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Original Research

Sleep and the common cold

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Abstract

Previous studies of experimentally induced colds and influenza have shown that sleep is impaired during these illnesses. This has been observed for both subjective reports and polysomnographically recorded sleep. The present study investigated whether naturally occurring illnesses influenced sleep measured using actimetry. Twenty-two volunteers had their sleep recorded on two occasions approximately 14 days apart. On the first occasion 15 of the volunteers had a cold and the other 7 were healthy. On the second occasion all volunteers were healthy. No significant differences were found between the healthy and colds group for any of the actiwatch measures. However, the numerical trends suggested that those with colds had lower sleep efficiency. Significant correlations were found between nasal symptoms and sleep disturbance. Reported fatigue the next day was also associated with less efficient sleep. These results confirm that the common cold can have detrimental effects on sleep but suggest that the overall magnitude of the effect is small and that it may reflect nasal obstruction.

INTRODUCTION

There is increasing evidence that upper respiratory tract illnesses, such as the common cold and influenza, impair central nervous system function. Initial studies of experimentally induced colds [1] demonstrated psychomotor slowing in those who were ill. These effects have been confirmed in studies of naturally occurring colds [2,3,4] Influenza has been shown to impair selective and sustained attention both in studies of experimentally induced infections [5] and naturally occurring illnesses [6].

It is well established that there are strong relationships between sleep and the immune system [7]. Studies have also demonstrated that experimentally induced colds and influenza have an effect on sleep. One study [8] reported that self-reported sleep was reduced during the incubation period of influenza but that sleep duration increased during the symptomatic period. Similarly those with symptomatic colds slept longer. Another study [9] examined this topic using electrophysiological recordings. They found that in symptomatic individuals, total sleep time decreased by an average of 23 minutes and that sleep efficiency was reduced by an average of 5%. However, daytime sleepiness, as measured by a multiple sleep latency test, was unaffected by cold status.

The present study had three main aims. The first was to extend research on the topic by investigating the effects of naturally occurring colds on sleep. A recent epidemiological study [10] collected data on both subjective reports of sleep disturbance and the prevalence of colds from a sample of over 7,000. The results showed that 46% of those reporting a cold in the last 14 days also reported disturbed sleep whereas 34% of those not reporting a cold had disturbed sleep. The second aim of the study was to measure sleep objectively using actimeters. A third aim was to examine associations between symptoms and sleep parameters and to determine whether disturbed sleep was associated with fatigue the next day.

METHOD

Participants

22 volunteers were recruited from the volunteer panel

of the Centre for Occupational and Health Psychology, Cardiff University. 15 participants (7 males, 8 females, age range 19-24 years) were experiencing a cold at recruitment whereas the other 7 (4 males, 3 females) were healthy. They were paid £10 on completion of the study.

Design

Participants were asked to report to the Centre if they developed a cold. If they fulfilled the inclusion criteria their sleep was then measured for one night using an actiwatch activity monitoring system (Actiwatch plus, Cambridge Neurotechnology). They then repeated the procedure for a second time when they had been healthy for at least a week. Seven volunteers were also tested when they were healthy on both occasions.

Inclusion criteria

Only volunteers who slept alone were included in the study. The volunteers also had to be medication free and have consumed no alcohol on both test days.

Informed consent

Participants were asked to sign a consent form that outlined the study, explained that they were free to withdraw at any time and confirmed the anonymity of all information.

Measures

Sleep was assessed using an actiwatch activity monitoring system (Cambridge Neurotechnology). 24 variables were derived from the data (sleep latency, actual sleep time, percentage of time moving during sleep etc – see Table1). Activity is measured by means of a piezo-electric accelerometer which is set up to record the integration of intensity, amount and duration of movement in all directions. The corresponding voltage produced is converted and stored as an activity count in the memory unit of the Actiwatch. The maximum sampling frequency is 32Hz. The Actiwatch records all movement over 0.05g. Filters are set to 3 and 11 Hz. Actiwatch readers and software were used to calibrate the Actiwatch units and to download the data.

Symptoms were assessed using a symptom checklist [3] involving rating the presence and severity of nasal symptoms (e.g. runny nose, blocked nose, sneezing), other respiratory tract symptoms (e.g. sore throat) and systemic symptoms (e.g. fever, headache). Symptoms were recorded both at bedtime and after waking the next day.

RESULTS

Statistical Analyses

Analyses of variance were conducted to compare symptoms on the two visits. Analyses of covariance, with the visit 2 data as covariates, were conducted to compare the colds and healthy groups at visit 1. Correlations between the symptom scores and sleep parameters were then computed.

Symptoms

Symptom scores were significantly different between the two visits ($F = 80.5$ $p<0.01$) and the symptom scores recorded at night and the following morning did not differ showing that symptom severity was constant over the sleep period (Symptoms: Colds/Night: mean=7.9 SD= 3.1; Colds/.Day: mean= 7.6 SD=3.8; Healthy/Night: mean=0.9 SD= 0.2; Healthy/Day: mean= 0.73 SD= 0.3).

