



Zeigarnik and von Restorff: The memory effects and the stories behind them

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Abstract

Two of the best known eponymous phenomena in memory research were carried out as dissertations in the same era at the same university, each supervised by an influential researcher working within the Gestalt framework. Both examined the influence of unexpected events on memory. Bluma Zeigarnik (*Psychologische Forschung*, 9, 1–85, 1927) first reported that memory is better for interrupted tasks than for completed tasks, a phenomenon long known as the *Zeigarnik effect*. Hedwig von Restorff (*Psychologische Forschung*, 18, 299–342, 1933) first reported that memory is better for isolated than for non-isolated pieces of information, a phenomenon long known as the *von Restorff effect*. In this article, I present: (1) a biographical sketch of the researcher behind each phenomenon, (2) a description of their dissertation research, and (3) an evaluation of the current status of each phenomenon.

Keywords Memory · Recall · Recognition

Introduction

In psychology, as in many sciences, numerous phenomena are named after the researcher(s) who first explored them. Sometimes they are given the most general labels (e.g., the Yerkes-Dodson Law – Yerkes & Dodson, 1908), sometimes their labels are more specific (e.g., the Müller-Lyer illusion – Müller-Lyer, 1889), but most often they are simply known as “effects” (e.g., the Stroop effect – Stroop, 1935). In the domain of memory, few longstanding phenomena are named for individuals, but surely two of the best known are the Zeigarnik effect and the von Restorff effect. The Zeigarnik (1927) effect refers to the observation of better memory for interrupted and hence incomplete tasks than for completed tasks; the von Restorff (1933) effect refers to the observation of superior memory for isolated information over non-isolated information.

Who were Zeigarnik and von Restorff? How did they come to study their eponymous phenomena? What did they actually do? How have their findings held up over time? The purpose of this article is to answer these questions. In considering each researcher and her famous phenomenon, I will begin with a biographical sketch, then outline the motivation behind the research, and then describe what was, in fact, actually done. I will conclude with a summary of the status of the phenomenon since the original work.

As it turns out, their stories are linked in multiple ways and together provide a compelling portrait of a time and place in the history of psychological science. Both were women in research at a time when men dominated the field. They did their work in the same research institute just a few years apart. Their famous findings come from their dissertations, published in the same journal. Both dissertations examined the influence of unexpected events on memory. Both were supervised by influential scientists and for each the driving force behind their dissertation was their supervisor’s “field theory,” deriving from Gestalt psychology. Neither ever pursued the phenomenon that her dissertation made famous. And for both, their work was carried out during one of the most dramatic periods in history – in the shadow

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of Hitler's rise to power in Germany, which would greatly influence the course of their lives.

Bluma Vulfovna Zeigarnik¹

Zhenya-Bluma Gerstein was born on 9 November 1901 in Prienai, a small town in southern Lithuania. She was the only child of Volf and Ronya Gerstein, educated Jews who owned a store in Prienai. Because Russian was the official state language, Bluma's education was in Russian, but her parents spoke Yiddish at home so she learned that language as well. Sometime in her youth, the family moved to Minsk, capital city of Belarus.

In 1916, Bluma enrolled at a girls' school in Minsk – in the fifth grade, having skipped the first four. Instruction was in Russian, but she also studied French, German, and Latin. Of her time enrolled at that school, 4 years were actually spent at home due to a life-threatening case of meningitis. When the worst of her illness had passed, she worked with private tutors. In 1918, she graduated from the seventh grade with a gold medal. She wanted to continue her education, but universities required the higher-level qualifications of boys' schools for admission. Bluma decided to take the boys' school final exams and obtained high scores, resulting in her becoming one of the first women in Russia to attend university.

Like many other successful psychologists (e.g., D. O. Hebb, B. F. Skinner), Bluma's interest in the discipline arose through studying literature, in her case through the influence of one of her teachers in Minsk. Consequently, she began to study in preparation for university, spending considerable time in the library. It was there that she met Albert Zeigarnik, whom she married in 1919. Because she was only 18 and because Albert was not well-to-do, her parents initially disapproved of the marriage. Eventually, however, they accepted it, even providing the support for Bluma and Albert to study in Europe. In 1922, Bluma (henceforth Zeigarnik) enrolled in the Department of Philosophy at the Friedrich Wilhelm University of Berlin (since 1949, the Humboldt University of Berlin); Albert became a student at the Polytechnic Institute of Berlin.

