

THE SLEEP OF SCHOOL CHILDREN, ITS DISTRIBUTION ACCORDING TO AGE, AND ITS RELATION TO PHYSICAL AND MENTAL EFFICIENCY.

LEWIS M. TERMAN,  
*Associate Professor of Education, Stanford University,*

AND

ADELINE HOCKING.

PART III. THE CONDITIONS OF CHILDREN'S SLEEP.

The conditions of sleep may be roughly classified under two headings: (a) the external or environmental, and (b) the internal or individual. Under the former may be considered such matters as the following:

1. *Housing conditions.* Teachers are fairly familiar with the unsatisfactory housing common among the poorer districts of our larger cities where families of all sizes carry on a wretched and squalid existence in dismal tenements of two or three rooms. Few of us, however, appreciate how many children in well-to-do communities are furnished sleeping accommodations which are hardly less pitifully inadequate. There is probably no section of the country where crowding is less common than in our Western States; but of the 2692 children who entered into this investigation only 32 per cent. have a bedroom to themselves, while 16.4 per cent. share the sleeping-room with two other persons and 9 per cent. with three or more.

2. *Ventilation.* Too often the teacher in the better class school takes it for granted that all the world shares her respect for fresh air and the out-of-doors. So little does she know about the home conditions which surround her pupils during the eighteen or nineteen hours when they are not in her charge!

The following table reveals the bedroom ventilation of our 2692 pupils for the different years. The first column shows that the number sleeping practically without ventilation is much larger in the earlier years. Why this marked improvement in ventilation in the later years? We believe it is difficult to account for it, except on the theory that it is the direct result of hygiene instruction in the school.

TABLE IV.—*Ventilation of Bedrooms.*

Age.	No window open.	One open.	More than one open.	Open-air.
	Per cent.	Per cent.	Per cent.	Per cent.
6.....	40.6	43.8	12.5	3.1
7.....	38	52.5	8	1.5
8.....	28.5	58.1	9.3	4.1
9.....	28.4	56.2	12.1	3.3
10.....	24.6	57.8	14.5	3.1
11.....	26	56.4	14.5	3.1
12.....	19.6	63.5	13.6	3.3
13.....	16.6	62	16.6	4.8
14.....	10.2	66.6	20.8	2.4
15.....	14	69	14.6	2.4
16.....	5.2	67.8	25	2
17.....	6.5	70.4	18.5	4.6
18.....	2.5	78	17	2.5

Any teacher who will go to the slight trouble necessary to make a *sleep survey* in her school will probably find enough not only to astonish her, but to give her some valuable suggestions for the teaching of practical hygiene. In this case it was found that 47 per cent. of those sleeping with no windows open were sharing the bedroom with at least two other persons!

*Work.* Early morning work disturbs the sleep of a large percentage of the school boys in the larger cities. Five per cent. of Ravenhill's boys rose regularly before 5 A. M. for various kinds of work. Of the six-year-old boys, 2 per cent. were engaged in gainful occupations out of school hours. This rose to 28 per cent. at eleven years and to 53 per cent. at twelve.<sup>1</sup>

<sup>1</sup>In our own study the returns on this point were unreliable because of the unfortunate wording of one of the questions. The expression, "hours per week," was evidently overlooked by many of the children, who answered in terms of "hours per day" instead. For the same reason our data on amount of home study proved worthless.

Almost any teacher in city schools above the sixth grade will find, if she takes the trouble to inquire, a certain number of pupils in her class who are engaged in productive labor from 10 to twenty hours per week.

*Hours of retiring.* Many children secure insufficient sleep merely because they are not put to bed early enough. Nearly 5 per cent. of Ravenhill's six-year-old children retire as late as 10 o'clock, and nearly 10 per cent. of her ten-year-olds. The time lost in this way cannot be fully made up in the morning because of the disturbance caused by the early rising of parents and because of the necessity of getting to school at a given hour. In other words, the hours set apart for the sleep of children are not those best adapted to insure a sufficient amount. Even the families who set a reasonably early hour for the children to retire usually permit so many irregularities that, as one writer puts it, "the law is more observed in the breach than in the performance." Ravenhill found that 20 per cent. at six years and 40 per cent. at thirteen years were allowed one or more irregularities per week. The European custom of beginning school at 7 to 8 o'clock in the morning works great hardship, often causing the pupil to rush away to school in nervous haste and without breakfast. The American practice of beginning at 9 o'clock is far wiser, and should never be changed unless for very special reasons.

