SOAP WRAPPERS' "JIG"

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The management of a perfume factory have been concerned for many years by the extensive rhythmical movements used by operatives in wrapping soap. These movements, which are widespread only in the soap department, became known as the "jig".

A field investigation was carried out to determine its effects on the operatives' health and on productivity.

There are individual differences in the movements but the term "jig" refers primarily to rhythmical swaying of the trunk backwards and forwards, and very rapid repetition of certain movements, such as folding the ends of the papers, with some extraneous ones, such as tapping and shaking the soap. There are some exceptions to this; in one case the chief sign consists in a rotation of the head. In new operatives the movements are reported to appear only gradually after training.

It is difficult to fix exact limits between "jig" and "not jig" because the distribution appears continuous, ranging from relative immobility of all muscles except those of arms and fingers, to a general response of the entire musculature. In extreme cases the movements are exaggerated and extensive, giving the impression of great activity performed in a spectacular, jerky manner. But if the "jig" could be objectively defined and measured the distribution would probably be positively skewed, fewer operatives having a high degree of "jig" compared to those with a low degree.

Description of the Job

The 15 soap wrappers sit facing each other in pairs (with one left over) at double desks which are placed in two rows of four on either side of a conveyor belt. The pairs are altered about once in six months. The wrappers are serviced with trays containing five or six dozen tablets on their left or right side, according to which way they are facing.

Soap is picked up with the left or right hand and

placed on parchmentine (inner wrap) on the desk. Soap and parchmentine are then picked up and simultaneously the other hand picks up a board skillet (a strip of stiff paper) which is placed centrally on an outer wrap; the two hands are brought together, the soap and parchmentine being placed centrally on the skillet. A seam is made with a "druggist fold" and the soap is turned to wrap one end and then reversed to wrap the other. The soap does not rest on the desk when the ends are folded but is held up in front of the operative, slightly away from the body. Finally, the soap is placed on the belt and the other hand moves to pick up the next tablet. The time allowed for the whole cycle is 19 seconds.

Method of Investigation and Results

Since no objective measure could be devised, all wrappers were independently ranked from 1 to 15 for degree of "jig" by the supervisor, chargehand, and head girl. The mean of these three rankings was taken as an index of degree of "jig", the coefficient of concordance (w) being 0.88 ($P < 0.001$).

An index of efficiency was obtained by taking the ratio of "standard hours" to "working hours". ("Standard hours" are equivalent to output, one standard hour being the amount of work which it is estimated should be produced in one clock hour. "Working hours" equal clock hours minus extra hours, *e.g.*, waiting time.)

The relation between "jig" and efficiency was investigated. The "jig" rank order was correlated with an efficiency rank order based on the mean of the previous three weeks' output. As predicted by the investigator, there was a positive correlation, Kendall's τ_b (Kendall, 1948) being +0.48 ($P = 0.0139$). A similar correlation was calculated as a check between "jig" and mean efficiency for the first weeks of October, November, and December, 1953, τ_b being +0.52 ($P = 0.0084$).

RANK CORRELATION BETWEEN "JIG" AND MEAN EFFICIENCY OVER THREE WEEKS *

"Jig"	1	2	3	4	5½	5½	7	8	9	10	11	12	13
Efficiency	1	3	2	7	5	6	10	12	8	13	11	9	4

$\text{Tau}_b = +0.48, P = 0.014$ (one tail)

* In all cases 1 is the maximum and 13 (or 15) the minimum of each variable.

RANK CORRELATION BETWEEN "JIG" AND MEAN EFFICIENCY FOR FIRST WEEKS OF OCTOBER, NOVEMBER, AND DECEMBER, 1953

"Jig"	1	2	3	4	5	6½	6½	8	9	10	11	12	13
Efficiency	1	3	2	6½	6½	5	9	10	11	13	12	8	4

$\text{Tau}_b = +0.52, P = 0.0084$ (one tail)

Each of these correlations includes one different operative, and one operative was excluded from both since a valid efficiency index could not be determined owing to her recent transfer away from, and back to, the department. With one exceptional case excluded these correlations would be considerably higher.

To ensure that these figures are not confounded by age or practice, tau_b was calculated between "jig" and (a) age and (b) duration of experience of soap wrapping. Neither of these correlations was significant, being $+0.19$ ($P=0.35$) and $+0.14$ ($P=0.48$) respectively.