The university had, at that time, a stellar group of researchers in the Psychological Institute, so Zeigarnik was exposed to the thinking of Gestalt psychologists Wolfgang Köhler, Kurt Koffka, and Max Wertheimer, all students of



Fig. 1 Bluma Zeigarnik (age 21 years), from the Zeigarnik family archive with the permission of her grandson, Andrey Zeigarnik. This photo appeared as Fig. 2 in his biography of his grandmother (Zeigarnik, 2007)

Carl Stumpf (for a history of Gestalt psychology, see Wagemans et al., 2012,b). But she was especially taken with the teachings of another Stumpf student, Kurt Lewin (for a biography, see Marrow, 1969),² just 10 years her senior and with a devoted and impressive group of students assembled around him. She began working with him on studies aimed at extending Gestalt principles from perception more broadly to cognition. The conceptual basis of the work is described in the next section of this article.

After graduating from the university in 1925, Zeigarnik continued working with Lewin, and published her famous dissertation titled “The memory of completed and uncompleted actions” in 1927 in *Psychologische Forschung*, the journal created by the Gestaltists in 1922 (and, since 1974, published in English as *Psychological Research*). An English translation was published subsequently as a book chapter (Zeigarnik, 1938). She was awarded her doctoral degree (with honors) in 1927; she was 26 years old. Figure 1 presents a photograph of her 5 years before her dissertation (age 21 years); Fig. 2 presents a photograph of her dissertation document.

For the next 4 years, Zeigarnik stayed on at the university as a part-time research scientist. Then in 1931, because communism appealed to them, Albert and his brothers decided that it was time to return to Soviet Russia. They saw this as a “homecoming,” not realizing what awaited them in Stalinist

¹ This sketch was compiled from several sources, including Marrow (1969), Nikolaeva (2011), and the websites <https://www.thescienceofpsychotherapy.com/bluma-wulfovna-zeigarnik/> and *Wikipedia*: https://en.wikipedia.org/wiki/Bluma_Zeigarnik. It relies especially, though, on a portrayal of his grandmother's life written by Andrey Volodya Zeigarnik (2007), and based on his interviews with his father, Vladimir, and his uncle, Yuri. Formerly a chemist in Russia, Andrey Zeigarnik now is a professional photographer who has lived in Israel since 2017 (see <http://www.zeigarnik.ru/>).

² I thank Henry Roediger for bringing this source to my attention.

