

Women in early 20th-century experimental psychology

Elizabeth Valentine profiles three women at the forefront of the development of the discipline

What role did women play in the early days of psychology in Britain? Did they conform to the female stereotype of 'caring' practitioners rather than to the male stereotype of unemotional scientists? Did they show a preference for 'soft' rather than 'hard topics'? This article discusses the work of three women – Beatrice Edgell, Victoria Hazlitt and May Smith – who, despite being in a tiny minority with the odds stacked against them, overcame barriers, pioneered methods and made original theoretical contributions to experimental psychology. In many cases their work anticipated later developments by several decades.

Women made a significant contribution to the development of experimental psychology in Britain in the early 20th century, at a time when social mores dictated that it was unnatural for women to pursue independent careers, which generally entailed forgoing marriage and a family. There were many barriers to obtaining qualifications and limited opportunities for employment; women faced discrimination, subordination and segregation. They were frequently barred from common-rooms and excluded from professional society dinners: properly bred women did not enter rooms where men were smoking.

Beatrice Edgell

Beatrice Edgell was born to a family who were able to offer her material and moral support when higher education was beginning to open up to women. She pursued her career with quiet determination, owing her success to courageous enterprise as well as diplomacy and discretion. Her sharp intellect was combined with charm and gaiety. The first British woman to obtain a doctorate in psychology, Edgell studied experimental psychology under



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Oswald Külpe in Würzburg. On her return she set up one of the first psychological laboratories in the country at Bedford College, London, and secured a part-time appointment at the University of London's Physiological Laboratory. Edgell's quest was to determine the extent to which the mind could be measured.

Her first, original, studies concerned time judgement (Edgell, 1903) and were designed to determine the duration of sound that can be most accurately estimated; and whether the point judged to be midway between two durations is closer to their arithmetic or their geometric mean. The latter question was relevant to the issue of whether judgements of duration were similar to judgements of quality and intensity, and to the theory of psychological measurement. Edgell was the first to apply this method of 'bisection' to the study of duration. The intervals most accurately estimated were between 1.5 and 3.3 seconds; shorter durations were overestimated and longer ones underestimated. This is in agreement with much later studies, though the interval most accurately reproduced (and perceived) has generally been found to

be shorter, about 550 milliseconds. The duration judged to be midway between two periods was closer to the arithmetic than the geometric mean, thus conflicting with Weber's law. The exponent of the power function underlying subjective duration calculated by Eisler (1976) is very close to the values obtained by Edgell.

Edgell undertook a gruelling year-long study of the calibration of the Wheatstone-Hipp chronoscope, with the physiologist William Legge Symes

questions

Is there any truth in the claim that women make better practitioners and men better scientists?

Why were there so few women in the early days of psychology and why are there so many now?

resources

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(Edgell & Symes, 1906). Mental chronometry was both scientifically and ideologically important: reaction times were used to make inferences about mental processes, and quantification was a hallmark of hard science, at a time when psychology was struggling to become established as a scientific discipline. The chronoscope was subject to multiple sources of error; electrical relays, dependent on batteries as a power source, could be unreliable, and different parameters governed times to make and break the current. Edgell and Symes exhaustively examined the sources and extent of errors, and advised on precautions to minimise them. They concluded that the instrument met Wundt's goal of accuracy to within one millisecond. Their paper was still being cited 30 years later and has received recent attention from a number of authors. The accuracy of mental chronometry was not improved on for another 50 years until the advent of tube-based cascade timers and transistors.

Edgell was also greatly interested in memory and carried out a number of paired associate learning experiments. An early report was presented to the Physiological Society (Edgell, 1905), despite the fact that women were not admitted as members until 1915. This study was later extended to over 1200 schoolchildren aged 8–12, divided into three age groups, and a small number of adults. Three conditions were compared: rote learning (the instructions being merely to attend to the stimuli, e.g. a pictured object and a number), generating a mnemonic and using a conceptual relation. Performance improved with age and was generally worst with rote learning. In the younger groups, girls outperformed boys, whereas the reverse was true for the oldest children. Mnemonics gave superior performance in the older groups. Applying statistical analysis to the data reveals that the superiority of mnemonics occurs earlier for girls than for boys. Recent work, generally employing much smaller samples than Edgell's, has found similar sex by age

interactions (e.g. Cox & Waters, 1986; Waters & Schreiber, 1991). Nevertheless, we still know relatively little about sex differences in memory development and in this sense, Edgell's work has barely been superseded.

Further work (Edgell, 1932) investigated immediate and delayed serial recall of pictures, demonstrating effects of position, confusion between semantically related items, coherence, and emotional salience. The results also anticipate Kay's (1955) later finding of a tendency to recall not only the original stimulus but also previously attempted recalls.

Victoria Hazlitt

Victoria Hazlitt, a student and subsequently a colleague of Edgell's, was an intense, ambitious young woman, whose feminine appearance belied her tough interior. She had a keen eye for the fundamental problems of psychology. Tragically, she burned to death in her mid-forties at the height of her powers, as a result of cleaning a silk dress with petrol. Following graduation, she spent a year at Colorado State University. On her return to Bedford College, she first turned her attention to animal learning, in particular transfer of training, and the question of whether previous experience facilitates (or hinders) subsequent learning (Hazlitt, 1919). Pairs of mazes were used, scrubbed at frequent intervals with Jeyes fluid, and the floor and walls were covered with clean grease-proof paper for each rat in order to minimise scent cues. Attempts were also made to control for sex, age, strain, time of day, and time of year. Learning curves (time and errors) demonstrated the superiority of practised over unpractised rats: the former ran faster and made fewer errors. The results anticipate much later work on learning sets, place vs. responses learning and the over-learning reversal effect. Hazlitt concluded that 'rats improve with practice in their ability to acquire motor habits, and...any hindrances to learning which may be offered by the survival of old habits are more than counterbalanced by the mastery which the practised rats gain over the general situation' (Hazlitt, 1919, p.311).

