Commentaries

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The "Hawthorne effect" — what did the original Hawthorne studies actually show?

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The "Hawthorne effect" is often mentioned as a possible explanation for positive results in intervention studies. It is used to cover many phenomena, not only unwitting confounding of variables under study by the study itself, but also behavioral change due to an awareness of being observed, active compliance with the supposed wishes of researchers because of special attention received, or positive response to the stimulus being introduced. At times, the term seems to be used as a social equivalent to "placebo effect". In social research, there is much critical literature indicating that, in general, the term "Hawthorne effect" should be avoided. Instead of referring to the ambiguous and disputable Hawthorne effect when evaluating intervention effectiveness, researchers should introduce specific psychological and social variables that may have affected the outcome under study but were not monitored during the project, along with the possible effect on the observed results.

Key terms context, evaluation, interpretation, intervention, paradigm, worklife.

When various types of intervention studies carried out in industry are evaluated, the "Hawthorne effect" is often mentioned as a possible explanation for the observed changes. The term is mostly used to refer to the behavior-modifying effects of being the subject of social investigation, regardless of the context of the investigation (1). In occupational health literature it is referred to as a nonspecific effect caused by participation in a study as such rather than by the specific intervention measures taken (2, 3). It is often compared with the "placebo effect", introduced by researchers in pharmacology. Very few authors disclose any knowledge of the studies from which the Hawthorne effect derives its name. Editors of distinguished journals in both clinical medicine and epidemiology cite misleading dictionaries when referring to it (4, 5). Even well-known handbooks on the principles of evaluation research attribute the Hawthorne effect to the results of an unpublished pilot study on illumination and compare it with the "placebo effect" (6).

This paper aims to clarify how far the general conception of the "Hawthorne effect" agrees with the results of the Hawthorne studies and how useful it is when results obtained in occupational health intervention are being evaluated.

The Hawthorne studies

Influenced by the "principles of scientific management", introduced by Frederick Taylor (7) in 1911, the Hawthorne studies were initiated in 1924 by the management of the Hawthorne plant of the Western Electric Company in Chicago, Illinois, in the United States. They started with an inquiry into the relationship between illumination and productivity, while the main studies, conducted between 1927 and 1933 in cooperation with the Massachusetts Institute of Technology (MIT) and Harvard University, were concerned with the effects of changes in rest pauses and workhours on productivity (8). The charismatic figure behind the scenes of the studies was Elton Mayo (1933), who encouraged management at the Hawthorne plant to develop further their inquiry into the factors affecting productivity. Inspired by the work of Durkheim, he espoused a conflict-free group consciousness that challenged the concept of class conflict.

In the initial phase of the studies, the effect of illumination on productivity was examined. This experiment was briefly described in the principal account of the Hawthorne studies (8). The illumination was decreased step by step for the experimental subjects, while the controls

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received constant illumination. Both sets of subjects slowly but steadily increased their performance of inspecting parts, assembling relays or winding coils. It was not until illumination in the experimental room was reduced to a level corresponding to moonlight that the experimental subjects started to complain that they could hardly see what they were doing and productivity finally started to decline (10). The experiment showed that lighting did not significantly affect productivity as long as it was kept at a reasonable level. Instead, it was evident that some other factor(s) was(were) much more important. This observation provided the impetus for the later studies.

The study was continued to evaluate the influence of other variables thought to be of importance for productivity. The further investigations were 1st directed towards physical factors causing fatigue and monotony and then continued by means of 4 extensive experiments (first relay assembly, second relay assembly, mica splitting and bank wiring). To allow for good control of the variables under study, namely, rest pauses and workhours, these experiments included only small groups of workers. After a long series of experiments in the "first relay assembly test", the investigators once more had to conclude that the changes in these variables did not explain the continuous increase in productivity observed during the test. Again some other variable(s), than those covered by the study, seemed to be responsible for most of the observed change. Roethlisberger & Dickson (8), who compiled the main report of the studies, suggested that the most important factor behind the continuous increase in output was the improved personal relations between workers and management. This conclusion was based on the annotations of the informally expressed opinions of the workers participating in the experiment, as well as on the general impressions of the investigators. This suggestion evolved into a "conclusion" and became the basis of the "human relations school" of management, which soon took over the leading role from the "scientific management school" in American industry.

Birth of the term "Hawthorne effect"

The original investigators concluded that the increase in output was partly caused by the experimental set-up as such and by the experimenters themselves. In the illumination experiments, some workers were defensive or suspicious and curbed their output, while others, overly anxious to cooperate, increased their output by "spurting". When planning the later tests, the investigators wished to achieve a relationship with the participants that would insure their working "at a natural pace" (8). As the investigators feared that the workers participating in the experiment might become uncooperative or resistant when taken from their regular work to work in a test room, the supervision was greatly modified. The considerable interest and special attention shown towards each of the workers participating in the experiment, as well as the special privileges allowed them, were probably of great significance for the observed increase in productivity. The reason for these changes was to provide for a controlled experiment in which only the factors explicitly intervened upon (ie, pauses and workhours) varied. However, at the end of the study, the investigators were forced to conclude that it may well have been these unintentional manipulations which caused the subjects to improve their overall productivity and thus gave birth to what is called the Hawthorne effect (10). The term was apparently introduced in 1953 by French (11), who stated: "From a methodological point of view, the most interesting finding was what one may call the Hawthorne effect — a marked increase in production related only to special social position and social treatment" [p 101].

