

Docimology Enters into Psychology: Dagmar Weinberg's Work in French Applied Psychology Laboratories

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Abstract

In 1938 the Russian-born psychologist Dagmar Weinberg observed that, in order to distinguish between “bad” and “good” workers, it was necessary to consider a biotypological description of their personality. With these words she defined her position in the context of mid-twentieth century psychology, when the applied psychological model of selection, centred upon the scientific study of aptitudes, was turning toward the study of personality. The current paper aims to reconstruct Weinberg's scientific career, which has hitherto not been investigated in depth. Attending both the Sorbonne laboratory and the École Pratique des Hautes Études, she was involved with two different research groups, those of Henri Piéron and Jean-Marie Lahy which dealt with docimology. However, her main interest was in mathematical statistics, which led her to developing new methods for selection, learning, and vocational guidance tests.

Keywords: Work psychology, Selection, Aptitude, Docimology, Biotypology, Personality.

1. The Background to Weinberg's Scientific Career

In 1963 the French psychologist Henri Piéron recalled the opening of the Institut National d'Orientation Professionnelle (INOP), which took place in 1928 in Paris. It aimed at “the development of vocational guidance [...] and of the use of psychotechnical methods to bring greater objectivity into the evaluation of aptitudes” (Piéron, 1963, p. 27). Piéron clearly referred to the contribution of a new discipline, docimology, which was first applied (Martin, 2002, p. 188) in the investigation carried out in June 1922 by Henri Laugier, Piéron, and the latter's wife on 117 twelve and thirteen year-old pupils (Piéron, Piéron, & Laugier, 1929).

This trend in psychology was also influenced by the work of Dagmar Weinberg, which has hitherto not been investigated in depth, although she had played one of the leading roles in the context of mid-twentieth century psychology, when the applied psychological model of selection, centred upon the scientific study of aptitudes, was turning toward the study of personality.

Weinberg was born on June (or July) 29th, 1897, in a Russian village whose name is still unknown. After spending the years from 1916 to 1920 in Moscow and Berlin studying, she moved to France where she took a degree in philosophy and a specialization in applied

psychology, working briefly with Jean-Marie Lahy, with whom she had a close relationship. They worked at the Laboratoire de Psychologie Expérimentale de l'École Pratique des Hautes Études, set up by Édouard Toulouse in 1898 in Villejuif and after the war “resuscitated” at the Asile Sainte Anne as a part of the Service départementale de prophylaxie mentale. Subsequently, Weinberg collaborated with Henri Piéron, who contributed to the setting up of a Psychological Institute which was created in 1920 at the Sorbonne University, under his leadership. The Institute trained applied psychologists in clinical, school, and work psychology (Zickar, Gibby, 2007, p. 88) and tended towards a physiological approach to aptitudes that was in line with the French *sensationist* philosophical tradition.

Among those she worked with there was Laugier, who from 1923 to 1932 was also head of the Laboratory of Physiology at the Hôpital Henri Rousselle (the Laboratory of Applied Psychology was directed by Lahy from 1923 to 1939). It was Laugier whom Weinberg lastly reached at the CNAM (Conservatoire National des Arts et Métiers), where he was appointed to a chair in 1929. After founding the Laboratoire de Biométrie at Viroflay in 1938, he appointed Weinberg Chef de travaux and Directeur-adjoint.

Toulouse, Lahy, Piéron, and Laugier shared a professional interest in the measurement of intelligence methods which went beyond those used by the Germans and Americans. Having trained as medics, the four preferred – as Schneider noted (Schneider, 1991, pp. 421-422) – a multifaceted view of individual abilities which could be revealed by tests of such faculties as memory, attention, and comprehension. The same guidelines were followed in the scientific study of work which became the fundamental basis of the French psychotechnics used by industries. This approach contrasted with the rational Tayloristic dictum that higher pay on an individualized basis should be the sole motivating factor of work. As for Toulouse, Lahy, and Laugier, they were much more interested in the worker's underlying physiology and psychology and, even though they shared the American belief in the importance of efficiency, they attached less importance to profit and keeping the worker/machine in top condition (Lahy, 1913, 1916; Schneider, 1989).

