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Age and Lateral Sleep Position: A Pilot Study

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ABSTRACT

Purpose: Previous research, undertaken using a Super 8 camera and non-continuous data, has reported that with increasing age people are more likely to sleep in the right lateral position. It has been postulated that this is due to age related alterations in cardiovascular function. This pilot study was undertaken to determine if collection and analysis of continuous sleep data was a feasible method for further investigation of this topic and to determine the sample size required for an adequately powered study. Increased understanding of age related changes in sleep position may provide advice to improve sleep quality and nursing care of the elderly person. **Method**: Research at the Centre for Sleep Research, University of South Australia, investigated the association between age and sleep position. Infra-red illumination and video cameras recorded the sleep patterns of 12 subjects for two nights. Videos were examined and the amount of time spent in each sleep position was calculated in seconds**. Results**: In a one-way analysis of variance, sample sizes of 19, 19, and 19 are necessary from the three age groups whose means are to be compared. The expected means are 20, 25 and 45 for the three age groups respectively. The total sample of 57 subjects achieves 82% power to detect differences among the means versus the alternative of equal means using an F test with a 0.05 significance level. **Conclusions**: The results of this pilot study support further investigation of the relationship between age and lateral sleep position preference, and particularly the physiological parameters which may underpin the adoption of different sleep positions with increasing age. The described method is appropriate and modifications are suggested to further improve future studies.

INTRODUCTION

Research about the correlation between age and sleep position is limited and outdated. DeKoninck et al. reported in 1983 that as people age they are significantly more likely to adopt the right lateral position for sleep.[1] DeKoninck et al. postulated that the identified preference for right side sleep position with increasing age was due to age related alterations in cardiovascular function.[1] Historically, it is believed that sleep on the left side interferes with the free action of the heart, requires the stomach to pump its contents against gravity and tends to produce congestion of the left half of the brain.[2] However, early direct visual observation studies identified that people with angina pectoris and cardiac inefficiency often adopted the left side lying position.[3,4] Physiological investigation of arterial blood pressure measured in 100 randomly selected subjects to assess differences in the positions of sitting, supine, left lateral and right lateral positions identified that 63% of all subjects had their lowest systolic as well as diastolic pressure in the left lateral position.[5] Only 12% of participants measured showed neither systolic nor diastolic pressure to be lowest in the left lateral position.[5] The authors commented that this left lateral hypotension may give rise to breathing difficulties, tightness, pressure or even pain in the chest while in the left lateral position. Pathological conditions effecting the respiratory and cardiac systems will cause these symptoms to occur more readily when the left lateral position is adopted.[5,6] Investigation in patient groups has identified that the adoption of the left lateral position should be avoided in patients with

congestive cardiac failure, severe coronary artery disease or after infarction without bradycardia.[7-9] Higher arterial oxygen saturation has been measured in the right lateral position in postoperative coronary artery bypass patients.[10] Further adoption of the right lateral position should be avoided by asthmatics due to increased vagal tone in this position which contributes to asthma.[11] People with gastroesophageal reflux should also avoid the right lateral position due to increased relaxation of the lower oesophageal sphincter and crural diaphragm making reflux eight times more likely to occur in this position with increased oesophageal acid exposure and acid clearance times.[12-13] Hence the adoption of either left or right lateral position for rest can have significant physiological and physical effects.

More recently when considering healthy, young adults heart rate, blood pressure, resting pressure product and oxygen saturation are reduced in left side lying when compared to supine, right side lying and supine head down positions.[6] Interestingly young adults who are classified as good sleepers and are satisfied with the quality of their sleep have been observed to sleep more on the right than the left side.[14] However investigation of the response of these physiological variables to changes in body position have not been undertaken in an elderly population.

Poor sleep quality results in insomnia which according to the International Classification of Sleep Disorders is always associated with a complaint of decreased functioning during wakefulness and fatigue and irritability.[15] Hence, research on optimal sleep positions has the capacity to improve sleep quality, and may improve function and quality of life. Currently, there is scant research on which to base advice to improve sleep quality with respect to sleep position and age.