Over the years, the Hawthorne studies have acquired the status of a creation myth in social psychology and in the subdisciplines of industrial and organizational psychology, management theory, industrial sociology, industrial psychiatry and the anthropology of work (12). In several articles, there have been speculations about whether the unidentified cause(s) of increased productivity could have been morale, attitude, supervision, teamwork, cohesiveness, informal organization, interpersonal relationships, social unity, awareness of being in an experiment, acquiring skill, or continuous feedback while working at piece-rate in a smaller group. With time, it has become increasingly common to attribute any unexpected result occurring in an experiment with human subjects to the Hawthorne effect (13).

Criticism of the Hawthorne studies

The Hawthorne studies were, in many respects, thoroughly and carefully conducted. However, they also had very important weaknesses. For the most part, the confusing results of the studies were due to the studies themselves. They contained so many uncontrolled variables that it became virtually impossible to identify any causal relationships. The human relations, which afterwards were considered to be of decisive importance, were not monitored from the beginning of the study.

The attempt to set the proper conditions for the experiment seems to have caused a change in human relations, which came to be of great significance in the next stage of the experiment (14). Roethlisberger (15) himself remarked, already in 1941: "If a human being is being experimented upon, he is likely to know it. Therefore, his attitudes toward the experiment and toward the experimenters become very important factors in determining his responses to the situation" [p 54]. Thus the experiment that the investigators thought they were conducting at the Hawthorne plant may have born little relation to the experiment which was actually performed,

because of the additional variables introduced through lack of experimental rigor. Indeed, it was probably the lack of experimental rigor which led to the various explanations given for the Hawthorne effect (16).

In the opinion of Kahn (17), the findings were probably primarily related to participation — not to the minor amusement of taking part in a brief experiment or the implausible response to mere managerial attention, but to playing an important part in decisions that really affected one's life. His opinion is based on records showing that the young women in the relay assembly test room increasingly took the opportunity to alter their work roles. It was a genuine transfer of power, to a significant degree and for no trivial period of time. From the beginning of the test there was a substantial reduction in supervision. In planning the studies, no definite arrangements for supervision had been made. The girls had previously been under the direct supervision of a group chief, who in turn reported to a section chief. In as much as the test room observer could assume responsibility for most of the day-to-day supervision, it was unnecessary to transfer the group chief to the test room. The test room observer was, however, mainly concerned with creating a friendly relationship that would insure the workers' cooperation (8). The workers were consulted, for example, as to the rest periods in the next steps of the test before final decisions were made on how to continue (17).

Kahn's view is in agreement with the findings of Greenwood et al (18), who, 50 years later, interviewed some of the employees participating in the first relay assembly test. The interviewers concluded that the main reason for working so hard in the test room had evidently been to avoid transfer back to the ordinary manufacturing department, where supervision was considered to be very harsh.

In a multiple regression analysis of the original results carried out by Franke & Kaul (19), managerial discipline, the economic adversity of the depression, and the time set aside for rest were found to explain most of the variation in quantity of output. Prior to the 8th period of the experiment, 2 of the 5 young women were replaced, the main reason being that they persisted in talking too much. One of the replacements turned out to be the new group's quickest, most ambitious and most responsible member. This replacement of 2 of the 5 experimental subjects in the middle of the relay assembly test may well have been of considerable importance for the continuous rise in productivity.

Another factor that probably affected the results was the economic depression, beginning in October 1929. The threat of losing one's job may partly explain the increase in productivity. Reduction of physical and mental fatigue during rest pauses probably also contributed to higher output rates for 4 of the 5 workers. In addition, the use of an incentive pay system based upon the output of the small group in the test room rather than the much bigger staff of the whole department may also have increased productivity to some degree. According to Franke & Kaul (19), however, the effects of incentives in the relay assembly room test seemed to be minor in comparison with those of supervision, fear of losing one's job, and rest pauses.

One factor that has not received the attention it deserves is the background of the study. In his autobiography *The Elusive Phenomena* (20), written after his retirement and published after his death, Roethlisberger reveals his deep disgust with Taylor's principles of management. "My two years at M.I.T. from 1920 to 1922 were a steady disillusionment from beginning to end. Course XV was really a course in 'scientific management' and 'Frederick Taylorism'. It had a profound effect upon me. The extension of technology into social space was repugnant. When I was to meet unscientific scientific management in the flesh later on, I was loaded for bear" [p 22]. In light of his autobiography, it is surprising that Roethlisberger made no reference whatsoever to Taylor or his principles of management in the report on the Hawthorne studies, which he wrote together with Dickson, even if it seems indisputable that he badly wanted to shoot down Taylor's ideas. He succeeded in this mission without ever referring to Taylor! The swift acceptance of the Hawthorne report was probably due to the fact that it provided an alternative "scientific basis" with which to rally around and applaud for the growing numbers who were critical of Taylor's mechanistic view of workers as human machines.