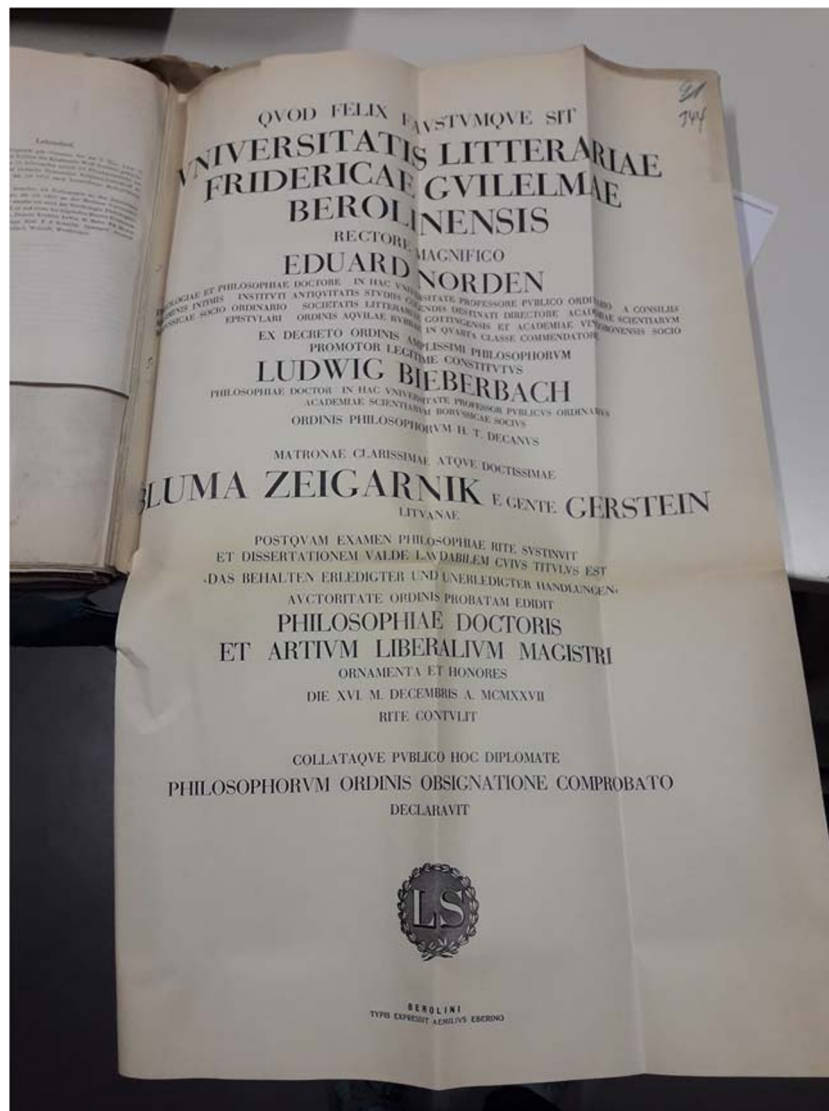


Fig. 2 Bluma Zeigarnik's dissertation document, from the archives of Humboldt University of Berlin (Phil. Fak. 01, Nr. 664, Blatt 344)

Russia. They moved to Moscow, where Zeigarnik became a scientist at the Institute of Higher Nervous Activity, soon to become part of the All-Union Institute of Experimental Medicine. It was there that she worked with the second great influence of her scientific life, Lev Vygotsky (for biographies, see van der Veer, 2014, and Yasnitsky, 2018). In 1933, when Lewin visited Moscow on his way back to Germany overland from Japan, Zeigarnik organized Lewin's visits to Vygotsky's home, introducing her two mentors and including her colleague and close friend, Aleksandr Luria. It was Zeigarnik who told Lewin of Hitler's rise to Chancellor, which finally convinced Lewin that, as a Jew and a free thinker, he must leave Germany: That year, he accepted a position at Cornell University in the USA. [Other major figures in Gestalt Psychology – Max Wertheimer (The New School for Social Research, 1933) and Kurt Koffka (Smith College, 1927) – had already left for America, and Wolfgang Köhler would follow

2 years later (Swarthmore College, 1935).] When Vygotsky died of tuberculosis 4 years later at the age of 37 years, and with Lewin having moved to the USA, Zeigarnik lost her two major inspirations, a source of deep regret throughout her life.

A visit to Lazarett Hospital in Berlin during the 1920s, in particular to Kurt Goldstein's clinic (see Goldstein, 1939; for his influence, see Teuber, 1966), had generated in Zeigarnik a continuing interest in clinical psychology, to which she turned in the 1930s. Her focus became clinical neuropsychology, and medical psychology more generally. Albert and Bluma's first child, a son named Yurii, was born in 1934. Then, in 1935, she was awarded the academic degree of Candidate of Biological Sciences, a major boost to her career since her German Ph.D. was not respected in Soviet science. But in 1936, a government decree – the resolution “On Pedological Perversions in the System of the People's Commissariat of Education” – rendered much of Soviet psychology forbidden ideologically

(see Bauer, 1959), and little is known about Zeigarnik's work for the next 4 years. Finally, though, in 1940, she published her research on post-traumatic dementia, work that she had begun in the early 1930s.

In 1938, her research group became part of the Institute of Psychiatry of the Ministry of Health, and Zeigarnik began to work as a psychologist-neurologist. Albert and Bluma's second son, Vladimir, was born in 1939. In 1940, she traveled to Lithuania to see her mother for the first and last time since the 1920s, her father having already died. But that same year, Albert was arrested on charges of being a German spy and sentenced to 10 years in prison camp.³ With two small children and inadequate income, these were difficult years for Zeigarnik, who spent considerable time going to the Lubyanka – the KGB headquarters in Moscow – to try to find out what was happening to her husband. In that time, she was supported by a host of brave friends, notably Aleksandr Luria and Susanna Rubinshtein.