*Vermin.* Medical examiners not infrequently find from 10 to 40 per cent. of the pupils of a school afflicted with vermin. Needless to say, the child who is so tormented cannot secure normal sleep. The reflex nervous irritation produced by vermin disturbs the nutritive functions not only directly, but also indirectly, through its interference with sleep, and teachers need not be surprised when extreme malnutrition and nervousness result from a cause apparently so trivial. Other parasitic diseases, such as scabies, ringworm and intestinal worms, should be mentioned in this connection.

*Miscellaneous conditions.* The sleep of school children is influenced in many other ways. Temperatures much above 60 degrees are unfavorable either to quantity or quality; and largely for this reason children sleep more in winter than in summer. The late sunrise of winter mornings exerts an in-

fluence in the same direction. Our reflexes are habituated to such delicate response to the stimulus of light that for many of us even a gleam of moonlight through the window disturbs our rest. Humidity and atmospheric pressure are other factors, though their exact effects have not yet been determined.<sup>2</sup>

Other children sleep poorly for lack of a bed and because of inadequate protection from cold. Still others are aroused by the din of early street noises.

### *Internal Conditions Influencing Sleep.*

Improper diet is one of the most important of these. The child's sleep may be disturbed by excess of starchy foods, unsuitable cooking, etc. The late dinner, following an inadequate breakfast and a cold, unsatisfying noon-day meal, favors engorgement of the stomach through excess of hunger, and is also unfavorable to sleep.

The influence of tea and coffee upon sleep is a matter of common observation. The experiments of Hollingsworth (18) on ten men and six women, extending over a period of forty days, verify common opinion on this point, and show that the influence of caffeine is in inverse proportion to the weight of the subject. One cup of coffee for the seven-year-old child is therefore equivalent to three cups for the average adult. Even this may understate the facts, since it is probable that the child's body does not adjust and become habituated to the evil effects of drugs as well as the body of the adult, even in proportion to its size.<sup>3</sup> It is not overstating the facts to say that many hundreds of thousands of school children in the United States are kept in a constant state of semi-intoxication by the use of coffee and tea. The total effect upon sleep and health can only be surmised.

<sup>2</sup>For conflicting evidence on this point see the study of Dr. Caroline Osborne (28).

<sup>3</sup>It is much to be regretted that our own investigation did not undertake to secure data on the relation of sleep to the consumption of coffee and tea. The prevalence of this species of drug habit among school children has, however, been ascertained by Dr. Hoag for the California cities of Pasadena, Berkeley and San Luis Obispo. He finds that the proportion consuming one cup or more per day falls usually between 40 and 75 per cent. for children in the best schools. Occasionally the young child drinks from three to six cups of strong coffee daily.

Other familiar sources of disturbed sleep are obstructed breathing, eye-strain, dentition, earache, toothache, etc.

The nervous child is notoriously a bad sleeper. Such a child is likely to be obsessed by fears, tormented by absurd pangs of conscience, excited by an over-active intelligence, or worried by trivial happenings which would be forgotten by the normal child in a few minutes. Religion-bred fears, fear of the dark and vague indefinable anxieties haunt the evening hours of more children than most of us suspect, for children learn that it is pleasanter to bear many a secret pain and sorrow than to hazard reproof and misunderstanding by imparting them to unsympathetic elders.

One nervous girl of nine years, a stutterer and subject to many fears, is not able to go to sleep if she recalls after retiring that she has forgotten to say good-night to some member of the family. A boy of seven, with an over-active imagination, after going to bed rehearses for hours his play and story experiences of the day. Another cannot find the bed comfortable, and calls his parents a dozen times to tuck him in. If they do not come, he cries and moans. An adolescent girl was for years kept awake at night by fear of death and hell. The fear did not leave her during sleep, but disturbed her dreams and caused her often to wake with a sudden start to realize again with renewed horror the awful doom inevitably awaiting her.

Home study nearly always robs the nervous child of the margin of sleep he so much needs. It not only causes him to remain up later, but is likely to induce an excited condition of mind, which is followed by superficial and disturbed sleep. Arithmetic lessons are especially unsuited for home assignments, but because of their quality of definiteness are just the kind of home work with which children are most likely to be burdened.