RANK CORRELATION BETWEEN "JIG" AND AGE

"Jig"	1	2	3	4	5	6	7½	7½	9	10	11	12	13	14	15
Age	13	2	9	1	11	15	3	4	10	5	6	7	14	8	12

$\text{Tau}_b = +0.19, P = 0.35$ (two tail)

RANK CORRELATION BETWEEN "JIG" AND DURATION OF EXPERIENCE OF SOAP WRAPPING

"Jig"	1	2	3	4	5	6	7½	7½	9	10	11	12	13	14	15
Duration of experience of soap wrapping	9½	2	5	1	8	15	11	14	6	4	12	3	9½	7	13

$\text{Tau}_b = +0.14, P = 0.48$ (two tail)

Sickness records of the wrappers were compared with those of the 45 remaining operatives (banders, packers, etc.) in the soap department. Over the year 1953-54 the mean working days lost from certified sickness was 9.33 (S.D.=9.9) for the wrappers and 7.5 (S.D.=9.8) for the non-wrappers. In the category of respiratory diseases (including influenza and colds) the means were 7.1 (S.D.=9.2) for the wrappers and 3.3 (S.D.=5.5) for the non-wrappers.

Absence from all other causes was also compared between the two groups over the same period and the

means were 5.2 (S.D.=5.8) for the wrappers and 4.9 (S.D.=6.3) for the non-wrappers.

The differences between the means were tested by Student's *t* test and no significant differences were obtained.

All wrappers were given a directed interview, the results of which are discussed below.

Discussion

Rhythm, as an aid to work, has been recognized in motion study since Gilbreth's *Principles of Motion Economy* (1923). But the term rhythm can refer to two different things: (a) the speed or rapidity with which repeated motions are made, and (b) the "beat" or variation of strain and rapid movement. Barnes (1949) observes that it is "most natural for the worker to fall into this [latter] kind of rhythm and that many kinds of work provide opportunity for the operator to accent certain points in a cycle of motion". Shaw (1952) stresses the role of rhythm as "one of the main characteristics of a good motion study pattern" and as providing "a definite focusing point or beat". Neither of these authors, however, gives much attention to rhythmic movements which are not part of the work cycle but constitute additions to the essential movements, although Barnes relates increase in muscular pressure and number of strokes to fatigue which breaks up the natural rhythm and disturbs coordination. Farmer (1921) states that individual rhythms, superimposed on the necessary ones, are introduced "either because motor control is weak, or because the ordinary movement involved in doing the task is of such a kind as to give no pleasure in its performance; in this latter case another movement is introduced to compensate for the tiring effect of the necessary movement". He points out that "workers left to themselves may beat to an unnecessarily lengthy and complicated rhythm which may be the cause of many unnecessary movements, and which in turn may become a semi-automatic habit". To preclude these rhythms he advocates teaching rhythmic movements, of a circular rather than a jerky kind, in which "the terminal phase of the preceding movement naturally suggests the initial phase of the next". But the movements to be used are clearly limited by the requirements of the job and soap wrapping needs small, deft finger movements in various directions which would seem to be performed more naturally in a jerky, staccato manner rather than in a smooth, circular one.

Superimposed rhythms may be introduced to "synchronize with some physiological rhythm such as heart beat or breathing" (Farmer). They may

also be related in some way to the concept of "irradiation", a specific type of neuromuscular incompatibility associated with motor skill, which is defined as "progressive involvement of more and more tissue in aspects of activity that were originally more localized" and which is manifested "in spreading patterns of muscular tension and movement" (Bartley and Chute, 1947).

Self-estimation of "Jig".—Nine out of the 15 wrappers admitted using rhythmical movements of one kind or another (Nos. 1 to 8 and No. 13 on the rank order). Four out of the nine disliked making these movements and wanted to stop, including the two with the maximum "jig". Reasons for disliking it were impairment of efficiency and embarrassment (e.g., "people think you are mad"). Three of the four who disliked it had tried hard to stop without any success. In one case (No. 6—head rotation) this seemed to make it worse, "You work quicker if you keep steady. I've tried to stop movements but the more I try to stop, the worse it gets—have given up trying to stop now". One (No. 13) was now quite reconciled to it. The following from Bartley and Chute (*op. cit.*) is interesting in this context:

"Irradiation, although it represents a possible form of compensation for nerve and muscle tissue, in many instances represents for the individual a state in which he is less comfortable and less able to perform the task. The individual judges himself to be inefficient."

The five who liked the "jig" (Nos. 3, 4, 5, 7½ and 7½*) said that it helped them to work, e.g., "the rhythm helps", "it just carries me along", and "it's better than sitting stiff and stark".

Work Situation.—It is postulated that the "jig" is related to variables in the work situation and in the operatives.

