The Muscle-Readers, a Historical Sketch

Leverage Research

The recognition that non-verbal cues can have significant psychological impacts is far from new. Like much else in psychology, however, empirical investigations of the relevant phenomena have their origins in the 19th century. That shifts in attention, imagery, and even unconscious mental processes manifest themselves in automatic or involuntary movements was a fairly common belief among early psychologists and physiologists, including Herman Lotze, Henry Maudsley, and William James, as was the notion that these cues played significant and under-studied roles in interpersonal interactions. “We gather what is passing in one another's minds,” a classic article by C. S. Pierce and psychologist Joseph Jastrow concludes, “in large measure from sensations so faint that we are not fully aware of them, and can give no account of how we reach our conclusions from such matters...such faint sensations ought to be fully studied by the psychologist and assiduously cultivated by every man.”[1] What this cultivation might yield was far from certain, but at the time, many believed that attention to such cues would reveal a great deal about a person’s frame and direction of mind—information useful in education, therapeutics, and myriad other domains of applied psychology. Accordingly, the study and cultivation of nonverbal communication were taken up with some zeal.

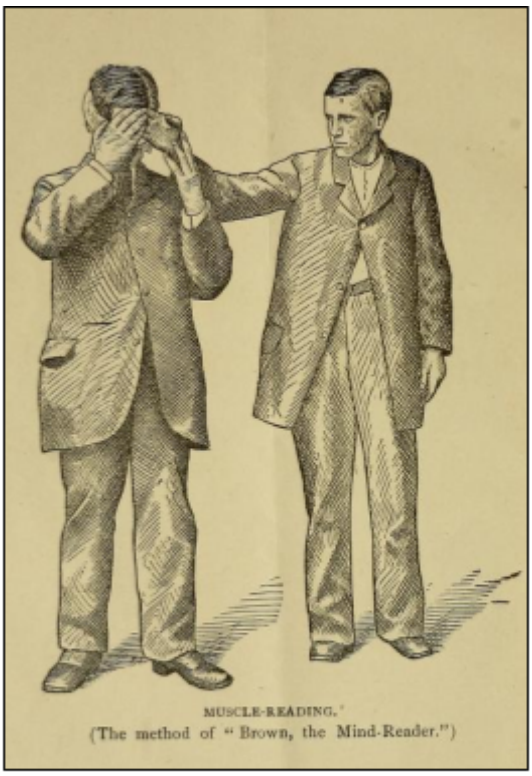

Figure 1. Muscle-reading technique using hand-to-forehead contact.[2]

Like many popular notions, the topic went by a variety of names. There was “Cumberlandism,” named for performer Stuart Cumberland, and “Hellstromism,” for Axel Hellstrom. The earliest and most common, however, was the more descriptive “muscle-reading,” a term coined by physician George Beard in an article debunking the famed contact mind-reader J. Randall Brown

[1] Charles S. Peirce and Joseph Jastrow, “On Small Differences of Sensation,” *Memoirs of the National Academy of Sciences* 3, (1884): 74–83, on page 83. The fuzzy borders of the mind were something of a theme for Peirce, who was fond of the example of horse riding in this regard. “In riding a horse,” he remarks elsewhere, “I understand him and he understands me; but how we understand one another I know hardly better than he” (Peirce, *The Collected Writings of Charles Sanders Peirce*, vol 7, §456).

[2] George M. Beard, *The Study of Trance, Muscle–Reading and Allied Nervous Phenomena in Europe and America*, (New York, 1882), plate 1.

(figure 1). At the time, performers like Brown were quite popular, claiming to read names and locate the smallest of hidden objects by tapping into the thoughts of volunteers. Much to Beard's chagrin, such assertions had gained credibility not only with members of the public but within the scientific community. Hoping to undermine these claims, Beard drew on the aforementioned ideas in physiology and began amassing evidence for a purely ideomotor explanation, working with amateur performers and acquaintances whom he'd asked to practice the proposed muscle-reading technique. His studies, first published in 1877, included a number of noteworthy results. For one, the performers all seemed to require physical contact to achieve above-chance performance. At the same time, his avowedly non-psychic subjects seemed capable of feats similar to Brown's. In one case, a judge named Blydenberg was reportedly able to select predetermined items from "a medley of keys, knives, trinkets, and miscellaneous small objects" by concentrating on "muscular thrill" in the hand of a knowing subject. In another, a participant was able to locate a hidden object "in nearly all cases" by attending to the subtle movements of volunteers holding either arm.