Sleep

Analyses of covariance were carried out on the first visit scores with the second visit scores (when all volunteers were healthy) as covariates. The adjusted means are shown in Table 1.

No significant differences were obtained between the colds and healthy groups. However, a number of numerical trends were present in the data. Those with colds slept for longer but were generally awake for greater periods of time. Sleep was also more disturbed in the colds group (more time moving and higher levels of activity).

Correlations between symptom scores and sleep parameters (colds only)

Many of the sleep parameters were significantly correlated with the total symptom score (e.g. percentage of time awake: r=0.74; sleep latency: r=0.8; sleep efficiency: r=-0.73; mean activity score in active phases: r=0.69). Analyses of the individual symptom scores showed that nasal obstruction largely accounted for the correlations between the total symptom score and the sleep parameters (blocked nose and: percentage of time awake: r=0.53; sleep latency: r=0.69; sleep efficiency: r=-0.50; mean activity score in active phases: r=0.63).

Correlations between sleep parameters and fatigue the next day (colds only)

Sleep latency and the total activity score were both correlated (r=0.66 and r=0.68) with reported fatigue the next day.

Table 1. Differences between cold and healthy control groups on measures derived from the actiwatch data (scores are adjusted means from analysis of covariance, standard error in parentheses; data from visit 2 underneath)

Variable	Colds group (N=15)	HEALTHY CONTROLS (N=7)	ANCOVA
Time in bed (minutes)	469.95 (16.40) [481.11]	433.41 (21.53) [472.14]	N.S.
Assumed sleep (minutes)	476.98 (15.74) [481.33]	445.75 (20.64) [466.39]	N.S.
Actual sleep time (minutes)	433.99 (14.23) [433.11]	409.45 (18.70) [402.82]	N.S.
Percentage of overall time asleep	90.90 (1.14) [89.11]	92.59 (1.51) [93.60]	N.S.
Actual time awake (minutes)	43.43 (5.47) [39.87]	33.56 (7.19) [30.0]	N.S.
Percentage of overall time awake	9.10 (1.14) [7.06]	7.41 (1.51) [8.54]	N.S.
Sleep efficiency	87.44 (1.70) [90.26]	90.30 (2.29) [85.81]	N.S.
The number of sleep bouts	48.51 (5.48) [49.56]	51.42 (7.18) [46.28]	N.S.
The number of episodes of wakefulness	48.43 (5.48) [39.34]	51.56 (7.17) [42.43]	N.S.
Mean length of sleep bouts (minutes)	609.47 (64.88) [597.44]	535.62 (84.98) [545.73]	N.S.
Mean length of wake bouts (minutes)	42.27 (2.96) [49.55]	43.72 (3.76) [46.43]	N.S.
Time spent moving during sleep (minutes)	35.38 (4.05) [28.94]	28.62 (5.30) [28.67]	N.S.
Percentage of time moving during sleep	7.43 (0.88) [6.09]	6.12 (1.16) [6.48]	N.S.
Activity score	5830.11 (784.15) [5997.55]	4933.14 (1014.43) [5868.00]	N.S.
Mean activity score	4.39 (0.82) [3.16]	2.98 (1.08) [3.43]	N.S.
Mean activity score in active periods	53.54 (4.07) [52.66]	50.72 (5.34) [50.33]	N.S.
Movement and fragmentation index	37.0 (4.31) [30.66]	35.10 (5.65) [33.75]	N.S.
Average wake movement	24.14 (6.78) [22.80]	36.92 (8.89) [25.97]	N.S.
RMS wake movement	58.07 (9.92) [68.51]	77.64 (13.00) [62.33]	N.S.

Discussion

The results from the present study suggest that the effects of having a cold on sleep are modest. Indeed, a much larger sample size would be necessary to demonstrate significant effects for the group as a whole. However, the results show that those with nasal obstruction are particularly prone to sleep disturbance. Sleep disturbance due to nasal obstruction was also associated with increased fatigue the next day. These results suggest that decongestant medication may be useful to remove the cold-induced sleep disturbance. However, such medication may increase sympathetic activity and arousal during sleep.

Research [9] has examined whether disturbed sleep was responsible for cold-induced performance impairments. It was concluded that this was unlikely due to the modest effect of having a cold on sleep and it was suggested that cold symptoms may be responsible for the disturbed sleep. This is consistent with the view suggested by the present data. However, it is unlikely to represent the full profile of sleep/upper respiratory tract illness effects. Cytokines associated with fever may also lead to sleep disturbance and this plausibly explains earlier findings showing different effects of influenza and the common cold on sleep [8]. It may also be the case that disturbed sleep increases susceptibility to infection [11] and further research on this topic is desirable. Sleep disturbance is also a common feature of the nasal obstruction in allergic rhinitis [12].

Overall, the results from the present study suggest that having a cold many lead to a small amount of sleep disturbance. This was found to reflect nasal obstruction and for the sub-group of volunteers with a blocked nose there was greater evidence of sleep disturbance. Further research on this topic, and the behavioral effects of sleep disturbance associated with upper respiratory tract illnesses, is required.

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