In the early 1920s Hazlitt undertook pioneering experiments in university

selection, reported in her book *Ability* (Hazlitt, 1926). The aim was to predict success in arts and science degrees. Members of the psychology department administered a battery of tests to first-year students for three years. Speed of verbal association and judgements of style predicted success in arts degrees. Drawing to directions, solving mazes, carrying out orally given directions, classification and generalisation, and grasping and expressing symbolic relations predicted success in science. Memory for different kinds of material failed to discriminate arts from science students; Hazlitt suggests that

memory is necessary but not sufficient for high intelligence. High general ability predicted excellence in arts or science, but the specialised tests were better at predicting examination performance, particularly in the case of science students. These results reinforced Hazlitt's belief in the importance of special abilities.

Her contrast between extraverts (individuals who are mainly interested in their fellows) and introverts (those who turn away from their fellows and interest themselves rather in the rest of science) foreshadows Hudson's (1966) work on convergers and divergers.

Hazlitt was critical of Piaget's views, and carried out a number of prescient investigations suggesting that children could grasp logical relationships at an early age. She presented a paper on children's thinking to the British Association in South Africa in Cape Town in July 1929 (Hazlitt, 1930). A contingent of 535 people travelled from Britain, in three ships. With further proceedings in Johannesburg, and tours to various parts of what is now Zimbabwe, delegates were away for a month or more.

In one of the experiments on 'exception', 88 children were presented with differently coloured Russian eggs taken apart, and instructed to put them all back 'except the green one'. The youngest child to succeed was 3 years 4 months old. Some children subsequently succeeded if the instruction was to put the eggs all back 'but not the green one'. Similar experiments were carried out using



effects of alcohol and some other drugs during normal and fatigued conditions. *Medical Research Council Report 56*. London. HMSO.

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different materials; in one case the children were asked to formulate a rule distinguishing one set of cards from another.

A second set of experiments was carried out on 'generalisation', the same object being paired with a different one on different trays. The children were asked a series of questions in order. Very few children under five answered correctly, although one aged 3 years 2 months did. Hazlitt claimed that recognition of sameness seems to come suddenly to children but not usually before the age of three and, contrary to Piaget, that recognition of sameness is possible for very young children. Experiments confirming Hazlitt's observations were not conducted for another 30 years.



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May Smith's pioneering research found that fatigue can result in an initial phase of enhanced performance which is followed by a long phase of reduced efficiency

May Smith

May Smith had no intention of becoming an industrial psychologist, a field to which she later made a major contribution. Originally trained as a teacher, she persuaded William McDougall to take her on as a student in his laboratory, while she was working in Oxford. Smith was outgoing and direct, with a practical, down-to-earth



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common sense. Her ability to relate to people of all kinds met in her work – prostitute prison-inmates, laundry workers or fellow BPS members – stood her in good stead as a psychologist.

A major piece of research undertaken was a heroic study of fatigue (Smith, 1916), induced by taking only 1½, 3½ and 5½ hours' sleep on three successive nights. Smith kept herself awake by reading, marking essays, knitting, and working out the results of experiments. The experiment was conducted on average five days a week for three years, apart from holidays. Smith was the sole participant, though the results were subsequently replicated on 'other girls'. The dependent variables were performance on a pursuit rotor (McDougall's 'dotting machine'), serial

word recall, the windmill illusion of reversible motion, speed of tapping and nonsense syllable learning. An initial phase of enhanced performance was followed by a long phase of reduced efficiency, from which recovery was slow. It was also accompanied by loss of effective appraisal of performance, 'extremely bad work being not infrequently accompanied by a conviction that it is unusually good' (Smith, 1916, p.349). Considering the implications for industrial psychology, Smith noted that the optimum time spent working depends on the nature of the work and the individual.

This work was extended to the effects of drugs (mainly alcohol and opium) (McDougall & Smith, 1920). Smith later became an investigator for the Industrial Fatigue/Health Research Board. Her study on nervous temperament (Culpin & Smith, 1930) was pioneering in design and conception. It established a correlation between clinical assessment by interview conducted by the psychotherapist Millais Culpin and performance on objective tests administered by Smith, at a time when clinical psychology was struggling to become recognised, and underlined the importance of psychoneurosis as a factor in industrial illness.

Conclusions

Women, despite their small numbers and the obstacles to professional advancement, played an important role in developing psychology in Britain in the early 20th century. Indeed, the involvement of women in psychology was

unusual in comparison with other sciences (e.g. physiology). For example, women were accepted in the British Psychological Society from its inception (but not into the Royal Society until 1948 or thereabouts). Various reasons have been put forward to account for this, such as psychology being a young subject, male dominance being not yet entrenched so women could gain a foothold, or simply that they were accepted to swell the numbers.

In terms of experimental psychology specifically, it is noteworthy that women often undertook heroic experiments and pioneered new methods. They were informed about European and American work but were not afraid to be theoretically independent. A wide range of topics were investigated, with no preference for 'soft' over 'hard' subjects. There is no evidence for the 'territorial segregation' i.e. separate spheres of operation for men and women, with women occupying 'caring' practitioner roles, and men 'understanding' scientist roles, that became prevalent later in the century, particularly in America, and which may account for the current predominance of women in psychology.



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