A few years later, a group of British scientists would arrive at a similar view when working with the mentalist Washington Irving Bishop, a one-time associate of Brown's who claimed not to know how he accomplished his readings. In a series of controlled experiments, Bishop showed himself quite adept at tasks involving direct contact. In a series of object-location tasks, for instance, the blindfolded performer was reportedly able to find a small object hidden under a drawing room rug, a pencil case stuck in a chandelier, and a matchbook hidden inside a shelved book, with some successes coming in under a minute. In another test, he was able to work out the specific body part held in mind by naturalist George Romanes (his right large toenail). He did not succeed with everyone or on every attempt, however, and most significantly, his abilities drastically declined when tactile communication channels were eliminated. While able to perform his act when in direct contact with an experimenter or connected by a rigid medium, such as a walking stick, he was unable to do so when connected by a loose strap. Likewise, when, at the mentalist's own request, they conducted a no-contact reading in which Bishop attempted to guess a letter of the alphabet viewed by one of the experimenters, his performance was at chance levels. The mentalist, as the group concluded in their 1881 report to *Nature*, was most likely relying on the unconscious cues of volunteers.

Both the American and British articles caused something of a stir, piquing the interest of those eager for a deflationary account of the popular thought-reading acts and challenging those who felt that more was at play. Within a few years, a slew of additional studies followed, each attempting to outline the limits of the technique. Researchers sympathetic to the telepathy claims pointed to results showing above-chance performance in the absence of physical contact and in cases where correct answers seemed to go beyond what one would expect to be communicated by "muscular thrill" alone—duplicating drawings, guessing cards, and so on. Proponents of unconscious signaling, meanwhile, pointed to additional channels of information, such as visible

shifts in posture and "involuntary whispering," now referred to as subvocalization or covert speech.[3] Naturally, the skeptics were on guard against fraud and poor statistical reasoning, as well. Indeed, the thought-reading controversy would become a site of several major developments in this arena. Discussions of thought-reading include some of the earliest applications of probability theory in experimental psychology and were top of mind when R. A. Fischer was working out his influential notion of statistical significance.[4] Studies in the area were also early sites of randomization, with the practice becoming common after Charles Minot's discovery that misleading success rates could result from the fact that freely chosen numbers and figures were not evenly distributed—that subjects were 35% likelier to choose a 3 than a 0, for instance, and that they were far more likely to draw a circle or square than, say, a pictograph.[5]

One noteworthy study employing such methods was a relatively late investigation by Berkeley psychologist George Stratton and collaborators.[6] To assess the limits of "muscle-reading" in circumstances of little to no contact, the psychologists worked with Eugen de Rubini, a performer known for accomplishing standard muscle-reading feats by looking at subjects or using only a slack watch chain for connection. To gain a rough quantitative measure of Rubini's abilities, the experimenters developed a simple binary choice task involving the placement of an object on the right or left hand side of a table and a similar 10 option task in which he was to pick out a specific book or matchbox. Trials were conducted in blocks of 10, with the location or book on which the experimenter was to focus being determined immediately beforehand by a privately cast lot. To investigate the mechanics underlying Rubini's performance, they tracked his performance under several distinct conditions. These included one in which the experimenter acting as "guide" was connected to Rubini by a slack watch chain and walked behind him as he decided which choice to make; one where the guide followed behind with no chain; and a third where there was no chain and special care was taken to control any visual cues present in the second condition (auditory controls were also experimented with but found to have little effect). In the binary task, Rubini chose correctly on 24 of the 30 watch-chain trials and 45 of the 70 trials with no chain but the possibility of peripheral visual cues (e.g., when the experimenter was slow to follow).[7] When blinders, screens, and other stringent visual controls were implemented, however, he fell to 14 in 30. For the 10 option test, the results were a bit more complicated. Rubini was correct on 12 of 20 watch-chain trials, 4 of 20 with no chain, and 5 of 30 with

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[3] Hansenand and Lehmann,"Ueber unwillkürliches Flüstern: Eine kritischen und experimentelle Untersuchung der sogennanten Gedanken-Ubertragung," *Philosophische Studien* 11, (1895): 471–530

[4] Ian Hacking, "Telepathy: Origins of Randomization in Experimental Design," *Isis* 79, no. 3 (1988): 427–51.

