

Correlation between age and sleep

Psychology A level coursework

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Abstract

The area of study was duration of sleep. The aim of this activity was to measure the correlation between sleep and age. Past research has shown a negative correlation, which means as we grow older we have less sleep.

The research method was survey, and a sleep diary was used to collect the data. Sleep diaries were recorded over seven consecutive days.

There were 26 participants, males and females, aged 17 – 53. The participants were chosen using opportunity sampling.

Weak correlation has been found on scattergraph but the correlation was not significant ($p=0.05$, critical value = 0.331, observed value = - 0.250). Therefore the null hypothesis was retained. There is no correlation between age and sleep.

Further analysis of sleep duration in age group showed that the higher needs for sleep are required by young people, age group 17 – 20, 20 – 30. Duration of sleep for people over 30 are the lowest, just around 6 hours. This could be related with family and work responsibility associated with this age. People in age 40 – 53 sleep longer as they are more aware of the influence of sleep hygiene for our health.

This suggests that it is not the need for sleep but the ability to sleep is reduced. Must be that others than only ageing changes factors are affecting the human being's ability to sleep. Further research should be conducted so we could find how age, socio-economic circumstances and health status are associated with human sleep quality.

1. Introduction

The need for sufficient, sound sleep has worldwide importance. As industries around the world are increasingly implementing shift work (round-the-clock) schedules, millions of people are changing their sleeping habits. In addition, due to the sleep disorders mentioned below, as well as, to fast-paced lives, many people go without adequate sleep. These habits can have serious consequences. For instance, automobile accidents increase dramatically among people with sleep disorders. Sleep disorders also cause problems in the workplace that effect society as a whole.

It is commonly know and proofed that not getting enough sleep can affect different people in different ways and depends very much on our daily routine. It can make us irritable, worried or nervous, unable to concentrate or cope with even the simplest of tasks. We may find ourselves feeling drowsy during the day, becoming forgetful or more accident prone than usual. Often people who are suffering from insomnia may feel short tempered and more likely to become impatient with others.

That is why study on sleep quality is such important.

1.1. Background research

Through out previous research it has been found that there is a significant negative correlation between sleep and age. But to understand the correlation firstly we need to understand sleep.

Study conducted by Dement and Kleitman (1957) helps us to understand more about sleep. Falling asleep is not a passive activity. Our healthy (and normal) sleep consists of two basic stages: REM (rapid eye movement) and non-REM. The non-REM stage is further broken down into four sub-stages, with the first stage reflecting the beginning of sleep. During stages three and four, delta sleep occurs. Delta sleep is our deepest

and most restorative sleep stage. After the fourth stage of non-REM, we enter REM, where dreams occur.

The progression through the stages is marked by decreasing frequency and increasing amplitude of the EEG (electroencephalograph). REM sleep is characterized by fast, desynchronized EEG activity resembling the awake stage. These cycles continue throughout the night, the SWS (slow wave sleep) period getting shorter and the REM period getting slightly longer as the night progresses. REM is also identifiable by the loss of muscle tone, our bodies are effectively paralyzed.

Later research by Habsom (1987) showed the relationship between REM and non-REM over a lifetime. Each sleep is about 60 minutes in early infancy and increases to 90 minutes during adolescence.

A. study conducted by researchers at the University of Chicago, in particular Dr Eve Van Cauter, found a strong link between sleep and aging.¹ She found that sleep deteriorates at two points in a person's life - between the ages of 16 and 25 and again between the ages of 35 and 50. While the total time of sleep may remain the same she reports that the quality of sleep deteriorates, with less and less time being spent in a state of slow wave or deep sleep. The study shows that total deep sleep decreases from nearly 20% of a normal nights sleep for those under 25 to less than 5% for those over 35 years of age. There seems to be a relationship between the amount of human growth hormone secreted in the body and the quantity of deep sleep.