Imitation.—Strong evidence was gained from the interviews suggesting that imitation, conscious or unconscious, of skilled wrappers was related to the "jig" after training. Before presenting the evidence, methods of training new wrappers will be summarized.

Soap wrapping is considered by the management to be the most skilled of all the jobs in the factory, since it requires a high degree of finger dexterity and involves complicated movements which take some time to learn. The policy has been to make a really serious attempt to teach it, and, since it is apparently impossible to "pick it up" by sitting beside skilled wrappers, groups of three or four are instructed in the method, movement by movement, on a

separate training belt in the same department. Once they are considered trained they are moved on to the skilled belt and allowed to develop their own individual ways of wrapping without correction.

In the absence of photographic studies, the correct method of wrapping was agreed upon by the methods department as that used by a particular chargehand who was not a "jigger".

The wrappers employed at the present time reported that this chargehand trained four of them, another chargehand (also without the "jig") trained five, two were trained by both, and two more were trained by both chargehands and a head girl. One of the wrappers (No. 1 on the "jig"), who was trained by three people, and another (No. 7½ on the "jig") who was trained by both chargehands, spontaneously commented that they were confused by different methods. The period of training varied from six weeks to nine months.

Eight out of the nine operatives admitting the "jig" reported facing others with the "jig" when they were trained and only one reported facing an operative without it.

Four of the six who did not admit the "jig" reported originally facing those without it and two reported facing those with it, but in one case the movements were described as being only slight.

Seven of the nine reported developing the "jig" unconsciously ("it just came") and two reported that they were aware of developing it from sitting opposite or copying a girl with the "jig"; e.g., "One wrapper told me to cut it out but we were also told to copy the girl opposite when we make a mistake" . . . "If the girl sitting opposite does it, then you would pick it up".

One wrapper (without the "jig") said: "We have to look down when sitting opposite a girl with a lot of movement". Another said: "All the girls watch 'X' (No. 3 on the "jig" and employed longest as soap wrapper). They say, 'Haven't you watched 'X' wrap?'". A third said, "I sat opposite 'X' for a long time and that got me really moving".

Farmer (1921) re-trained younger workers in improved methods but when they saw older girls around them working in a different way and naturally producing more, they tended to drop the new methods and adopt the old ones again. But when training was started in a new room the young girls after three months of the improved methods, were, on average, producing 88% more than workers of the same standing in the original room. In another experiment a similar procedure was used but the trained young workers were then moved back into the original room with the consequence that the whole department, on average, started working with fewer

* Tied rank.

movements. There was, however, some reluctance to do so because "the new movements seemed so easy and some felt that if they adopted them they would not be working so hard as they ought to be".

The above evidence, together with the fact that the "jig" is reported to develop slowly after training, suggests that training may not be sufficiently intensive or consistent to preserve the methods taught after moving to the skilled belt, and/or that training on a separate belt, but in the same room, still fails to eliminate the possibility of imitation, the effects of which appear later. It seems probable that liability on the part of new wrappers to imitate traditional methods varies inversely with the intensity and consistency of their training. Another possibility is that new wrappers imitated particularly two much older ones with 20 and 21 years' experience of soap wrapping (Nos. 2 and 4 on the "jig" rank order) owing to a prestige factor. The mean years soap wrapping of the remaining wrappers at the present time is 4.9 years. A prestige factor may also be related to efficiency as well as experience. The works manager thought that in 1949 some were following the methods of these older wrappers and others were following the methods of a young wrapper who was the most efficient and without any "jig". When the latter left, the "jig" apparently spread to those who seemed to have been previously imitating her.

Posture.—Unlike most wrapping jobs, the arms are unsupported when the ends of the papers are folded round the soap and the backs of the seats are seldom used. This lack of support, together with the simultaneous and opposite reaching movements of the arms (one hand placing the soap on the belt and the other reaching for the next tablet), would probably induce some rhythmical sway.

Two wrappers spontaneously commented that the seats (which they can adjust themselves) were responsible for the swaying part of the "jig". In one case, movements were considerably reduced by "finding a better seat" and, in the other, it was thought that if the seat were nearer the desk the movements would disappear, but this was not done because the operative concerned had become adapted to the habit: "it just carries me along".

Speed of Work.—Evidence was gained from the interviews that the "jig" was related by the operatives to their efforts to pick up speed after training. This fact must be considered in connexion with the following brief history of the department since 1946.

