatment on Sleep Quality in Shift Workers

Ethics Reference Number : 7355

Your ethics application, as shown above, was considered by the Health Care and Food Ethics Panel on 11/25/2015.

I am pleased to inform you that your application for ethical approval was APPROVED, subject to the conditions listed below – please read carefully.

Standard Conditions of Approval

- Your Ethics Application has been given a Project Reference number as above. This MUST be quoted on all documentation relating to the project (e.g. consent forms, information sheets), together with the full project title.

- All documents must also have the approved University Logo and the Version number in addition to the reference and project title as above.

- A full Risk Assessment must be undertaken for this proposal, as appropriate, and be made available to the Committee if requested.

- Any changes in connection to the proposal as approved must be referred to the Panel/Committee for consideration without delay quoting your Project Reference Number. Changes to the proposed project may have ethical implications and so must be approved.

- Any untoward incident which occurs in connection with this proposal must be reported back to the Panel/Committee without delay.

- If your project involves the use of samples of human origin, your approval is given on the condition that you or your supervisor notify the School of your intention to work with such material by completing Part One of the form entitled “Notification of Intention to Work with Human Relevant Material or Human Bodily Material” which must be obtained from the PD (Sean Duggan), BEFORE any activity on this project is undertaken.

This approval expires on 11/25/2016. Please set a reminder on your Outlook calendar or equivalent if you need to continue beyond this approval date. It is your responsibility to reapply / request extension if necessary.

Yours sincerely

[Signature]

Cardiff School of Health Sciences
Western Avenue,
Cardiff, CF2 3YB

Telephone: +44 (0) 29 2041 65
Fax: +44 (0) 29 2041 65

Ysgol Gwyrddwr Saithryd Caerdydd
Rhodfa'r Gelliawcin,
Caerdydd, CF2 3YB

www.cardiff.ac.uk
Appendix Seven

PARTICIPANT CONSENT FORM

Reference Number:
Participant name or Study ID Number:

Title of Project:
Name of Researcher:

__________________________
Participant to complete this section: Please initial each box.

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

1. I agree to take part in the above study.

The following statements could also be included on the consent form if appropriate:

2. I agree to the interview / focus group / consulta

3.

__________________________  __________________
Signature of Participant     Date

__________________________  __________________
Name of person taking consent     Date
5. I agree to the interview / focus group / consultation being audio recorded

6. I agree to the interview / focus group / consultation being video recorded

7. I agree to the use of anonymised quotes in publications
Appendix Eight

Consultation Form

Client Code: ___________________________ Date of birth: / /

Address: ______________________________________

G.P: ______________________________________

Occupation: ______________________________________

Reason for treatment: ______________________________________

Has client received reflexology previously?

____________________________________

Medical Conditions:

Digestive: ______________________________________

Urinary: ______________________________________

Reproductive:

____________________________________

Last Period: __________________

Skeletal/
Muscular

Nervous:
(E.g Sleep/Headache)

____________________________________
Appendix Nine
Wilcoxon Calculations

Mean Values of total sleep - PSQI

This mean value was calculated as follows: -

\[ 4+6+4+4+5+6 = 29 \]

\[ \frac{29}{6} = 4.83 \text{ hours.} \]

The mean value following intervention was calculated as follows: -

\[ 7+6+7+8+8+5 = 43 \]

\[ \frac{43}{6} = 7.16 \text{ hours.} \]

The total difference between hours sleep prior to intervention and following intervention are: 2.33 hours.
### Word Count

<table>
<thead>
<tr>
<th>Section</th>
<th>Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature Review</td>
<td>3885</td>
</tr>
<tr>
<td>Method</td>
<td>1789</td>
</tr>
<tr>
<td>Results</td>
<td>1725</td>
</tr>
<tr>
<td>Discussion</td>
<td>2032</td>
</tr>
<tr>
<td>Conclusion</td>
<td>216</td>
</tr>
<tr>
<td>Total</td>
<td>9647</td>
</tr>
</tbody>
</table>