[5] Charles Minot, "The Number Habit," *Proceedings of the American Society for Psychical Research* 1, no. 2 (1886): 86–95; Charles Minot, "Second Report on Experimental Psychology: Upon the Diagram Tests," *Proceedings of the American Society for Psychical Research* 1, no. 4 (1889): 302–17.

[6] George M. Stratton, "The Control of Another Person by Obscure Signs.," *Psychological Review* 28, no. 4 (1921): 301-14.

[7] The studies were conducted before the widespread adoption of statistical testing and the trial blocks were not identical (e.g., some featured auditory controls, some not), but for those who are curious, the probability of matching or beating the combined sight and watch chain results by chance is 0.000183 (uncorrected).

additional cue controls of varying stringency (including a suggestive but non-dispositive run of 0 in 10 when visual and auditory cures were both stringently controlled).[8]

The area was also at the cutting edge of psychological measurement, with the interest in unconscious cues spurring developments in head and eye tracking, as well as bodily indices of emotion.[9] A particularly noteworthy example may be found in the "automatograph," a machine used to record involuntary hand movements.[10] Introduced by Joseph Jastrow in 1892, the device consisted of a plate positioned atop ball-bearings and attached via rigid rod to a hidden etching device (figure 2). Provided subjects kept their hand on the plate for the duration of a task, the machine would produce a detailed record of their movements. Often, Jastrow asserted, these etchings could be used to discern noteworthy information about the train of thought. Attention paid to objects at different locations generally produced drifts in the direction of the item, and counting the tics of a metronome yielded countable oscillations. In some cases, concentrating on visual forms, such as the letter "O" was said to produce corresponding movements (e.g., loops). One study, conducted by one Milo Tucker, even reported full-word

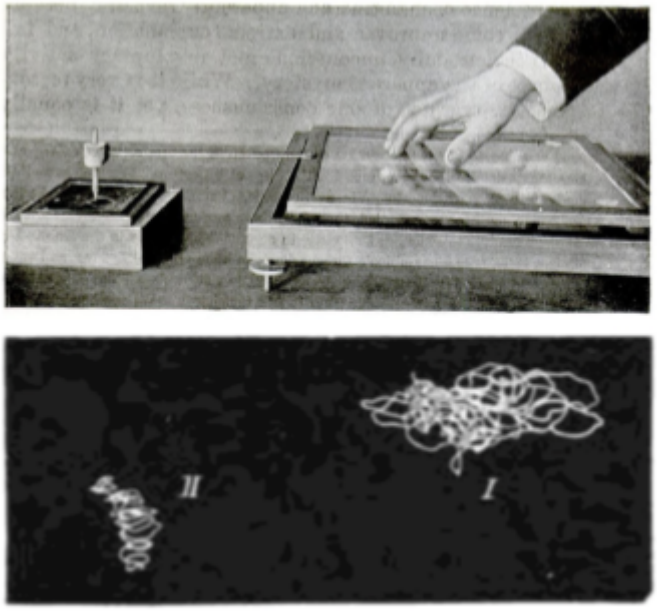

Figure 2. Top: automagraph designed by Jastrow. During the experiment, the etching device would be hidden from the subject. Bottom: etchings made while subjects were thinking of the letter "O." [11]

[8] The probability of obtaining the 12 in 20 result or better is approximately 5.4226e−8. A more appropriate analysis of the 10 option choice task, however, would be one that accounts for closeness of the guess (e.g., guessing 8 when the thought-of position was 9). Pooling all the trials without stringent visual controls as in the analysis above and running the data through a no-intercept ordinary least squares regression yields an r-squared of 0.871 with p=6.54e-19 (calculated with statsmodels; Skipper Seabold and Josef Perktold, "Statsmodels: Econometric and Statistical Modeling with Python," *Proceedings of the 9th Python in Science Conference* 57, (2010): 92–96).