Was there really a Hawthorne effect?

It is difficult to base the concept of the Hawthorne effect on the preliminary studies of the effects of changes in illumination, as the results of these studies were never reported (13). Of the subsequent 4 studies it is only the relay assembly test room experiment that produced results which have been attributed to the Hawthorne effect.

The relay assembly test was designed to explore the optimal cycle of work and rest periods. The productivity of the experimental group increased with each new work schedule. When the workers were returned to the ordinary schedule of the plant, with full workdays and full workweeks, and without breaks or lunches, the productivity, surprisingly, did not drop back to the original level. Obviously the workers' behavior was influenced by some other variable(s) than those which the investigators had intentionally manipulated (21). Although the management instituted rest breaks similar to those tried out in the test room, no significant signs of increased productivity followed this measure in the manufacturing departments in question (22).

Several studies have been carried out to reproduce the Hawthorne effect. In industry, Rosen & Sales (23)

assessed productivity levels in a furniture manufacturing plant before, during, and after the entry of behavioral researchers. They found that the reactions to the researchers were dependent on the attitudes of the worker. Because their research was generally perceived as supportive of management, older employees, those not active in unions, and those with a rural background showed increased productivity, whereas the productivity of younger, union-active, and urban employees tended to decline during the research. This and other industrial studies have re-affirmed the importance of the meaning an employee attaches to changes in his or her work situation (21).

Referring to a reanalysis of the results of the Hawthorne study, Rossi & Freeman (6) doubted whether the data actually demonstrated any Hawthorne effect at all. They stressed that intervention does not consist only of the "treatment" administered, but also of everything else done to the target(s) as part of the process. Every aspect of the intervention delivery system can affect the outcome of the intervention, and to such an extent that monitoring the delivery of an intervention is almost always a necessary adjunct to impact assessment.

The original data have also been reexamined by Jones (14), who concluded that they show slender or no evidence of a Hawthorne effect. He concludes that the Hawthorne effect is largely a construction of subsequent interpreters of the Hawthorne experiments and stresses that a more fruitful line of inquiry would be to explore the social and historical context of the reception of the Hawthorne experiments. This reflection is in line with the conclusion drawn by Carey (24) already in 1967: "It still remains an open question how it was possible for conclusions so little supported by evidence to gain such an influential and respected place within scientific disciplines and to hold this place for so long" [p 403].

Evaluation of the results from intervention studies

In research on humans, the principles of natural science apply when the human being is studied from a biological point of view. In certain circumstances, it may be possible to study, for instance, the effects of illumination on productivity according to the principles of natural science, but it is definitely not possible to examine the effects of changes in work supervision in the same way. Today, it is generally accepted that all people reflect upon their situation and react to it when they consider this appropriate. There is no need to call this a special "effect". In some investigations, the people under study are actively enrolled in carrying out the study, while in others they are left to react as they wish. When an attempt is made to get people under study to participate actively in the realization of the study, the reason for the attempt may be "pragmatic", trying to make the study feasible or more efficient, or it may be "ideological", motivated by the intention to empower some community (25).

In any intervention study in worklife, there will be more factors affecting the results than those monitored by the researchers. When the results obtained are evaluated, it is important to comment also upon relevant unmonitored factors, as far as they have been identified during the course of the study. Each factor thought to be of importance should be specifically addressed and appropriately considered. If referring to the Hawthorne studies is thought to add light to the discussion, reference should be done on the basis of a knowledge of the studies and their results. Vaguely referring to "the Hawthorne effect" should be avoided, as it adds more to confusion than to clarity.

Concluding remarks

The "Hawthorne effect" is commonly referred to as an increase in productivity — or even some other outcome under study — caused by participation in the study as such. It is probable that participation in a study may increase productivity in certain contexts, for instance, those at the Hawthorne works in Chicago in the early 1930s. However, the available literature does not support the hypothesis that this same phenomenon necessarily happens in other contexts. Over the years several other interpretations of the results of the Hawthorne studies than those made by the original reporters have been presented. Accordingly, the observed increase in productivity may well have been brought about by one or more of the following list: (i) relief from harsh supervision, (ii) receiving positive attention, (iii) learning new ways of interaction, (iv) possibilities to influence work procedures, (v) rest pauses, (vi) higher income, or (vii) threat of losing one's job. All of these factors, as well as any combination of them, can be argued for as causes of the observed increase in productivity. The so-called Hawthorne effect has thus become more and more ambiguous over time. Therefore, it is questionable whether the term has a function any longer in the evaluation of results from intervention research in industry — not to mention results from clinical or epidemiologic research in general.

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