As a consequence of this difficult time, her grandson Andrey (Zeigarnik, 2007) describes Zeigarnik as having changed from open to very guarded and fearful, in part because of her concern for her sons. She would never talk about her past in the West and held, at least on the surface, a very Marxist perspective that she mandated as well for her family. In 1941, Zeigarnik was reassigned to work at a clinic for nervous diseases in Chelyabinsk where she was a senior research scientist focusing on the rehabilitation of head injury victims.

In 1943, Zeigarnik and her sons returned to Moscow to find that their apartment had been ransacked by an individual housed there for those 2 years by the government. She also suffered another loss: Her second dissertation, based on her medical research during World War II, was stolen from her home by a co-worker at the Institute of Psychiatry. Fearing reprisals if she accused the co-worker of plagiarism, she destroyed all material related to that work. Eventually, life was restored to order and she became head of a laboratory at the Institute of Psychiatry. In 1949, she also began to teach courses on psychopathology at Moscow State University. But at the end of the 1940s, Soviet psychology was again censored by the government at the same time as a state anti-Semitic campaign began against “cosmopolitanism,” Stalin's barely disguised attack on Jews (see Pinkus, 1988). Demoted from head of laboratory in 1950, by 1953, Zeigarnik had lost her job, basically for being a Jew. Luria, Rubinshtein, and other friends helped her to survive in this period, financially and in terms of work. It was not until 1957, well after Stalin's death and with Khrushchev's rise to power, that Zeigarnik returned to the position of head of the psychopathology laboratory at

the Institute of Psychiatry. She remained there until 1967, while also teaching at Moscow State University.

In 1958, she completed her third doctoral dissertation, earning the degree of Doctor of Pedagogical Sciences. In 1965, she was given the title Professor of Psychology, and in 1967 she was elected chair of the Faculty of Psychophysiology and Neuropsychology of Moscow State University. In the following years, she published several monographs, among them *Thought Disorder in the Mentally Ill* (1959), *Pathology of Thinking* (1965), *Introduction to Pathopsychology* (1969), *Personality and Pathology of Activity* (1971), *Experimental Abnormal Psychology* (1972) and *Foundations of Psychopathology* (1973). In 1978, she was awarded the First Degree Lomonosov Prize for her work on the psychology of mental disorders and the rehabilitation of the mentally ill. In 1983, she was chosen to receive the Kurt Lewin Award from the Society for the Psychological Study of Social Issues, but her government refused permission for her to travel to the West to receive it.

Figure 3 presents a picture of Zeigarnik later in life. Throughout the 1980s, she remained in her position at Moscow State University, lecturing and supervising many



Fig. 3 Bluma Zeigarnik later in life, from the Zeigarnik family archive with the permission of her grandson, Andrey Zeigarnik. This photo appeared as Fig. 3 in his biography of his grandmother (Zeigarnik, 2007)

³ When I contacted Andrey Zeigarnik, her grandson, I asked him what was known about his grandfather. He replied in an email on 21 August 2019 that “Albert died 2 years after imprisonment. This is the official version and we don't know the truth. Russia still has unpredictable history.”

graduate students. During that time, she published her monographs *The Theory of Personality of K. Lewin* (1981), *Theories of Personality in Foreign Psychology* (1982), and *Pathopsychology* (1986). Ironically, her last book (Zeigarnik, 2001), published posthumously, was about her dissertation work. Nikolaeva (2011) details her work and her influence in Russia. It was also during this very active time, however, that Zeigarnik became seriously ill from the long-term consequences of anemia. She died on 24 February 1988, at the age of 86 years.

As her grandson, Andrey, wrote (Zeigarnik, 2007, p. 265), “She was a tiny, fragile-looking woman, hardly coming up to the shoulder of a person of average height. Understandably, she never gave lectures from behind the podium, because she would not have been visible. But she perceived herself to be taller than her actual physical size. Every time she bought a coat or a dress, she would choose a size too large.” He went on to describe her devotion to her grandchildren and graduate students, her loyalty, her clinical acumen, her sense of humor, and her “extraordinary kindness.” Clearly, she led an extraordinary life – a complete life – but certainly one with memorable interruptions.