[9] See, e.g., Hugo Münsterberg and W. W. Campbell, "Studies from the Harvard Psychological Laboratory (II).," *Psychological Review* 1, no. 5 (1894): 441–495; Oskar Pfungst, *Clever Hans (the Horse of Mr. Von Osten): A Contribution to Experimental Animal and Human Psychology*, trans. by Carl Rahn (Holt, Rinehart and Winston, 1911), ch. 4; William T. Preyer, *Die Erklärung des Gedankenlesens: nebst Beschreibung eines neuen Verfahrens zum Nachweise unwillkürlicher Bewegungen* (Grieben, 1886), chapter 2.

[10] Joseph Jastrow, "Involuntary Movements," *Popular Science Monthly* 40 (1892): 743–750.

[11] Jastrow, "Involuntary Movements," figure 1; Joseph Jastrow, "Further Study of Involuntary Movements," *Popular Science Monthly* 41 (1892): 637–643, figure 14.

tracing similar to the automatic writing seen in hypnosis and some forms of brain damage, though the neatness and singularity of the result raise suspicions.[12]

Another, less popular approach saw experimenters develop the muscle-reading skill themselves. Rather than rely on performers who might have reason to misrepresent their experience or lack the introspective training prized by psychologists at the time, a few psychologists began practicing and reporting on the method. These included well-known figures like Oskar Pfungst (see below) as well as less famous figures like Thomas Verner Moore, who claimed that close attention to a subject's face allowed him to guess the suit of a thought-of cards at a rate "that would not have occurred by chance more than once in a thousand times."[13] Perhaps the most successful adopter of this strategy was University of Wyoming professor June Downey. After several years of practice, Downey reported that she could duplicate even the most striking acts of the era's stage performers, including the guessing of dates imagined by a subject, the reconstruction of multisyllabic words held in mind, and "finding a book and identifying therein a word chosen at random."[14] Like most muscle-readers, she argued that such results undermined the bulk of evidence cited in favor of telepathy. Unlike most of her predecessors, however, her primary interest in the method was not its potential use as a debunking tool but its potential as a psychometric measure. In particular, her explorations in the area led her to suspect that muscle-reading might find applications in the assessment of personality and what would today be termed cognitive style.[15] Her efforts in this direction would not, in the end, prove successful. Nevertheless, her studies do provide a good sense of muscle-reading under naturalistic (if less tightly controlled) conditions, useful figures on individual variation, and a number of curious observations.

In general, Downey's studies suggested that muscle-reading was something to which most individuals—as many as 56 of 60 according to a 1909 investigation—were susceptible and that all but a few reported that they were not conscious of any movements on their part.[16] Rates of success were comparable between women and men (though the majority of her sample came from the former group) and relatively close when comparing subjects who visualized an object's location to those who rehearsed a verbal description of the locale.[17] Some differences were observed between credulous and incredulous subjects as well as between those participating with eyes closed vs. those with eyes open, though the limited scale of the studies and the number of comparisons made with the same underlying data render these merely suggestive. In general,

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[12] Milo Asem Tucker, "Comparative Observations on the Involuntary Movements of Adults and Children," *The American Journal of Psychology* 8, no. 3 (1897): 394–404. Precautions were usually taken to conceal the recording device from subjects, but given that they had to keep their hands on a plate during the exercise, the possibility that they discovered and responded to the experimenters' hypotheses must be taken into account.
[13] Thomas Moore, *Dynamic Psychology*, 330. Sadly, Moore does not specify the relevant design.
[14] June E. Downey, "Muscle-Reading: A Method of Investigating Involuntary Movements and Mental Types.," *Psychological Review* 16, no. 4 (1909): 257–301, on p. 267.
[15] June Downey, *The Will-Temperment and its Testing*, 55.
[16] Downey, "Muscle-Reading," 269.
[17] Downey, "Muscle-Reading," 269, 278–79, 294–95.

though, the most interesting findings were not those arising from group comparisons but those concerning "peculiar automatic tendencies" that emerged over the course of investigation.[18] One of the more unexpected phenomena was something labeled "recapitulation." On some 22.6% of trials in a 1908 study, the reader did not go directly to the hidden object but, as path tracings made by observers indicated, followed the path that the guide had taken when hiding it.[19] If a guide had hesitated at a specific location, for instance, or deposited the object only after a circuitous route, the reader would do the same. When asked if they had kept their prior trajectory in mind during the reading, however, subjects insisted that they had not. Another curious observation was that objects could be located even as the guide's attention was absorbed by a distractor task, such as the rehearsal of random names or counting aloud.[20] These and a few other observations led Downey to suggest, somewhat tentatively, that muscle-reading might allow one to access unattended as well as occurrent cognitive content, though the lead was never followed up on.