Research conducted by The National Foundation of Sleep in US demonstrates that our sleep needs remain constant throughout adulthood². According to opinion of the researchers it is a common misconception that sleep needs decline with age. Changes in the patterns of our sleep – what specialist call "sleep architecture" – occur as we age and this may contribute to sleep problems. As people age they tend to

¹ <http://www.dermaxime.com/sleep-aging.htm>

² http://www.sleepfoundation.org/site/c.huIXKjM0IxF/b.2422503/k.8494/Aging_Basics.htm

have a harder time falling asleep and more trouble staying asleep than when they were younger.

In addition to changes in sleep architecture that occur as we age, other factors affecting sleep are the circadian rhythms that coordinate the timing of our bodily functions, including sleep. For example, older people tend to become sleepier in the early evening and wake earlier in the morning compared to younger adults. This pattern is called advanced sleep phase syndrome. The sleep rhythm is shifted forward so that 7 or 8 hours of sleep are still obtained but the individuals will wake up extremely early because they have gone to sleep quite early. The reason for these changes in sleep and circadian rhythms as we age is not clearly understood. Many researchers believe it may have to do with light exposure.

Compared to normal sleep cycles the elderly have more fragmented poor quality sleep. Slow wave sleep is reduced indicating poor rejuvenation of tissues as growth hormone secretion is reduced. There is an increased in stage 1 and 2 sleep with more fragmented REM sleep indicating more dreaming. Age related changes in sleep are due to weaker circadian regulation of sleep and wakefulness. Manipulation of the circadian timing system, rather than the sleep homeostat, offers a potential strategy to alleviate age related decrements in sleep and daytime alertness levels. [Kales and Kales. 1974)³. In summary the aged can experience the following:

- Increased napping through out the day
- Increased sleep latency
- Increase in awakenings and arousals
- Decreased stage 3 and 4 sleep (slow wave sleep)
- Increased stage 1 sleep. Stage 2 sleep is variable.
- Decreased REM sleep. REM sleep appears to be equally distributed through sleep cycles. I.e. there is no increase in REM at the end of the sleep period.
- Reduced sleep efficiency

³ <http://www.sleephotline.com/Sleep/categories/Anti-Aging-Sleep.html>

- Increased stage shifts
- Fewer cycles
- Phase advancement
- Decreased melatonin levels

Some studies suggest that increased in napping is associated with increased mortality. On the other hand napping has been associated with lower diastolic pressure, improved mood, decreased subjective sleepiness and improves in mental performance.

Poor physical health is implicated in disrupted sleep, and one of the main reasons for poorer sleep quality with increasing age is because of chronic ill-health causing pain and discomfort at night, resulting in sleep complaints and disorders (Vitiello et al., 2002). Blaxter (1990) found a strong association between health status and reported duration of sleep; respondents with chronic conditions were more likely to sleep for less than 7 hours or more than 8 hours per night. However, this research examined duration rather than quality of sleep.

1.2. Rationale

Sleep research comprises many different areas: narcolepsy research; sleep and cardio-respiratory research; and studies of pain and sleep, circadian rhythms, shift work and it's effects on sleep, sleep deprivation, sleep and aging, and infant sleep, to name a few.

I am going to conduct study to find out if people really need less sleep as they getting older. Could be that they just loose the ability to sleep without interruption. The lack of ability to sleep as was mentioned before can be cause by many factors related with physical and mental health condition. It is incontrovertible that individuals suffering from psychiatric disorders, such as depression and anxiety, have poorer quality sleep (Piccinelli and Wilkinson, 2000; Ustun, 2000)

Sleep has a big impact on our life. I think sleep it is the most interesting part of the physiological approach and I am interested in seeing the relationship between sleep and age for myself with my own research. It is an ethical and straightforward study to carry out and gathers quantitative results, ideal for my coursework.