The foundation of Zeigarnik’s dissertation

With Kurt Lewin as her supervisor, Zeigarnik was strongly influenced by his field theory (e.g., Lewin, 1939), a theory closely linked to Gestalt theory. This linkage is hardly surprising given Lewin’s colleagues in the Psychological Institute, including Kurt Koffka and Max Wertheimer. Although he became one of the most prominent social psychologists, Lewin was very much influenced by Gestalt psychology, writing that “The fundamental ideas of Gestalt theory are the foundation of all our investigations in the field of the will, of affection, and of the personality” (Lewin, 1935, p. 240). As further evidence of this influence on his thinking, Lewin also writes that he collaborated for over a decade with another colleague, Wolfgang Köhler,⁴ one of the architects of Gestalt theory and the eventual Director of the Institute – and later von Restorff’s dissertation supervisor.

In Lewin’s conceptual system, a person was “a complex energy field in which all behavior could be conceived of as a change in some state of a field during a given unit of time. He postulated a theory of psychological tensions in which tensions function as a form of energetics” (Marrow, 1969, p. 30). These tensions (or needs or wants), existing in the “psychic field” (as opposed to the physical field),⁵ provided the mental energy to prepare for and ultimately to bring about

behavior. Carrying out the behavior released the tension (for more on his theory, see Burnes & Cooke, 2013). It is easy to see how this led to the core idea motivating Zeigarnik’s dissertation research.

The story has often been related of how Lewin arrived at the insight that then became the basis of Zeigarnik’s dissertation. Best known is Boring’s (1957, p. 734) version: “There is a story related to Zeigarnik’s experiment. Lewin and his friends were in a restaurant in Berlin, in the sort of prolonged conversation which always surrounded Lewin. It was a long time since they had ordered and the waiter hovered in the distance. Lewin called him over, asked what he owed, was told instantly and paid, but the conversation went on. Presently Lewin had an insight. He called the waiter back and asked him again how much he had been paid. The waiter no longer knew.” Boring’s emphasis is on the waiter remembering the total amount of the bill, not on remembering what was ordered.

There is, however, another version told by Donald MacKinnon, who was at the particular gathering. Marrow (1969, p. 27–28) quotes MacKinnon’s description: “[S]omeone called for the bill and the waiter knew just what everyone had ordered. Although he hadn’t kept a written reckoning, he presented an exact tally to everyone when the bill was called for. About a half hour later, Lewin called the waiter over and asked him to write the check again. The waiter was indignant. ‘I don’t know any longer what you ordered’, he said. ‘You paid your bill’.” MacKinnon’s emphasis is on the waiter remembering what each person had ordered, not on remembering the total amount of the bill. These differing stories fit very nicely with another idea being developed around the same time – Bartlett’s (1932) perspective on memory as being fundamentally reconstructive. The crux, though, is that the waiter remembered some aspect of the interaction better when the interaction was not yet completed; this was the undischarged tension in Lewin’s field theory.

Zeigarnik’s dissertation connected Lewin’s field theory to his observation about the waiter’s memory. Applied to task performance, in field theory the idea was that the intention to perform a task created a kind of need (or “quasi-need”) that resulted in a kind of psychological tension. That tension, which would be released when the task was completed, would remain active when the task was interrupted and not completed. Could that residual tension influence later memory? That was the question that Zeigarnik addressed in her dissertation: “What is the relation between the status in memory of an activity which has been interrupted before it could be completed and of one which has not been interrupted?” (Zeigarnik, 1938, p. 300).

What Zeigarnik did

Over the period 1924–1926, Zeigarnik undertook an impressive series of experiments to answer this question. In her first

⁴ Lewin’s unsent letter to Köhler (1933/1986), which would have been dangerous for them had it fallen into Nazi hands, indicates their closeness.

⁵ Lewin’s concept of field, like that of his Gestalt colleagues, had its roots in the 19th-century concept of field in physics (see McMullin, 2002). Lewin’s concept was broader, however, than the Gestalt perceptual/cognitive perspective, referring also to personality and motivation.

experiment, 32 adults were given 22 tasks to do. These tasks were quite different from each other, examples being thread winding, paper folding, multiplication, drawing a vase, and counting backwards. Each task was intended to take about 3–5 min (although there was no time limit), with the instructions to “complete as rapidly and correctly as possible” (Zeigarnik, 1938, p. 300). Half of the tasks were allowed to go to completion whereas half were interrupted. Interruption occurred just when the participant “was most engrossed” in the task and consisted of presenting the next task and saying “Now do this, please” (Zeigarnik, 1938, p. 303). After presentation of all 22 tasks, participants were immediately asked to recall as many of the tasks as they could.