2. Between Docimology and Biotypology

In her first years at the Sorbonne, Weinberg was employed in compiling extensive bibliographies for the research laboratories and journals on account of her knowledge of various foreign languages (Polish, Russian, German, and English). However, her skills in mathematics and statistics led to her soon working in the fields of applied and school psychology, using biometrics. The biometric approach was not well-known to the French researchers, who were unable to apply statistics to a wide range of population.

The significance of Weinberg's work became apparent in the 1928 research undertaken with Laugier on the subjective factors emerging in the assessment methods for an important university selection process (Laugier, Weinberg, 1928). This was within the realm of *docimology*, which was established in France at the beginning of the 1920s by Piéron and Laugier in order to regulate exams and “human relationships” between examiner and examinee which had assumed arbitrary and “very different forms” because of the different degrees of the examiners' authority – as Binet had revealed in 1909 (Binet, 1909, pp. 23-25) – and to acquire the appropriate knowledge of the aptitudes and the propriety of corrections and judgments (Piéron, 1963, pp. 53-54). It was no coincidence that docimology aimed to replace the traditional tests with new versions that used statistical methods (on the basis of Gauss' law) rather than an arithmetical approach. As regards the meanings of “aptitude” and “test”, the former was defined by Claparède in 1922 as “what distinguishes, from the point of view of efficiency, individuals' psychological sphere” (Claparède, 1922, p. 73), and the latter by Piéron as a method which makes it possible to “characterize an individual from a determined point of view” and to “classify him in a group composed of individuals who can be compared

with him” (Piéron, 1929, p. 140). In this way, individuals were classified on an efficiency scale designed for each type of aptitude: the highest score was considered the most efficient (*ibid.*, p. 137).

Vocational guidance was one of the first applications of the new school syllabus (the Ordinance of 26th September 1922 placed vocational guidance in the remit of the Under secretariat of Technical Teaching). In fact, Fontègne defined vocational guidance as “psychology applied to vocations” (Fontègne, 1921, p. 58) serving to “direct individuals” – as Claparède had written – namely children, adolescents, adults, handicapped people, etc., “towards the jobs with the best prospects of positive outcomes, because it meets their psychological and physic aptitudes in the best way” (Claparède, 1922, p. 20). In the light of this new conception of vocational guidance, the format of competitions and exams evolved. It was in fact in this context that docimology was most widely used, as shown by Laugier and Piérons’ above-mentioned research (Piéron, Piéron, & Laugier, 1929).

As for Laugier’s and Weinberg’s 1928 work, it dealt with the comparison between the marks given to 166 tests by two very careful examiners of extensive professional experience who had corrected the tests independently of each other (Laugier, Weinberg, 1928). The data obtained from an accurate statistical analysis (Beaufils, 2002, pp. 42-44), which were reported again in more detail in 1930 (Laugier, Weinberg, 1930), showed a difference between the subjects: the second examiner seemed to be more indulgent than the first. Consequently, Laugier and Weinberg hypothesised a sort of “personal equation” (Laugier, Weinberg, 1928, p. 237) which led to them to affirm four points (*ibid.*, p. 229): divergences in student grading between different teachers, variability on the part of the same teacher, trust in the final mark given by a jury, teacher competence and erudition in correcting tests.

Because of the subjective coefficient, the authors concluded that “in the case of a selection process, the two examiners will not choose the same candidates; in our case, half of the candidates admitted by one examiner will not be admitted by the other, and *viceversa*” (*ibid.*, p. 243).

Also in 1928, Weinberg presented an essay – one of the few essays which she wrote alone – at the 5th International Conference of Applied Psychology in Utrecht. She discussed different individual responses to exertion. Underlining that the results provided by the psychological literature on this matter were rather discordant and moreover were obtained by the analysis of small samples, she defined the essential experimental conditions for collecting data more accurately. These conditions were: larger samples of subjects, constant exercise, and observation of the whole learning process (Weinberg, 1928, p. 298-299).