*Night terrors.* In children from six to ten years of age night terrors are a common disturbance. They are occasionally provoked by indigestion, obstructed breathing or other reflex irritations, but in most cases of chronic recurrence are associated with other hereditary nervous taints, notably migraine. They are often present in chorea. The condition is symptomatic

of general nervous instability. *The child who suffers often from night terrors deserves special oversight on the part of parent, teacher and physician.* Often it is wise to remove such a child from school.

In a study of a precocious and talented boy, one of the writers has uncovered an extreme case of prolonged suffering from night terrors. The following clinical description will no doubt add to the reader's interest in the case:

Age when study was made, 14 years. Mother, who was 46 years old at his birth, a woman of remarkable intelligence and decided literary ability. Father, though a ne'er-do-well, was from one of the best families of England. The son, a musical prodigy at 6 years, attacked by chorea at 7 years; since which period he has suffered from tics and automatisms. Because of his nervousness, has not attended school since age of 7. Taught by his mother and has excellent literary taste. He constantly improvises music, and shows remarkable ability and interest in botany. He is independent of thought, oldish, and very talented, but neurotic and "queer."

From the age of eight to about twelve this boy suffered the most horrible night terrors imaginable, for two years almost nightly. These involved drowning, falling from cliffs and steeples, being shot, mangled, seeing himself lying dead, crossing frail bridges over bottomless chasms, being placed in hell, undergoing countless forms of torture, etc. Sometimes in his dreams a crowd of people would poke at him with red-hot irons. Sometimes he walked through dark and gloomy places, when horrible faces would suddenly appear. The most terrifying dream of all, though the subject does not understand why it should have been so, was one in which he found himself looking down into a deep well, which grew deeper and deeper the longer he looked, until, with a scream of terror, he would awaken. Some of his nightmares belonged to the class of "continued" dreams. One of these lasted nearly a month. It began in a bleak, cold house in which the subject thought himself starving and dying of thirst. After what seemed an interminably long time one drop of water and one crumb of bread would appear. These were ravenously consumed, and then after another small eternity another drop and crumb came to tantalize him.<sup>4</sup> The following night he found himself

<sup>4</sup>The boy and mother had some months previously remained without money or friends in the city of New York in a half-starved condition. The boy fully expected at the time to die of starvation. He has always lived in grinding poverty, eating his bread without butter and often going without meals altogether.

in the same house, but other persons were with him. Gradually these changed their human shapes. More and more joined the throng, each newcomer more horrible, mis-shapen and gorilla-like than the others. The next night these monsters began an endless series of tortures, biting off his nose, poking at his eyes, starving him, etc. This continued with variations for many nights, each dream ending with cries and waking. Finally the monsters began to die, each with nerve-racking screeching and groaning. But for each one that died one or two others appeared, still more horrible. The continued dream ended in death from starvation.

This boy insists that he *has never had a pleasant dream*. All his dreams have been nightmares. At the age of twelve years he made a determined effort to free himself from these *by willing not to have them*. No one suggested this. Immediately they became less frequent, and finally ceased almost altogether.

We have in the above case a peculiar combination of neurotic constitution, rheumatic diathesis and unfortunate mental and physical influences. Not many children have suffered from night terrors as this boy has, but many nervous children are afflicted to a less degree. To condemn such children to the sedentary life of the school or to burden them with school tasks or over-strenuous musical training is a mistake.

It is not yet clear to what extent the Freudian method of psycho-analysis displays the true mechanism of such dreams, or how successfully the method may be applied in the therapeutic treatment of stubborn cases.

It may be added that children of school age are seldom affected with protracted *insomnia*.

### *Teaching Children to Sleep.*

Teachers do not control the homes of today, but they are implanting the ideals which will condition the homes of to-

MORROW. That only 3.1 per cent. of the school children in the mild and equable climate of California enjoy open-air sleeping-rooms suggests what remains to be done in this line of instruction.

The teacher should know the poor sleepers in her classes and those who suffer night terrors or other fears and obsessions which interfere with sleep. She should know which children drink coffee, tea and beer; which ones sleep in crowded and ill-ventilated bedrooms. Facts demonstrate that a large proportion of the homes stand in need of expert advice in these and kindred matters. Here, as elsewhere, poverty and ignorance take their greatest toll out of the lives of little children.