Of all those participating in the muscle- and thought-reading literature, however, the most famous was not a psychologist but a farm animal. Overlapping with and to some extent drawing from the popularity of mentalism, the late 19th and early 20th centuries witnessed a significant growth of interest in "wonder animals," non-human animals said to be capable of substantial intellectual feats or, in many cases, telepathy. Today, the best remembered is doubtlessly der Kluge Hans, a horse whose trainer, Wilhelm von Osten, claimed could read, identify calendar dates, and perform calculations up to and including cube roots.[21] A 1904 commission determined that fraud was not involved in the performances but recommended further study to determine the exact means by which Hans solved the problems, with member Carl Stumpf telling the press that he believed the horse was using sensory cues unintentionally produced by his trainers.[22] This lead was soon followed up by Stumpf's student, Oskar Pfungst, who released the results of his own studies in 1907. According to Pfungst, Hans' abilities ultimately depended on what his questioner did or did not know. In reading, calculation, and similar tasks, Hans showed near-perfect performance when the questioner happened to know the answer. When such knowledge was absent, however, his performance dropped to chance levels. A similar pattern emerged when the horse was made to wear large blinders, blocking his vision of the questioner, suggesting, Pfungst argued, that visual cues played an important role in his success.[23]

To bolster this interpretation, Pfungst then conducted a series of tests placing the experimenter himself in the role of Hans. Subjects were asked to think of a number (calculation, leter, etc.), and Pfungst attempted to discern the answer by attending visually to bodily cues. In most cases,

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[18] Downey, "Muscle-Reading," 295.
[19] June Downey, "Automatic Phenomena of Muscle-Reading," *The Journal of Philosophy, Psychology and Scientific Methods* 5, no. 24 (1908): 650–58.
[20] Downey, "Muscle-Reading," 279, 296. Other phenomena included
[21] See Pfungst, *Clever Hans*, ch. 1.
[22] Pfungst, *Clever Hans*, Supplement II; Pfungst, *Clever Hans*, 5.
[23] Pfungst, *Clever Hans*, 42–47.

he found that he could guess correctly, and with "more suitable subjects," Pfungst claimed the ability to determine not only the correct answer but incidental features, such as whether a subject imagined a letter in script or print form or the order of addends in an arithmetic problem (e.g., whether they thought of 3+2=5 or 2+3=5).[24] Lest any doubt persist, he then went about measuring these movements and subjects' breathing rates during the tasks, finding notable answer-revealing shifts as Pfungst, like Hans, tapped his answer. The case, Pfungst concluded, was remarkable not because of what it revealed about the horse's intellect but because of how strikingly it illustrated the ties between thought—emotionally tinted thought in particular—and action.

The years that followed Pfungst's analysis represent something of a high water mark for ideomotor phenomena in psychology. The case of Clever Hans was among the most famous results of psychology to date, with Pfungst's argument for the role of unconscious cues serving as a reminder of (or advertisement for) their greater relevance for the discipline. Theories of the phenomena were debated in the pages of leading journals and incorporated into pedagogical practices, encouraging the use of motor imagery and active learning on the assumption that motor and ideational influences were bidirectional. Practitioners like Downey hoped that muscle-reading might be used in psychometric testing, and criminologists looked to it as a way of extracting useful information. The Harvard psychologist Hugo Münsterberg went so far as to suggest that automatographs be used to identify perpetrators from a lineup when witnesses were unwilling or unable to comply.[25] As time went on, however, interest in the phenomenon proved difficult to sustain. Discussions continued for another two decades, buoyed by the occasional telepathy claim and a sustained interest in measurement technologies like Jastrow's, but by the 1930s, there was no muscle-reading literature to speak of.