DeKoninck et al. examined the sleep positions of 10 subjects in five age groups: 3-5, 8-12, 18-24, 35-45 and 65-80 years over two nights. [1] A Super 8 camera captured half of participants sleep. The camera alternated between recording and not recording every eight seconds. Each recorded frame was examined to determine the position of the subject's trunk, head, legs and arms. The participants sleep position was only considered in analysis of data if all limbs, the head and trunk were maintained in the same position for over a minute. Hence if any movement occurred within a minute of adopting a position the data was not included in analysis. The amount of data lost to analysis due to this criterion was not reported in their paper. However, less than fifty percent of subjects sleep was included in analysis. Selection criteria for the study by DeKoninck et al. included right handedness.[1] The literature has provided conflicting reports regarding the adoption of a sleep position according to handedness: Various studies are in conflict with the more common sleeping positions. It has been reported that people go to sleep while lying on their dominant side, on the side opposite to the dominant hand and that the majority of people whether left or right handed go to sleep on their right side.[16-18] It is possible, therefore, that the findings of DeKoninck et al are not generalisable.[1]

The current pilot study sought to determine

- irrespective of handedness,
- considering trunk position to constitute the lateral position without consideration of hand, arm and leg position, and
- using continuous data

if

- increased preference for right sided sleep position occurs in adults with increasing age
- determine the feasibility of this studies method of investigation and
- determine the sample size required for a full study.

METHOD

An observational study was conducted at the Centre for Sleep Research of the University of South Australia. Ethics approval was provided by the University of South Australia and the Queen Elizabeth Hospital, Adelaide, South Australia. Twelve eligible volunteers, four in each of the age groups 18 to 39 years, 40 to 59 years and 60 years and over participated in the study. Participants did not report any known sleep disorders or sleep-disturbing medical, musculoskeletal or emotional problems. They were recruited from participants known to the Sleep Centre from other studies and from colleagues of the researcher. Each subject was paid $60 for their participation in the study to cover incidental expenses such as overnight care for pets and children and travel costs.

Participants were asked to bring their own pillow to the Sleep Centre to minimise alteration to their usual sleep environment and arrived at the Sleep Centre one to two hours prior to their usual bedtime. During this time they were encouraged to perform their usual bedtime and waking rituals. They slept for two nights in the sleep laboratory, where an infra-red light source allowed their sleep during the night to be recorded on video. They slept with one sheet covering them. Polysomnography was not used to identify onset and cessation of sleep in this study. Data were recorded from the time participants turned out their light to when they arose from their bed. It was considered that resting as well as sleeping position was pertinent to the intent of this pilot study and that both resting and sleeping position will affect physiological function.

Analysis

Videos were viewed in order to calculate the total amount of time (seconds) each participant spent lying prone, supine and on their left and right sides. The time counter of the machine used to view the videos was assessed against a stop watch and found to be accurate. The counter was placed at zero when a participant entered the bed. The counter reading was recorded whenever a participant commenced to alter their trunk position and when the trunk position was stable. The position was also recorded. Positions were documented using the criteria reported by Dzvonik et al.[19] Body position was defined as 'prone' if the subject lay on the stomach, 'supine' if the subject lay on their back with both shoulders on the bed, and 'left' or 'right side', if the subject was judged to be neither on the stomach nor the back and was to some degree turned either to the right or left side, as judged by the position of the shoulders.[19] When participants changed position the time taken to adjust from one position to another was excluded from the count.

Time slept in a certain position per person was averaged over the two nights. Mean absolute difference (standard deviation) between first and second night was 4560.9 (2700.5) for left, 3199.6 (1614.2) for right, 3410.1 (2564.0) for supine, and 1048.2 (1315.3) for prone position. Times slept in certain positions are given as mean values and standard deviations (SD) and as percentages of overall minutes slept per person.

RESULTS

1. Comparison of positions

Sleep time was spent mostly on the left side (42.1%).

Table 1: Average seconds slept in each position per night and % time of total sleep time spent in each position.

	Left	Right	Supine	Prone
Mean time spent in position(SD)* [sec]	10,385.8 (4207.7)	7734.1 (5539.9)	5241.9 (3110.6)	1635.6 (1788.6)
% Time of total sleep time (SD)	42.1% (18.0%)	29.8% (20.4%)	21.7% (13.0%)	6.4% (7.4%)

*SD = standard deviation

2. Comparison with age

With increasing age there were tendencies of reduced sleeping time on the left side and increased sleeping time on the right side. The percentage of time slept on the right side increased when "younger and medium" aged people (n=8; 21.4% time slept on right side) where compared with "older" people (n=4; 46.6% time slept on right side).

Table 2: Average seconds (SD) and % time of total sleep time (SD) in each position stratified by age.