After these preliminary remarks Weinberg went on to describe the experimental tests (le *Test du tourneur*) she had carried out using a particular device invented by J.-M. Lahy (*ibid.*, p. 299) on the basis of a previous model: the *Zweihandprüfer*. It was created in the 1920s by the German psychotechnician Walther Moede in order to investigate coordination of hand movement in adolescents and adults and to study phenomena such as reasoning, attention, and sensitivity. Produced by the firm Éts. d’Applications Psychotechniques in Clamart, this trolley-shaped device included two hand-grips which, together with a sharp stiletto, were used by the subject to trace a design drawn on a metal plate. Any deviation in the tracing was counted as an error recorded by an error-marker. The test was timed.

Weinberg’s test consisted of five consecutive attempts carried out at 30-second intervals. It was conducted in 1927 and 1928 on 221 subjects aged 13-15 years. From these experiments there emerged a reduction in the differences between individuals, an inverse relation between the values obtained at the beginning and at the end of the experiments. This relation was evident in the subjects at the ends of the scale, i.e. the fastest ones made the least progress, whereas the slowest made most progress (Weinberg, 1928, pp. 300-301).

These attempts to make psychology more objective and *exact* by using statistics were in line with Toulouse, Laugier and Piéron's eugenic idea that human problems might be identified and corrected scientifically through medicine and biology. As Laugier, Toulouse, and Weinberg wrote in 1932: "We might say that if this research [biological investigations] progressed rapidly and if the conclusions corresponded to reality we could achieve a complete change in social architecture which is based on individuals' biology and ignores social prejudices" (Laugier, Toulouse, & Weinberg, 1932, p. 31).

This determinism integrated with a scientific conception of human beings backed up by a statistical approach. Individuals were *measured* according to their distinguished physical traits correlated with their intellectual and social aptitudes. The French researchers thus found themselves in the realm of biotypology, i.e. the study of organisms sharing the same hereditary characteristics. The term had been coined and first used in print in 1922 by the Italian endocrinologist Nicola Pende, who considered public health a priority. Following the Galtonian eugenic project and the dual line of thought of Cesare Lombroso's medical approach and Achille De Giovanni and Giacinto Viola's constitutionalist theory (De Giovanni, 1898), at the beginning of the 1920s he had attempted to classify human beings on the basis of their morpho-functional characteristics (Pende, 1922; 1924; 1939). His consequent reductionist view of the body/mind relationship allowed morphological and endocrinologic measurements. The Biotypologic Orthogenetic Institute, created in 1926 at the University of Genoa, was the direct expression of Pende's reflections on human typification according to characteristic illnesses and psychological make-up.

It was against this background in 1931 that Toulouse created a new organization with explicit eugenic goals, the Association d'Études Sexologiques (with Laugier as Vice President); its aim was to correct those problems of the human race emerging from the procreation of children which was the result of a "sentimental anarchy. [...] Syphilis, madness, and every type of morbid disposition are given free rein" (Toulouse, 1932, pp. 2-3).

Similar paths were followed by the Société de prophylaxie criminelle, the Société de sexologie, and the Société de biotypologie, three institutions founded in 1932 by Toulouse. The aim of the society, whose General Secretary was Laugier, was "the scientific study of human types through research into the correlations between the different morphological, physiological, psychological, pathological and psychiatric characters and the application of these data within the various branches of human activity: eugenics, pathology, psychiatry, pedagogy, guidance and professional selection, rational organization of work, and criminal prophylaxis" (Société de biotypologie, 1932, p. 40). Its main task was the development of a standard biotypological form to be used in recording information about subjects in order to have a common basis for broader comparisons among individuals.

Weinberg was called in to provide statistical legitimacy for the French biotypologists' research. The studies she conducted in 1932 and 1933 with Fischgold on the physiological aspects of biotypology did just this. They measured hearing acuity in 439 14- to 15-year-old pupils tested with the audiometer made by the Western Electric Company (Weinberg, Fischgold, 1932; 1933).