1.3. Formulation of aim

The aim of my research is to measure the correlations between sleep and age. Some of a past study had shown a negative correlation between sleep and age. Negative correlations between age and sleep means that the ability to sleep diminishes with age.

1.4. Statement of alternatives hypothesis

People need less sleep as they get older and will be significant negative correlation between the two variables.

The kind of hypothesis is called directional. I have selected this hypothesis because directional hypothesis is more specific. I can predict, not only that a specific relationship between sleep and age will exist, but further, the direction of the relationship.

1.5. Statement of null hypothesis

There will be no correlation between sleep and age.

2. Method

I carried out survey method to ask the participants to record their sleep.

This is considered as the best way to find out about people rather than judge attitudes from people behavior.

2.1. Participants

The type of sample used for my study called an opportunity sample. I asked my close friends and flat mates if they would like to take part in the study. 20 % of participants were selected via popular internet chat room. I have chosen this method because is a quick and efficient way of acquiring participants. I studied a total of 26 people in age from 17 to 53.

2.2. Apparatus

Instruction for psychology survey in form of briefing letter– Appendix 1

Sleep diary – Appendix 2

Agreement for participation in psychology study – Appendix 3

Debriefing of the experiment in form of letter– Appendix 4

2. 3. Procedure

To conduct my experiment I used procedure as follow:

1. I phoned to my friends and asked each of them if he/she would like to be my participant in a study related with duration of sleep.

2. I presented each of participants the same briefing letter (Appendix1), which instruct participant what is require from him/her to do. To the some participants set of documents related with the study (the briefing letter, an agreement and sleep diary) was delivered personally. Most of participants received the information in digital form via email post.
3. Each participant was given more than 3 weeks to fill the sleep diary (Appendix 2). They decided when to start but they were informed that the procedure requires recording sleep over seven consecutive days during a typical working week and not a holiday period.
4. After that each participant was fully debriefed receiving the prepared instruction (Appendix 4)

2. 4. Researchers

One A level student collected data

2. 5. Controls

Conducting psychological studies I need to be certain that the procedures I am planning to use conform to ethical guidelines. It means that no harm is given to the participants by taking part in the study.

Ethical issues in psychological investigation, which I gave high importance, are: informed consent, deception, right to withdraw, confidentiality and competence.

Informed consent: Participants must have enough knowledge about the study to decide whether they want to be involved. Before taking part in the survey my participants were briefed about the task they will be involved. I informed all of the participants that the survey is intended to research duration of human sleep. The brief

was delivered to each participant prior to the study and serves to explain to them what they will be required to do.

Deception: Sometimes deception in psychological studies may be necessary so that participants' behaviour is not affected by knowing the aim of the experiment. One way to deal with deception is to debrief participants afterwards. For the ethical and practical reason at the end of the study they were debriefed.

Right to withdraw: All participants were inform before they agreed to take part in the survey that they have the right to withdraw at any time in the experiment and no pressure will be put on them to continue.

Privacy: Another important aspect is confidentiality. The participants were ensured that their results will not be used as example. I informed them who is going to read the coursework.

Competence: Competence means understand my limitation and strive to maintain and develop my skills to conduct the study professionally and what the most important ethically. I must not take claims I can not substantiate.

It is important for the study to identify potential sources of bias in the investigation and any possible confounding variables.

One of confounding variables could be the style of life of some of my chosen participants. Some of them work for recruitment agencies as temporary, part time employees in catering industry. This industry is known for non regularity in demands for staff. Often temporary worker take as much work as is available to be financially secure in the time when is less work.

Also can happen that about some conditions of the participants I was not inform as they did not wish to tell me. It is possible that someone may take some kind of

medication which may make him/her sleepy. In opposite side stress related with work or personal life may decrease the ability to sleep or opposite increase.

In order to deal with the confounding variables I adopted standardized procedure. The diary I provided to the participants have place for “any comments”. So participant could put down any additional information which could have significant influence for the finding.

