piece of angel-food cake; they were served at the beginning of the third work hour both in the morning and in the afternoon. The mean hourly output of the control group varied only slightly from period to period; the experimental group had consistently higher output than the controls when the workers were on a five-meal schedule (Table 16).

TABLE 16

Meal Frequency and Productivity for Periods Representing Ten Workdays Each[84]

Period	Experimental group				Control group			
	No. of meals	Mean hourly production			No. of meals	Mean hourly production		
		Av.	Min.	Max.		Av.	Min.	Max.
I	3	175	169	178	3	183	174	188
II	5	192	188	196	3	184	177	189
III	3	176	171	179	3	183	179	187
IV	5	194	189	196	3	184	179	189
V	3	176	168	178	3	184	180	189

The *fact* that industrial production has increased on the five-meal schedule does not need to be questioned. But the experimental conditions of Haggard and Greenberg do not allow a clear-cut identification of factors responsible for the increased output. The effect of the rest pauses alone, provided by between-meal feedings, and the effect of intake of food of little nutritional value should have been studied to distinguish between the direct, physiological effects of the additional meals and the indirect effects through changes in "morale."

The physiological interpretation of an increased production in terms of high muscular efficiency maintained through more frequent meals is open to question. In *all* p.m. production curves there was a slump followed by a "spurt" at the end of the day although the R.Q. continued to decrease (Fig. 14). This fact indicates that the decrease in output was not related to carbohydrate utilization. Decreased output did not reflect a decrease in the work capacity. The authors have commented that the decline of production "did not signify that the operator was wholly incapable of achieving a greater production by making a greater effort,"[84] but have not incorporated this fact in their general interpretation. For the main experiment the average production rates only, not the hourly output curves, were given.

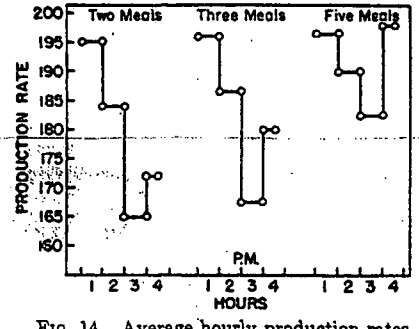

FIG. 14. Average hourly production rates of operators eating different number of meals.[84]

The workers operated power-driven sewing machines; in terms of energy expenditure this represents very light manual work that does not deplete significantly the total energy reserves of the body, and it is hardly conceivable that the work capacity of the muscles could be affected by a variation of blood sugar of the magnitude present three to four hours after a meal.

In describing the general conditions of the experiment the authors were struck by the fact of stable daily output of the highly skilled operators: "They were capable of turning out a production of 100 per cent hour after hour. And what is more, they were able to time themselves so that their production, at the end of the day, was almost exactly 100 per cent, neither above, which might have led to readjustment of the wage scale, nor below, which would have resulted in loss of bonus."[84] We are not informed what has happened to the production of these "100 per centers" on the five-meal schedule. In any case, the restriction of output indicates the presence of social-psychological factors affecting the output records and the necessity for taking them into account in interpreting the results.

The problems of between-meal feeding and its effect on general level of productivity and on the character of the daily output curve is of considerable practical importance. We need further research, both in the laboratory and in industry, before the effects of interim feeding will be well established and clearly understood.

5. *Music in Industry*

In operations that produce boredom-fatigue, talking and singing (as well as daydreaming) are used by the workers to get them "over the hump" of the shift. Wyatt[85] has found a significant negative correlation between the rate of output and the amount of talking in a group of girls engaged in repetitive work such as weighing, wrapping, and packing (see Figs. 15 and 16). The data were obtained under the time-rate system of payment. Both the output and the amount of talking were

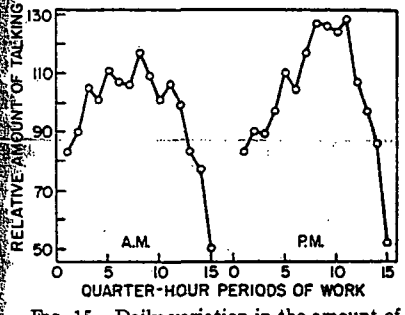

FIG. 15. Daily variation in the amount of talking.[85]

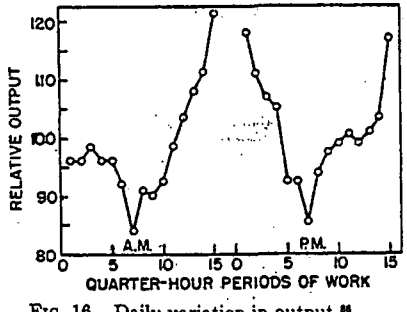

FIG. 16. Daily variation in output.[86]

[85] S. Wyatt, *Ind. Health Research Board (London), Rept.* No. 69 (1934).