The presence of the physician in the school should not arouse a mistaken sense of assurance that all will now be well as regards the physical needs of the child, and that the teacher can safely turn over every responsibility of this kind to the medical examiner. The latter usually has several thousands of children under his charge, and cannot pay heed to all the conditions which concern the individual child. As already suggested, the teacher should make a health survey of her pupils, and should strive to do what she can to improve the conditions which she finds to exist.

Sleep ranks with food as one of the most imperative needs of the human organism, and like the latter it has its educational and economical aspects as well as its physiological and biological. But while diet has long received a liberal share of attention from economist, hygienist and biologist, the scientific study of the hygiene of sleep has been hardly more than initiated. We seem to have rested content in the supposition that sleep of satisfactory quantity and quality can always be had when needed. Theoretically, and under natural conditions, this may be true. Under the unnatural conditions of modern life it is not true. In this respect the problem is analogous to that of ventilation. The ocean of fresh air is always at hand, but the problems of the ventilating engineer are none the less real.

## APPENDIX.

*The Sleep of the Feeble-minded.*<sup>5</sup>

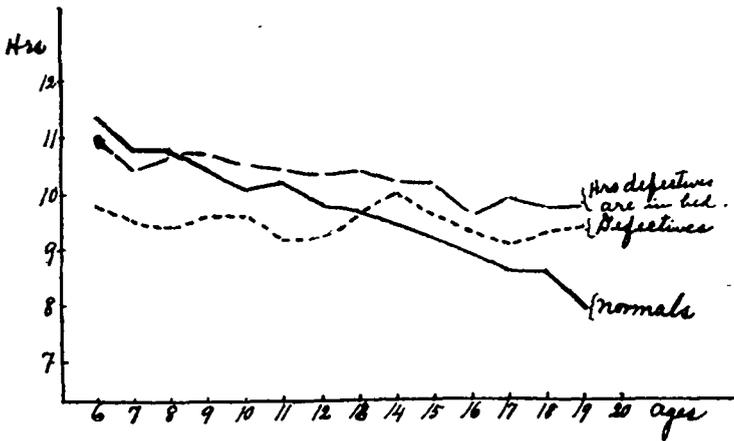
Through the courtesy of Superintendent Johnstone and Dr. Goddard of the Vineland Training School, the authors were able to make a comparison of the sleep of feeble-minded individuals, both children and adults, with that of normals. Sleep records of 383 inmates were secured under the immediate supervision of Dr. Goddard, together with supplementary data, according to the following question sheet, which was filled out for each individual:

- (1) Sex ..... Age .....
- (2) Grade of mentality.....
- (3) Type of defective.....
- (4) Regular hour of going to bed.....
- (5) Regular hour of getting up.....
- (6) At what hour does patient usually go to sleep? (Give an actual record if possible).....
- (7) At what hour does patient usually awaken? (Give actual record for same night as above if possible).....
- (8) Is sleep usually *unbroken, somewhat broken, or very much broken?* .....
- (9) Disposition of patient:—quiet, irritable, good-natured, self-controlled, violent, fits of temper, moody, anxious, nervous, lacks self-control, lacks energy.....
- (10) Conditions of health.....Physical defects.....

## RESULTS.

(a) *The sleep of mentally defective children, according to chronological age.* The following chart shows the average hours of sleep for the 193 of our defectives (sexes taken together) whose ages lay between six and nineteen years. For sake of comparison, the curve for our normals is produced, also a curve showing the average number of hours by *chronological ages* our defectives are allowed in bed.

<sup>5</sup>The writers are greatly indebted to Dr. Goddard and Superintendent Johnstone for their interest and co-operation in the study.