Although Zeigarnik did not number her experiments, I will do so for clarity. The results of her first four experiments were very clear – and remarkably consistent – as shown in Table 1. In Experiment 1, which she considered her main experiment, she tested participants individually and their recall strongly favored interrupted tasks, whether indexed in terms of the participants or the tasks. In Experiment 2, using a different set of tasks, she replicated with a sample of 15 individual adults. She also twice replicated the finding in group testing situations, once with 47 adults – Experiment 3 – and once with 45 children (mean age of 14 years) – Experiment 4. In all four of these experiments, the proportion of participants who recalled the interrupted tasks best was consistently around .8. Throughout her experiments, Zeigarnik’s preferred statistic was the ratio of interrupted tasks recalled (IR) to completed

tasks recalled (CR), a measure which shows superior recall of interrupted tasks to the extent that its value is greater than unity. Zeigarnik also saw this measure as having the virtue of eliminating individual differences in memory. This ratio hovered close to 2.0 across all four experiments.

Zeigarnik also carried out two small experiments (both with 12 adults) to challenge potential alternative interpretations; these are also shown in Table 1. In Experiment 5, the issue was whether interrupted tasks might be “a shock” so she interrupted all 18 tasks but allowed participants to immediately resume completing half of them whereas the other half were not completed; she observed her standard result favoring recall of the incomplete tasks. In Experiment 6, her concern was whether participants might assume that interrupted tasks would be resumed later and hence preferentially retain them. She therefore told participants for six interrupted tasks that they would be resumed and for six interrupted tasks that they would not be resumed, and included six completed tasks as well. In fact, no interrupted tasks were resumed. Both interrupted conditions showed her typical advantage over the completed condition.

Pursuing the concern about people anticipating resumption of interrupted tasks, Zeigarnik conducted two further experiments, each with 12 participants. In Experiment 7, using 20 tasks, she informed participants for the interrupted half of the tasks that they would be resumed; in Experiment 8, using 18 different tasks, she informed participants for the interrupted half of the tasks that they would not be resumed. She argued

Table 1 The results of the six main experiments reported in Zeigarnik’s dissertation

Participants/tasks	I > C	I = C	C > I	IR/CR	I&NR/I&R
<i>Experiment 1</i> (32 adults; 22 tasks; individual sessions)					
Adults	.812	.094	.094	1.9	
Tasks	.773	.091	.136		
<i>Experiment 2</i> (15 adults; 22 new tasks; individual sessions)					
	“an almost exact duplicate”*			2.0	
<i>Experiment 3</i> (47 adults; 18 tasks; one large group session)					
	.787	.064	.149	1.9	
<i>Experiment 4</i> (45 children, mean age = 14 y; 18 tasks; one large group session)					
	.800	.089	.111	2.1	
<i>Experiment 5</i> (12 adults; 18 tasks)					
(compared interrupted-and-not-resumed (I&NR) to interrupted-and-resumed (I&R))					
					1.85
<i>Experiment 6</i> (12 adults; 18 tasks)					
(compared completed, interrupted-and-not-resumed, and interrupted-and-resumed)					
				1.94	1.9

Note. I = Interrupted; C = Completed

IR/CR is the ratio of the number of interrupted tasks to the number of completed tasks recalled. I&NR/I&R is the ratio of interrupted-and-not-resumed (the standard interruption condition) to interrupted-and-resumed

Ratio values > 1.0 indicate superior memory for the interrupted tasks

*Zeigarnik did not report the details in Experiment 2

that if her previous findings hinged on participants anticipating resumption of interrupted tasks, then her effect should be enhanced in Experiment 7 but reduced in Experiment 8. Neither outcome transpired: Her effect was virtually unchanged, leading her to discard the “anticipated resumption” explanation of superior recall of interrupted tasks.