Looking back, there are a number of reasons for this. Some issues were internal to the program itself. For one, they were difficult to scale. Muscle-reading proper was limited to interactions between two or at most a handful of people and generally required a significant investment in the would-be reader. As Downey's investigations made clear, moreover, it was not fully reliable. Some individuals simply could not be "read," and even with the majority who could, the time it took Downey to locate a hidden object ranged anywhere from 4.6 to 245 seconds, depending on the subject and how they thought of the item (e.g., verbally or imagistically).[26] There was variability in the skill of readers, as well, with little way of telling *a priori* who would be able to acquire the skill. Even among practiced readers and reasonably expressive individuals, outcomes depended on temperament. Some subjects seemed to work better with some readers. As time went on, then, psychologists increasingly abandoned the hope that muscle-reading would find its way into education, personnel management, and other areas requiring mass deployment and a

[24] Pfungst, *Clever Hans*, 104–105.
[25] Hugo Münsterberg, *On the Witness Stand: Essays on Psychology and Crime* (Doubleday, 1908), 124–25.
[26] Downey, "Muscle-Reading," 288.

degree of standardization.[27] Finally, success depended to some extent on the cooperation of those involved. As was noted early on, a wary subject could misdirect or in some cases block the relevant cues by concerted effort, and while this mattered little for the kinds of studies cited above, it proved a lingering issue for suggested legal applications.[28] (Unfortunately, awareness of this concern was not enough to prevent adoption of the ill-fated polygraph, a descendent of Jastrow's automatograph).[29]

At an earlier time in psychology's history, the absence of such scalable applications may have been less of an issue. The early 20th century was one of increasing professionalization for the field, however, particularly in the United States. Many of the first psychology departments in the English-speaking world were formed at land-grant colleges, institutions founded with practical ends such as agriculture and basic education in mind. To secure funding, then, psychologists leaned heavily on their discipline's contributions to pedagogy and organizational management. With the onset of World War I, moreover, the field saw a strong push for standardization of the kind seen in army personnel testing. The highly individualized practice thus found itself in a field where uniformity and mass deployment were at a premium. Ideologically, the period also saw the development of behaviorism and a widening distrust of methods requiring individual skill or too much of an interpretive element. While Jastrow's recording technologies continued to hold interest, then, methods requiring active involvement and/or introspective reports on the part of the experimenter fell from favor in many parts of the discipline. To some extent, the very notions of unconscious cueing and ideomotor phenomena (understood as idea-mediated actions) became suspect. As early as 1917, one sees researchers complaining that consciousness was "rapidly losing its standing as a respectable member of the psychologist's vocabulary," and with the rise of stimulus-response vocabulary, the notion of "ideas" came to be seen as dispensable or outmoded.[30] The prominent psychologist Edward Thorndike went so far as to compare ideomotor action, with its reliance on ideas bringing about corresponding movements in the body, to imitative magic, the belief that desired events may be elicited through ritualized mimicry (e.g., injuring one's enemy by effacing a wax figure of them).[31]

Timing was also poor in that spiritualism, the perennial foil for muscle-readers, was on the decline. Though academic and popular interest in the paranormal would experience a few resurgances later in the century, the topics never reached the heights seen in the Victorian era, when seances were a regular feature of bourgeois society and psychical research a common

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[27] June Downey, *The Will-Temperament and Its Testing* (World Book, 1923), 55.
[28] That Münsterberg's suggestion of using automatographs on witnesses would fall prey to dissimulation requires little comment, but even less extravagant uses of unconscious movements were recognized as problematic by some observers (e.g., William Sullivan, *Crime and Insanity* (Physicians and Surgeons Book Company, 1925), 157).
[29] As the National Research Council concluded in its 2003 review of the technology, polygraph results appear to work well in laboratory studies of individuals not employing countermeasures but face profound problems when used in the field with subjects potentially capable of willfully shifting the results, see National Research Council, *The Polygraph and Lie Detection* (National Academies Press, 2003), executive summary.
[30] H. W. Chase, "Consciousness and the Unconscious," *Psychological Bulletin* 14, no. 1 (1917): 7–11, on p. 7.
[31] Edward L. Thorndike, "Ideo-Motor Action," *Psychological Review* 20, no. 2 (1913): 91–106.