Could be that people’s sleep efficiency (the amount of time asleep given the amount of time in bed) is reduced and the number of naps taken during the day increases. Participants were asked to record their sleep to the nearest 15 minutes. This is increasing the likeliness that participant will record also nap taken during the day.

The diary may cue the participants to guess the purpose of the study, that is, they provide demand characteristic. This may have influence the internal validity of the research. By a standard procedure I ensured that no participant will be given more clues than others.

I communicated with participants using the prepared introductory instruction and the debriefing instruction so all participants were treated the same.

I had to control the confounding variables to make sure my results are accurate. Survey was conducted in the participant’s natural environment. Without these precautions my results would not be reliable.

3. Results

3. 1. Descriptive statistics - summary table

The table below shows the total weekly and average daily time of sleep of my participants. Also their age and gender are taking into consideration.

Table 1 Weekly and daily time of sleep

Participant	Total weekly time of sleep	Average daily time of sleep	Gender	Age
1	55.5	7.93	Female	29
2	50.5	7.21	Female	50
3	41	5.86	Female	39
4	52	7.43	Female	22
5	57	8.14	Female	30
6	54.25	7.75	Female	26
7	53	7.57	Female	17
8	37.5	5.36	Female	37
9	44	6.29	Female	33
10	50	7.14	Female	21
11	85	12.14	Female	19
12	83	11.86	Female	30
13	55	7.86	Female	20
14	43	6.14	Mail	44
15	71	10.14	Mail	23
16	61.3	8.76	Mali	42
17	58	8.29	Mail	52
18	54	7.71	Mail	53
19	37.25	5.32	Mail	32
20	42	6.00	Mail	30
21	45.75	6.54	Mail	23
22	47.5	6.79	Mail	29
23	62	8.86	Mail	34
24	43	6.14	Mail	40
25	66.25	9.46	Mail	24
26	56	8.00	Mail	28

In average my participants slept 7.72 hours per day. Women sleep a little longer than man. Daily average sleeping time of female participants was 7.89. Man' s sleep average time was 7.55.

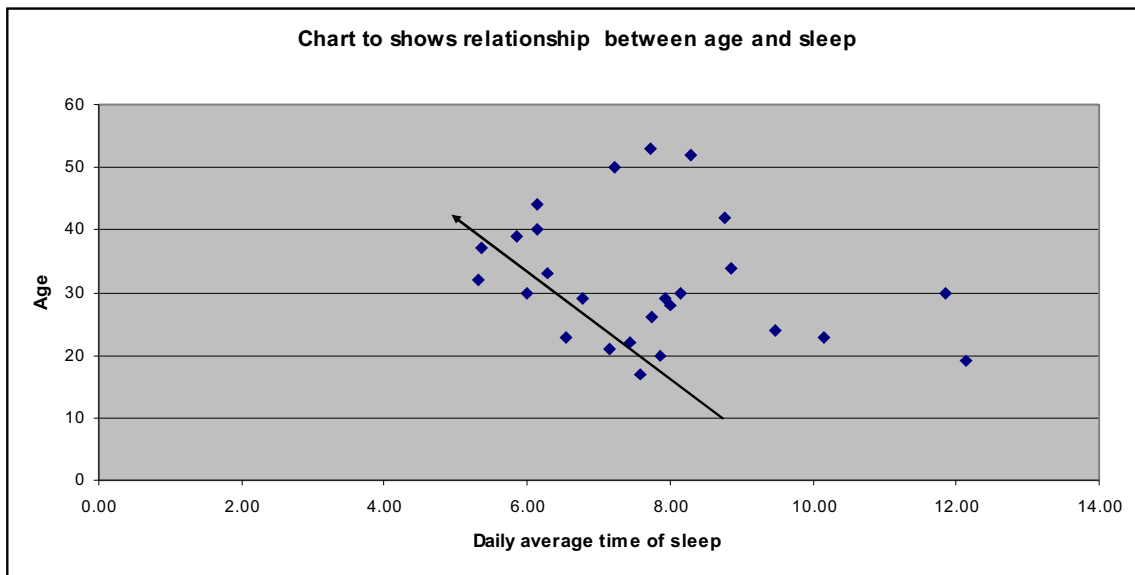
Another way to look at the data is presented below. This shows average time of sleep by age group.