At the end of 1932 she coordinated Toulouse and Laugier's work on a form called a *fiche psychologique*. The *fiche* had another origin. Known as *Fiche psychologique d'orientation professionnelle*, this type of form was given in 1930 to 12- to 13-year-old pupils by Piéron and his wife Mathilde, who urged teachers to evaluate pupils not only on the basis of their marks but also of their professional aptitudes and psychological make-up (Piéron, Piéron, 1930). However, Huteau has recently commented that this *fiche* did not identify specific aptitudes and the profiles suitable for particular jobs (Huteau, 2002).

In 1932, during the International Congress of the New Education held in Nice, Toulouse, Laugier and Weinberg proposed a biotypological “book” of individuals. It would accompany children throughout their school years and adults throughout their professional lives. Thus the biotypological profile became a biological identity card which provided useful information concerning the individual’s professional, social, and family background.

As for the biotypological paradigm, they agreed with the idea that classification of individuals should be based on the study of the indexes of the different functions which ought to include an analytical method (Laugier, Toulouse, & Weinberg, 1934a). However, what did they mean by *biotypology*? The first topic dealt with the list of the variables which had to be considered in order to describe individuals, whereas the second concerned the organization of the numerical descriptors of the individuals who could be considered as types. There were two possibilities: *a.* typological analysis, in which types were defined by grouping individuals with similar profiles; *b.* factorial analysis. The *type* was a set of theoretical variables that summarized more observable variables.

Toulouse commented that biotypology was *the science of correlations* (Toulouse, 1937), although Huteau says that Toulouse was not capable of properly distinguishing the two analyses, which were used separately by Laugier and Weinberg (Huteau, 2002).

The findings of the first docimological investigations supported by such biotypology were published in two 1934 essays by Toulouse, Laugier, and Weinberg (Laugier, Toulouse, & Weinberg, 1934a; 1934b). Toulouse assumed the direction of the Centre de Biotypologie de la Seine at the beginning of the same year. This centre replaced the Centre de Psychiatrie et de Prophylaxie Mentale Henri Rousselle. The aim of those two works, which can be viewed as pioneering in the field of the statistics applied to school performance, was to determine the psychophysiological characteristics of the tested pupils. To this end, Laugier, Toulouse, and Weinberg classified a sample of 125 Parisian schoolchildren by submitting them to a biotypological exam. The data revealed that the most capable pupils tended to be younger and the least capable were older. Moreover, the pupils who were physically strongest proved least capable whereas those who were physically weaker had above average capabilities. Consequently, school performance appeared to be based on two criteria: age and psychophysiological constitution.

This kind of research led Laugier and Weinberg to consider sex differences. On this issue, at the end of 1920s they carried out a study on 4833 students at the Parisian Faculté des Sciences, in order to compare differences in science grades between male and female students. The results published in 1935 showed that the degree marks were on average the same for males and females, even though males obtained higher marks in subjects such as general physics, differential calculus, and rational mechanics (Laugier, Weinberg, 1935a).

As for the link school performances/vocational guidance furnished by docimology, the investigations conducted by Weinberg and her colleagues in the middle of the 1930s for the Institut National d’Orientation Professionnelle concerned the professional goals and ambitions of schoolchildren, mechanical apprentices, and delinquents.

Starting from these premises, the main theme of the 1934 work co-authored by Laugier and Weinberg (Laugier, Weinberg, 1934) was the measurement of fatigue in learning on the basis of both Kraepelin’s *fatigue curve* (Kraepelin, 1902) and Jost’s law (Jost, 1897). The latter was concerned with the repetitions of exercises interspersed with other activities. The question was: during the interval periods, did learning cause forms of regressive inhibition on the main task? 54 female 14-15 year-olds were submitted to two attention tests evaluating the aptitude to concentrate on monotonous tasks. The first of these was Toulouse-Piéron’s test *de barrage*, which presented 400 exemplars of 8 target figures. The second test consisted in identifying and marking letters (*a, e, m, b, o*) of a newspaper article. Positive results were achieved in

learning both the main task and the secondary one assigned to them during the intervals. The greater or lesser difficulty of the secondary task due to factors such as the different graphical form of the signs and letters, the more familiar form of the letters, and the different number of the elements to mark, had no influence on the proper execution of both tasks; the major factor in the mechanisms of alternation was, therefore “the change in the type of work” (Laugier, Weinberg, 1934, p. 466).