Age group	Left	Right	Supine	Prone
Young (n=4)	12,613.3 (4775.2); 49.2% (17.7%)	4938.3 (2347.8); 19.4% (9.1%)	6575.0 (2117.7); 26.0% (9.1%)	1334.4 (1835.3); 5.4% (7.5%)
Medium (n=4)	9419.9 (4562.5); 44.0% (23.3%)	5364.5 (6670.8); 23.4% (27.9%)	6018.1 (1759.0); 27.4% (7.7%)	1155.8 (2311.5); 5.2% (10.5%)
Older (n=4)	9124.3 (3364.2); 33.0% (12.0%)	12899.6 (3005.9); 46.6% (9.3%)	3132.5 (4335.2); 11.7% (16.5%)	2416.6 (1333.3); 8.7% (4.7%)

3. Left handed versus right handed participants

With respect to handedness there were no tendencies in the percentages of time slept in a certain sleeping position.

Table 3: Average seconds (SD)* and % time of total sleep time (SD) in each position stratified by handedness.

Handedness	Left	Right	Supine	Prone
Right (n=10)	10328.2 (4568.2); 41.8% (19.0%)	7231.4 (5120.2); 28.2% (19.8%)	5647.1 (2933.5); 23.2% (12.2%)	1674.3 (1854.2); 6.7% (7.7%)
Left (n=2)	10673.8 (2596.1); 43.2% (17.5%)	10248.0 (9299.9); 37.5% (30.0%)	3216.0 (4374.9); 14.2% (19.5%)	1442.3 (2039.7); 5.0% (7.1%)

*SD = standard deviation

4. Sample size

The main hypothesis under investigation is whether increased preference for right sided sleep position occurs in adults with increasing age; with age categorized into three groups. In a one-way analysis of variance, sample sizes of 19, 19, and 19 are necessary from the three age groups whose means are to be compared. The expected means are 20, 25 and 45 for the three age groups respectively. The total sample of 57 subjects achieves 82% power to detect differences among the means versus the alternative of equal means using an F test with a 0.05 significance level. The size of the variation in the means is represented by their standard deviation which is 10.80. The common standard deviation within a group is assumed to be 25.

DISCUSSION

The collection and analysis of continuous data in this study provides a measurement technique of a relationship between preference for the right side sleep position in participants aged 60 years and over. It is acknowledged that the small sample in each age group may not have provided the power necessary to detect differences, and thus this finding should be reassessed in a larger participant group.

The use of infra-red illumination when participants slept with one bed sheet did not impede the ability to assess the resting position of the participant.

Further studies should recruit a minimum of 19 healthy participants in each age group. Information regarding medical history, current medical conditions including self-medicated or medically managed conditions, history of sleep position and known alteration to sleep position should be used to screen participants. Those who report any cardiac, respiratory, gastro-intestinal or musculo-skeletal condition likely to alter their ability to adopt and maintain any sleep position should be excluded. Any participant with disordered sleep due to physical conditions such as sleep apnoea or nocturnal bruxism, or emotional and psychological issues which alter their sleep should be excluded. Restrictions due to the exclusion criteria indicate that active community groups, which elderly people frequent, such as Probus, Lions and golf and lawn bowling clubs could be targeted for recruitment of the elderly group.

Substantial funding and access would be required to perform the proposed future study at a sleep laboratory. The use of in-home infra-red illumination should be considered to decrease cost and to optimize collection of usual sleep data. Portable infra-red integrated illumination and camera systems are available for approximately $2000USD while stand alone room infra-red illumination devices can be purchased for approximately $550USD. In-home data collection would limit the ability to collect physiological data. Some physiological measurement equipment is portable but supervision while using this equipment is preferable and there is risk associated with leaving valuable equipment in research participant's homes. Monitoring for physiological change also has the inherent risk of alteration to the participants normal sleep position.

It is pertinent to consider the significant preference identified by DeKoninck et al. for right lateral sleep position in an apparently healthy, elderly population.[1] The findings of a further well-powered study would provide advice regarding the adoption of a sleep and resting position for the enhancement of health. Further, as the population ages this information will become more relevant to the maintenance of health in the nursing care of the elderly patient.

CONCLUSION

The method used in this study allowed collection of meaningful, continuous data. Further, the collection of physiological data in future studies would allow better understanding of why elderly people adopt specific sleep positions and inform the literature regarding sleep and rest positions.

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