feature in major scientific publications. This left a good deal of unconscious cueing research lost at sea. The old program had been so strongly tethered to the bugbear of spirit mediumship that, when the latter began to decline, it lost much of its relevance. At a certain remove, the fact that ideomotor phenomena were so associated with Ouija boards and mind-readers even worked against them. When spiritualism was at its peak, many saw engaging with it as a responsibility. With increasing marginalization, however, any interactions—even hostile ones—could be seen as keeping the issue alive. At best, traditional muscle-reading work would risk fighting yesteryear's battles. By the 1930s, researchers had largely abandoned the topic, discussing ideomotor phenomena in a far more circumscribed manner or simply eschewing it in favor of more respectable pursuits. The old muscle-reading results would be dusted off when new reports of telepathy began to gain traction, but the area saw exceedingly little direct study in the coming decades.[32] Only with the growth of cognitive neuroscience and renewed interest in implicit and unconscious psychological processes in the past few decades have theories of ideomotor action and related phenomena gained significant attention.[33]

Today, psychology is arguably the most hospitable it has been in over a century to the study of subtle nonverbal cues. Though the specific methods and theoretical constructs remain hotly contested, a host of implicit measures—means of assessing mental processes or attributes that do not rely on self-report—have become popular in social and cognitive psychology.[34] An active literature has also emerged on brain-to-brain coupling, or the synchronization of neural activity between individuals during social interactions (nonverbal interactions included).[35] Despite substantial growth in interest, however, there has been little study of the sort of high-precision "reading" exemplified by Downey, Pfungst, and the various stage magicians discussed earlier. At

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[32] One may make exceptions for Greenwald's influential studies of ideomotor conflict in the 1970s.

[33] For recent work, see Bernhard Hommel et al., "The Theory of Event Coding (TEC): A Framework for Perception and Action Planning," *Behavioral and Brain Sciences* 24, no. 5 (2001): 849–78; Yun Kyoung Shin, Robert W. Proctor, and E. John Capaldi, "A Review of Contemporary Ideomotor Theory," *Psychological Bulletin* 136, no. 6 (2010): 943. A particularly significant role was played by ideomotor theory in opposition to facilitated communication, a now discredited practice in which a facilitator helps individuals with autism and other communication-impacting conditions to type or point as a way of indicating their preferences, answering questions, and so on. Numerous studies using methods analogous to those employed by Pfungst have found that responses generated by the technique are heavily influenced by unrecognized ideomotor actions on the part of facilitators (see Wegner, Fuller, and Sparrow, "Clever Hands: Uncontrolled Intelligence in Facilitated Communication," *Journal of Personality and Social Psychology* 85, no. 1 (2003): 5–19.

[34] It should be noted that "implicit" has often been taken to refer to the processes and attributes being measured, as well, implying some degree of automaticity and/or unawareness on the part of the subject. For some recent reviews, see Bertram Gawronski et al., "Twenty-Five Years of Research Using Implicit Measures," *Social Cognition* 38 (2020): S1–S25; Anthony Greenwald and Mahzarin Banaji, "The Implicit Revolution: Reconceiving the Relation Between Conscious and Unconscious," *American Psychologist* 72, no. 9 (2017): 861–871.

[35] In one widely-cited study, Pavel Goldstein et al. ("Brain-to-Brain Coupling During Handholding is Associated with Pain Reduction," *Proceedings of the National Academy of Sciences* 115, no. 11 (2018): E2528–E2537) found that holding a partner's hand during painful stimuli was associated with synchronization across a wide swath of brain regions, increases in the accuracy of pain assessments by partners not receiving the stimulus, and lower reported pain from those receiving the stimulus. For a more general review, see Elizabeth Redcay and Leonhard Schilbach, "Using Second-Person Neuroscience to Elucidate the Mechanisms of Social Interaction," *Nature Reviews Neuroscience* 20 (2019): 495–505.

one level, this is understandable. The demands of such investigations in terms of time and effort are substantial, and even under ideal circumstances, results clearly varied from reader to reader and subject to subject. At the same time, most of the evidence comes from an era when reporting and record-keeping were not what they are today. The most striking claims—guessing equations, multisyllabic words, and so forth—are ultimately anecdotal. Still, we should not be too quick to dismiss the testimony of so many independent, trained psychologists. The early researchers' methods differed from those in use today, but most studies were subject to at least some degree of experimental control. While the most striking reports are anecdotal, moreover, the literature also contains detailed and systematic investigations, such as Pfungst's and Stratton's. These may not and should not convince us of all the claims made in these early years, but at the very least, the reports suggest that a tightly controlled investigation of the kind possible today is in line.