Table 2 Sleep by age group

Age group	Average time of sleep during one day
17-20	9.19
21-30	8.10
31-40	6.34
41-53	7.38

From the presentation we can see that highest need for sleep is required by young people in group 17 – 20 and 20 – 30. Participants over 30 slept just 6.34 hours. When they pass 40, they seem to sleep a one hour longer.

3. 2. Inferential statistics



The scattergraph presented above indicates a weak negative correlation.

In order to study the correlation between the variables (age and time of sleep) a line of best fit has been drawn.

In order to determine whether the negative correlation was significant, we used an inferential statistical test.

The Spearman's rank test has been chosen because:

- A test of correlation was needed
- The data used were ratings made by participants, which are ordinal data
- This means a non-parametric test should be used.

The statistical calculations are shown in Appendix 5.

3. 3. Level of significance

The level of significance selected was 5%, the hypothesis was directional, and therefore the Spearman's rank correlation test (rho or R_s) has been done in order to indicate the strength of the association. If rho falls between -0.5 and 0, there is a weak negative correlation.

The observed value of rho = - 0.25

The critical value of rho = 0.331

As the observed value is less (-0.25) than the critical value (0.331), we retain the null hypothesis, which is "There is no correlation between age and sleep". However the rho is not 0.0, what would indicate no relationship between the two variables. The rho is in our case - 0.25 and it indicate a weak negative relationship between age and sleep.

4. Discussion

4.1. Explanation of finding

The hypothesis predicted a significant negative correlation between age and time. The scattegraph shows a weak negative correlation, but this was shown to be non – significant at 5% level when using the inferential test.

The table below shows average amount of sleep by age group. It is shown that our demand for sleeping is diminish with age. The duration is change after 40. Then again we need more sleep. Unfortunately my study did not show how the demand for sleep would be for elderly people. Limitation of the finding is that I did not use representatives over age 60, 70 and 80. Significant is that all of the three participants I studied over 50 years old recorded average nearly 8 hours sleep. The extra information in form of comments the participants provided, would suggest that this is related with increasing awareness of influence sleep for health and well being. Two of the comments are “I wonder if there is any correlation between total sleep time or cycles and length of life?”, “I generally don't have any problems falling asleep but I've used melatonin now and then”.

The study showed that highest need for sleep is required by young people in group 17 – 20 and 20 – 30. People over 30 sleep just about 6.34 hours. When they pass 40, they seem to sleep one hour longer. Young adults (30-40) commonly consider as a very active, involved in family and work responsibility. The demand of every day life could limit the time young people spend in their bed. However, nearly 50 % of the participants from this age group emphasize their wish to sleep longer.

I studied only 3 participants from age group 17 – 20 years old. One of the participant's average daily sleep time records was more than 12 hours. This significantly changes the average time of sleep rest of the participants.

Unfortunately I did not study people older than 53 so the finding is limited and the study say nothing about sleep pattern rest of the population.

4.2. Relationship to background research

The weak negative correlation I found could be supported by opinion of researchers from The National Foundation of Sleep in US, according to which our sleep needs remain constant throughout adulthood. The researches show that sleep doesn't need decline with age. Changes in the patterns of our sleep occur as we age and this may contribute to sleep problems. As people age they tend to have a harder time falling asleep and more trouble staying asleep than when they were younger.