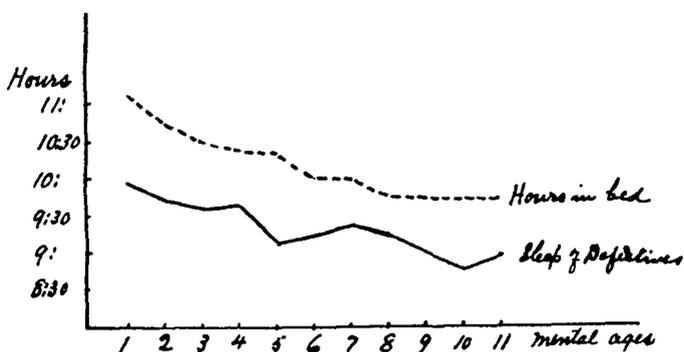


The interesting thing about the above curve is that *age differences are practically non-existent with the defectives.* The only marked rise in the curve comes at fourteen years, the sleep of children six to twelve running slightly lower than that for the ages sixteen to nineteen. If the curve for defectives had been prolonged to include the ages above nineteen years, it would be found practically horizontal from twenty to forty, with marked but gradual rise thereafter to sixty and above. The averages by decades are as follows:

	Number.	Sleep in hours and minutes.
Ages 21-30.....	137	9.05
Ages 31-40.....	39	9.06
Ages 41-50.....	11	9.26
Ages 51 and upwards.....	3	10.

Our data, however, for the years six (two cases), seven (three cases) and above fifty (three cases) are too scanty to be reliable.

(b) *The relation of sleep to degree of mental deficiency.* This is shown in the following chart, together with another curve indicating the average number of hours spent *in bed* by the feeble-minded individuals of various *mental-ages*.



Again it is seen that the amount of sleep bears little relation to intelligence, and the conclusion arrived at in Part II of the study of normal children is borne out. To test the matter further the hours of sleep of the defectives of each chronological age were tabulated separately for each "mental age." The results showed only very slight differences for chronological age, whatever the degree of mental defect, and such differences as were found are possibly due to the fact that the lowest grade defectives are allowed, on the average, a little more time in bed than are the higher grade defectives (see chart).

Low grade defectives, whatever their chronological age, sleep much less than normal children of the *same mental age*, while high grade mental defectives sleep as much as normals of the same mental age, or even more. Thus practically all our sixteen-year-old feeble-minded children whose mental ages fall between two and six years, inclusive, sleep the same number of hours, namely, nine and a half. Although the younger feeble-minded are allowed much more time in bed than are the older, their period of sleep is but little different.

In trying to understand the feeble-minded individual child from the biological and genetic point of view, the question of correlation or non-correlation of the sleep requirements to degree of mental retardation is extremely interesting. It is unnecessary to add that our own scanty data, vitiated as they are by the regimen of institutional life, do not pretend to give any final answer to this question, still less to explain any rela-

tion that may be present. Whether sleep be explained in terms of instinct, chemical and toxic influences or neural metabolism, the influence of extreme mental defect upon it is of interest both theoretically and practically.

(c) Does the relative smallness of age differences in the sleep of these feeble-minded individuals as compared with normals indicate a *genuine contrast between normals and feeble-minded*, or is the phenomenon due merely to the daily program of the institution? It is evident from data already presented that the institutional program would act to *reduce* any genuine age differences that might exist, but since the hours in bed are regulated *in part* according to chronological age, we should hardly expect the age differences in sleep to be so completely obliterated. The fact of obliteration would itself indicate the extreme plasticity of the sleep habits.

This point, however, can only be settled by the collection of sleep records from children who do not lead an institutional life, and the writers would be glad to secure the co-operation of teachers of public school *special classes* in the collection of data on the subject. Correspondence with this end in view is invited.

(d) *Sex differences* of importance do not appear in our sleep records of the feeble-minded.

(e) For each age the *variability among the feeble-minded* as regards hours of sleep is much less than for the normals. This may be wholly the result of institutional life.

(f) Among the feeble-minded, as among normals, no relation appears between *hours of sleep and the number of "nervous traits."*

(g) In *quality of sleep* the feeble-minded of each grade of mentality compare favorably with normal children. The figures for all grades taken together show that the sleep of 89 per cent. is "practically unbroken;" that of 8.4 per cent. "somewhat broken," and that of 2.6 per cent. "very much broken."

In conclusion, it may be said that unsatisfactory as are our data on the feeble-minded, they indicate in an interesting way the comparative lack of dependence of mental efficiency upon hours of sleep. Our feeble-minded children, whatever the

grade of defect, sleep much *less* than normal children of the same age, the feeble-minded adults much *more* than normal adults. As regards sleep, the feeble-minded seem to retain throughout life the characteristics of childhood.

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