Before 1946 payment was by straight piece work, except for trainees who had to earn more than a

fixed minimum before they could be paid on this basis. In 1946 the standard hour bonus system was introduced and the rate was made easier because the "jig" conveyed the impression that the operatives were overworked. The old basic rate was 1s. 5d. and 2d. an hour bonus was expected but since all operatives earned the 2d. (and no more), it seemed highly probable that there was some history of rate cutting. The new basic rate was 1s. 7d. plus 33.3% for a normal worker. There was apparently still suspicion that rates would be cut because, although output eventually increased, it was a long time before the 33.3% was earned. In 1949 the work was moved to a different building and the operations were altered. The banding, which had been part of the job up to this date, was taken off and the conveyor belt system installed. At about this time there was real pressure, owing to de-rationing of soap. Time studies throughout the factory had shown that any under-production was not due to slowness in the operations but to the time wasted between them. Because of this the works manager pointed out to each wrapper individually how much more she could easily earn (about £1 a week) if wasted time was cut out. This resulted in higher output and more consistent efficiency. But the management still think that the wide range of earnings and the fact that two or three wrappers are bunched together at the top of the range indicate that they are not fully extended, even though, owing to the easy rate, they are earning, on average, higher wages than any other operatives in the factory.

In spite of the evidence of restriction, which was apparently unconscious and not acknowledged or agreed upon, two of these events—efforts to achieve rapidly the minimum in straight piece work (for the operatives now employed who worked under this system) and the encouragement to earn more by cutting out wasted time—acted as incentives. Two of the nine admitting the "jig" attributed it directly to the pressure of straight piece work and five (including the two above) attributed it to their effects to pick up speed after training, but one of these (No. 2 on the "jig" ranking) considered the impression of increased speed with "jig" was illusory, "You think you are doing it more quickly by swaying . . . but the less you move, the more you get done". It is perhaps significant that Nos. 1 and 2 on the "jig" rank order, who both wished to be rid of it, were among the fastest, Nos. 1 and 3 on the efficiency rank order.

The positive correlation between "jig" and efficiency only means, of course, that, under present conditions, working with pronounced rhythmical

movements is relatively more efficient than working without them. It implies neither an absolute nor a causal relation between these variables. Farmer, however, cites some evidence to show that, if the idea of output comes to assume more importance than methods, the increased rate of working may result in movements which are too numerous or extensive. But under optimal conditions during training, such as total absence of the possibility of imitation and consistent attention to methods, the same evidence suggests that high efficiency could be reached without any superimposed rhythms.

Operatives.—It is hazardous to generalize from so few instances but it seems likely that there is some factor in the operatives which accounts for resistance to the "jig" under conditions which otherwise appear to induce it. The young operative, previously mentioned in the discussion of imitation, was, in the words of the works manager, "undoubtedly the fastest wrapper we have ever had" and "did not move a muscle other than her fingers". In 1949 she was deliberately placed opposite one of the high "jiggers" (No. 3 on the "jig" and employed 21 years as a wrapper) with the result that she remained immune to the "jig". The speed of the "jigging" wrapper, however, increased considerably, without lessening the extent of her "jig". At the present time there is only one really discrepant case, No. 4 on the efficiency rank order and No. 15 on the "jig", but she also recalled originally facing one with the "jig". Both these cases were apparently "jig resistant", in spite of the fact that they were fast workers and fully exposed to the possibility of imitating it.

It is possible that these individual differences in degree of motor control, and those which Farmer noted, are correlated with metabolic or psychological variables of wider generality.

Summary

The management of a perfume factory have been concerned for many years by the extensive rhythmical movements used by their 15 soap wrappers. These

movements, which became known as the "jig", range in different wrappers from relative immobility to a general response of the entire musculature, giving the impression of a high rate of spectacular activity. The movements are not conspicuous in any other group in the factory.

A field investigation was carried out to isolate some of the principal variables.

Significant positive correlations were obtained between degree of "jig" (as rated by three independent judges) and efficiency.

No significant correlations were obtained between degree of "jig" and age or duration of experience of soap wrapping.

No significant differences were obtained in days lost from (a) certified sickness and (b) all other causes, between soap wrappers and other operatives in the same department.

Evidence was adduced to suggest that the "jig" is related to (a) liability of newly trained operatives to imitate rhythmical movements in skilled ones, (b) posture, *i.e.*, the physical stance of the operative in relation to the work, (c) efforts to increase speed, whether self-induced or induced by others, and (d) a possible factor of resistance or susceptibility to "jigging" which may interact with the other variables.

An experimental investigation is needed to test these hypotheses, if and when further instances of the phenomenon are observed, and to establish what causal relations exist between the above variables.

Since this investigation was concluded, the works manager has reported that work is in progress on improved methods of soap wrapping.

I should like to thank the management of the firm, particularly the works manager and the operatives concerned, for their help and cooperation in this research.

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