Assuming that length of sleep is related with good quality of sleep, my study did not confirm the well-known assumption in sleep research that women report higher levels of sleep complaints than men (Landis and Lent, 2006; Zhang and Wing, 2006; Groeger et al., 2004; Sekine et al., 2006). Groeger et al.'s (2004) UK survey of men and women aged 16-93 (n=1997) found that women reported more sleep problems than men at all ages. My female participants' record of sleep was average 33 minutes longer than man.

4.3. Limitation and modification

The study was limited in a number of ways. Firstly to improve reliability of the study a bigger number of participants should be use and the age scale of participant should be wider. A greater variety in the male to female ratio should exist. Also the study should

take into account participant's socio-economic characteristics and health status. Number of hours slept each night should be recorded for a longer period of time.

The sleep diary should have position to express participant's needs for longer sleep. This could be for example question "Would you like to sleep longer. If yes how long?". This would give the cue to state whether the amount of sleep is enough or not for the participant for his well functioning. Participants should be encouraged to write more comments. Most of my participants left the comments place blank. However after the debriefing their gave me further explanation of their sleeping activity. Most of the participant which slept less than 7 hours said that would like to sleep longer if only circumstances allowed to do so.

To improve reliability of the study next time I would go for an interview. Each participant would be questioned face-to-face on all aspects of their sleeping habits, from what time they normally went to bed, to whether they slept more than their partners or lay in bed at the weekends. Using focus groups, in-depth interviews and audio-sleep diaries, this corpus of work would produce insights showing the ways in which sleep is socially patterned and the impact of the family context on our sleep. I believe that examine relationship between age and sleep I also should examine how physical health, socio-economic circumstances or gender roles were linked to sleeping patterns.

Also the internal validity of the study could be improved. Some participants called me to ask about further information about the study. Although I tried not to say more than was necessary, accidentally I could give more information about purpose of the study. This means that some participants could be more aware of the real purpose of the study than others. This could unconsciously affect participants' behavior (demand characteristic). Also they could manipulate the record, either time of sleep or an age.

4.4. Generalization of findings

Finding of my study can not be generalized to every day life because the kind of sampling I use and the mentioned above limitation. Might be that some participants did not record real time of their sleep and just randomly filled the diary. This is possible and difficult to check.

Although the samples I use include different kind of participants it doesn't cover all of the variety of social and cultural environments. Some of the participants are representative of different countries like Poland and Bahrain. The sample of participants includes: students, employed professional people, emigrants working as a waitress or care worker. It is wide spectrum but it is not wide enough to generalize to all population.

4.5. Implications and suggesting for future research

Sleep affects our daily functioning and our physical and mental health in many ways that we are just beginning to understand and more studies in area of sleep should be done.

Sleep greatly influences our waking hours, and we must understand sleep to fully understand the brain. Innovative techniques, such as brain imaging, can now help researchers understand how different brain regions function during sleep and how different activities and disorders affect sleep. Understanding the factors that affect sleep in health and disease also may lead to revolutionary new therapies for sleep disorders and to ways of overcoming jet lag and the problems associated with shift work. We can expect these and many other benefits from research that will allow us to truly understand sleep's impact on our lives.

It is important to establish what is affecting our sleep in every stage of our life. Do people really need less sleep or they loose the ability to sleep as long as they would

like? If we identify the causes of sleep deprivation we could prevent it and improve quality of our sleep.

Also it is important popularized an awareness of sleep hygiene and knowledge about sleep. Anxiety about falling asleep itself can even be a problem as, the more you worry, the less likely you are to be able to sleep properly. Physically, a lack of sleep can severely impair our ability to complete everyday tasks: driving while tired is responsible for thousands of accidents every year. Fatigue also lowers the immune system and makes your risk of illness much higher.

The suggestion for future study would be to assess whether any gender or socio-economic differences in sleep quality are because of poor physical health, and to conduct research including not only age but a more diverse range of measures of socio-economic circumstances, such as social class, income and housing conditions, as well as measures of gender roles.