This conclusion highlighted the limitations of the investigations which considered fatigue to be the only element influencing performances. A further element was monotony, of which industrial work was a valid example. Laugier and Weinberg recalled the concept of the “satiation” effect of repetitive tasks (*ibid.*, p. 466.) introduced in 1928 by Kurt Lewin (Lewin, 1928). Lewin was actually assisted in this by his colleague Anitra Karsten (Karsten, 1928/1976, p. 152), who had shown how the various manifestations of psychic satiation (impatience, irritability, forgetfulness) disappeared when the same task was performed in a different context. Laugier and Weinberg added the variable of motivation in learning: the subjects showed more improvements in the performance of two alternate tasks than in the continuous execution of a single task (Laugier and Weinberg, 1934).

The following year, at the Société de Biotypologie, Laugier, Weinberg, and Grawitz (Grawitz, Laugier, Weinberg, 1935) presented research on the career ambitions of 99 subjects, 78 of whom were pupils (9-15 years old) attending a secondary school and 21 of whom were apprentice mechanics (13-16 years old) attending a technical school. They all were submitted to the Vocational Interest Blank Questionnaire in order to compare job preferences with preferences for various activities, such as play in school and at home, school subjects, etc. and with marks achieved. The emerging profiles showed that the best pupils expressed preferences for a range of different professions, unlike the weakest pupils, who expressed some aversion for most jobs (*ibid.*, p. 21).

In the same year Weinberg and Laugier designed a mobile laboratory (*camion-laboratoire*) for the Ministry of Justice to test 13- to 21-year-old delinquents at youth detention centres (Laugier, Weinberg, 1935b). The lorry was equipped with devices for psychophysiological exams, such as polygraphs, spirometers, hand dexterimeters, audiometers, assembly test boxes, etc. This last test was invented by Weinberg in research she herself carried out in 1934 on 109 subjects between 13 and 15 years old (Weinberg, 1934). The test was the French adaptation of the American *assembly tests*, originally a part of the Army tests, and then used by J. L. Stenquist. Designed to test manual ability, it was produced in France by the firm Éts. d'Applications Psychotechniques, and consisted in assembling ten objects (nameplate, gas-tap, monkey spanner, door handler, etc.).

Also of significance was the work conducted in 1936 by Laugier and Weinberg (Laugier, Weinberg, 1936a) at the Saint-Lazare Station in Paris, where in March 1933 the State Railways had opened a laboratory to study human work not only to select personnel, but above all to develop methods and techniques for the rational use of labour. In the new Biometrics Laboratory, which from 1936 was situated near the station of Viroflay, Weinberg and Laugier looked at how individuals' adaptation to different tasks could be evaluated, since certain important tasks required highly specific aptitudes. The solution was to compare the aptitudes required by the tasks with the candidates' aptitudes, i.e.: “if you know the man, you know what he can do” (*ibid.*, p. 258). Starting from the premise that the main task of the laboratory was to provide a differential classification of individuals, the methodology developed by Weinberg and Laugier consisted in a biotypological approach, i.e. the analysis of biological functions (respiratory, circulatory, and digestive system, head size, etc.), and of psychological functions (simple, compound, sensorial, and muscular reaction times, hand dexterity, memory, etc.).

Obviously, the findings of this research were submitted to a statistical procedure to obtain biometrical indexes. The detailed descriptions of the laboratory rooms (lighting, colouring of the walls, etc.) provide evidence of the rigorous atmosphere in which the tests were carried out.