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9. <http://www.dermaxime.com/sleep-aging.htm>

Appendix 1: Instruction - Briefing letter to the Participants.

Dear Participant,

I study a psychology. The area, which recently attracts me, is a quality of human sleep.

I would like to conduct survey study in area of sleep duration. To do this I need your help and agreement to participate in the psychology study.

You are asked to fill a sleep diary. You should fill the sleep diary in over seven consecutive days. It is very important that it is a typical working day and not a holiday period. Record your sleep to the nearest 15 minutes.

You are free to leave the survey at any time or remove your result at the end.

Copy of the sleep diary and agreement of participation in the psychology study are attached to this letter. Filled diary and signed agreement should be sent me back.

If you have any question, please do not hesitate to contact me on my mobile phone 078 09 72 21 40 or via email: bozenkaew@wp.pl.

Attachments:

1. Sleep diary
2. Agreement of participation in the psychology study of sleep

Yours sincerely
Bozena Ewertowska

Appendix 2: Sleep diary

Your gender:.....

Your age:.....

<i>Day of the week</i>	<i>Number of sleep sessions</i>	<i>Total amount of sleep to the nearest 15 minutes</i>	<i>Any comments</i>
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			

Appendix 3 - Agreement for participation in the psychology study

Agreement

I am aware of the confidentiality of my participation in the psychology study.

I know the right to leave the study at any time or to remove the result at the end.

I have received enough information from the researcher to give me informed consent so I have idea what is expected from me to do.

Your signature:

Data:

Appendix 4 – Debriefing in form of letter to the Participants

Dear Participant,

Thank you for taking part in the experiment. I would like to give you more information about purpose of the study. The true purpose of the study was to find out if the time people spend sleeping is related with their age. Recent studies show that we sleep less as we grow older.

1. Would you like to know the overall findings from the study YES/NO
2. Did you feel distress by any aspect of the study?
3. What did you think the purpose of the study was?
4. Do you think it might have affected your performance? YES/NO
If yes, in which way?

I would like to ensure that your result will remain confidential and you will not be personally named in the report of the study.

Thank you again for your time and cooperation.

Yours sincerely
Bozena Ewertowska

Appendix 5 Statistical calculation – Spearman’s rho – correlation between sleep as we aging

Participant	Age	Average time of sleep	Rank A	Rank B	Difference between rank A and rank B (d)	d ²
1	29	7.93	11.5	17	-5.5	30.25
2	50	7.21	24	11	13	169
3	39	5.86	20	3	17	289
4	22	7.43	5	12	-7	49
5	30	8.14	14	19	-5	25
6	26	7.75	9	14	-5	25
7	17	7.57	1	13	-12	144
8	37	5.36	19	2	17	289
9	33	6.29	17	7	10	100
10	21	7.14	4	10	-6	36
11	19	12.14	2	26	-24	576
12	30	11.86	14	25	-11	121
13	20	7.86	3	15	-12	144
14	44	6.14	23	5.5	17.5	306.25
15	23	10.14	6.5	24	-17.5	306.25
16	42	8.76	22	21	1	1
17	52	8.29	25	20	5	25
18	53	7.71	26	14	12	144
19	32	5.32	16	1	15	225
20	30	6	14	4	10	100
21	23	6.54	6.5	8	-1.5	2.25
22	29	6.79	11.5	9	2.5	6.25
23	34	8.86	18	22	-4	16
24	40	6.14	21	5.5	15.5	240.25
25	24	9.46	8	23	-15	225
26	28	8	10	18	-8	64

N=26

Sum of differences squared = 3658.5

$$\rho = 1 - \left(\frac{6 \sum d^2}{N(N^2 - 1)} \right)$$

$$\rho = 1 - \left(\frac{6 \times 3658.5}{26 \times (676 - 1)} \right) = 1 - \frac{21948}{17550}$$

$$= 1 - 1.250 = -0.250$$