The same methodological strictness can be found in 1936 in investigations into 53 syphilitic mothers' hereditary influence on their children, i.e. on the percentage of their survival, body conformation, and level of intelligence (Toulouse, Badonell, Kacenenbogen, & Weinberg, 1936), and into the grading of *baccalauréat* exams at a number of Parisian *lycées* (Laugier, Weinberg, 1936b).

In 1937 both authors, in collaboration with D. Kowarski, carried out research in the Institut de Soudure Autogène on the psycho-physiological selection of 165 welders according to the biotypological schedule where the subjective factor was again considered. In fact, in the light of that rational organization of production, individual aptitudes – i.e. all those psycho-physiological characteristics improving the chances of professional success – improvements in working conditions (effects of variations in temperature and pressure, of the exposure to the twilight, etc.), and workers' psycho-physiological states were linked with the quality and quantity of production (Laugier, Kowarski & Weinberg, 1937, p. 182). However, Laugier, Kowarski, and Weinberg observed that human factor in the empirical observations concerning working subjects was difficult to systemize because of the complex and changeable conditions of industrial practice.

It was in this same period that Weinberg's more systematic works appeared. The first of these was a volume which dealt with the structure of her methods in biometry and biotypology (Weinberg, 1937); it was followed by a paper on the application of biotypology to individuals and groups, which she read during a 1937 congress on population held in Paris (Weinberg, 1938a). The third essay published in the *Encyclopédie Française* (Weinberg, 1938b) was a detailed report of European research on professional work. It is from this report that her profound knowledge on this topic emerges clearly. The *fiche biotypologie*, co-authored by her and Laugier and "intended to provide a picture for the preliminary analysis of work. [...] the constitution of the «biotypological profiles of jobs»" (Laugier, Weinberg, 1938, p. 190) – such as the study on the work of shunters (Laugier, Weinberg, 1939) – concluded the series of theoretical elaborations on experimental procedures, a subject which continued to preoccupy her until her death in 1946. It is demonstrated by her essay on the method of factorial analysis, written with Danger and published also in 1946 (Weinberg, Danger, 1946).

In the meantime Weinberg had been promoted to the position of *chef de travaux*, thus becoming assistant director of Laugier.

Following her former interest in the relationship between family environments and mental development, in 1939 Weinberg – together with Laugier and Cassin – carried out a survey whose findings revealed how children's mental aptitudes differed according to the different social levels of families (Laugier, Weinberg, Cassin, 1939). On a similar theme she worked with Delaporte, investigating the relationship between individual characteristics and life conditions. It was a comparison of the biotypological profiles of 650 children aged 9-11 on the basis of their parents' standard of living: i.e. "the child's living conditions, the family income, meal frequency" (Delaporte, Weinberg, 1939, p. 164). Factorial analysis showed how children living in good environmental conditions developed higher mental aptitudes than children living in poorer social environments. Mental aptitudes and social background had a significant influence on children's performance at school, while physical abilities did not (*ibid.*, p. 185).

On 1st February 1947, Piéron published a *chronique* in the *Année psychologique*: "Long before her time, at the age of 49, Weinberg was taken away quite suddenly [she died of

pneumonia] on 15th November 1946, after health difficulties brought on by her clandestine life during the years of occupation” (Piéron, 1947, p. 831). In fact, like Laugier, himself a Jew, Weinberg suffered intense persecution during the war, but in spite of this she continued her statistical analyses, demonstrating that passion for work which R. Weismann-Netter, a member of the Société de Biotypologie and responsible for clinical tests in Weinberg’s research (Toulouse, Badonell, Kacenenelbogen, & Weinberg, 1936, p. 9), recalled in her obituary: “Those phrases [...] which appear to be mere stylistic flourishes – ‘complete dedication to one’s work’, ‘putting one’s heart and soul into the work’, ‘working oneself to death’ – are in fact quite appropriate to her” (Weismann-Netter, 1946, p. 117).

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