Two features of Zeigarnik’s studies have received little attention over the years but could nevertheless be influential. The first is procedural: She included in her recall data only responses produced before the first hesitation, responses she considered to be spontaneous. She saw only that portion of recall as relating to the tension hypothesis; subsequent recall, she thought, would presumably involve more extensive search, which would not speak to her hypothesis, grounded as it was in the field theory idea of a continuing tension. (It is worth noting, however, that Zeigarnik (1927, p. 13) states that she did not find a difference between pre-hesitation recall and total recall.) Relatedly, she reported an observation about the order of recall – that the incomplete tasks tended to be recalled first. Possibly, then, output interference (see, e.g., Smith, D’Agostino, & Reid, 1970) – interference imposed by earlier-recalled items on yet-to-be-recalled items – could have played a role in her observed data pattern. The likelihood of a hesitation would be expected to increase as recall progressed so that, if completed tasks were recalled later, they would be less likely to be counted.

Zeigarnik did report some contrasting findings that she saw as also being consistent with her “continuing tension” account. In Experiment 9, seven participants who were fatigued when performing the tasks (but rested when recalling them) actually recalled more completed tasks; in contrast, eight participants who were fresh when performing the tasks (but fatigued when recalling them) showed no effect. Zeigarnik saw fatigue as undermining maintenance of the tension required to produce her effect. She also thought that the tension should dissipate with time and showed that in two further experiments. In Experiment 10, eight participants went through the entire procedure twice, the first time recalling one day later and the second time recalling immediately. They showed her typical pattern immediately but the effect disappeared after the 1-day retention interval. In Experiment 11, 17 participants were tested both immediately and then again after 1 day: The typical recall advantage for interrupted tasks was observed immediately but shrank by more than half over 24 h (despite the repeated recall). Zeigarnik was, however, ahead of her time (see McGeoch, 1932) in suggesting that what occurred in time – not time itself – was crucial. Therefore, in Experiment 12, she manipulated context change (see Sahakyan & Kelley, 2002, for a similar logic applied to intentional forgetting). For six participants called to an important telephone call just after all of the tasks had been administered, who consequently experienced a context change between study and test, she actually

found completed tasks to be better recalled. She further tested this context change idea with two small groups: four participants interrupted in such a way as to easily return to the experimental situation still showed her effect, albeit about half as large as usual, whereas three participants interrupted in such a way as to make returning to the experimental situation difficult actually recalled more completed tasks.

Zeigarnik even brought back 14 of the 32 participants from Experiment 1 after 3–6 months and carried out the procedure again with new tasks; she reported a correlation of .9 between the two occasions, which she saw as evidence of consistent individual differences. With regard to such differences, she noted that “ambitious” participants who wanted to succeed showed an enhanced advantage for the interrupted tasks. Her conclusion that “The strength with which such tension systems arise and persist evidently varies greatly between different individuals” (p. 314) foreshadowed the empirical work of other researchers that would follow, much of which would pursue her phenomenon by exploring individual differences.

In her conclusion, Zeigarnik (1938, p. 313) wrote that “The experiments reported here have shown that *unfinished* tasks are remembered approximately twice as well as completed ones ... because at the time of report there still exists an unsatisfied quasi-need. This quasi-need corresponds to a state of tension whose expression may be seen not only in desire to finish the interrupted work but also in memorial prominence as regards that work.”

Zeigarnik’s dissertation was the first to put Lewin’s ideas to a strong test. Lewin held her dissertation in high regard, stating in his book *A dynamic theory of personality* (Lewin, 1935, p. 240) that “All later investigations [in his laboratory] are built upon this” and describing her work as “of unusual conceptual clearness with great psychological acuity.” He also traced the influence of Zeigarnik’s dissertation on other work that followed closely in his laboratory. In 1928, Maria Ovsiankina showed that when a period of relatively few demands was provided following interruption of a task, that task tended to be resumed: The tension had not been resolved. Shortly thereafter, Gita Birenbaum (1930) showed that intentions relating to the primary task were rarely forgotten, unlike less central goals (e.g., the content of a letter would be remembered whereas the date written on that letter would be more likely to be forgotten).⁶ Zeigarnik’s dissertation clearly inspired a body of work aimed at putting Lewin’s field theory to continuing and stringent empirical test.

⁶ Birenbaum’s work fits well with fuzzy trace theory (e.g., Brainerd & Reyna, 2004), with its distinction between gist and detail.

Status of the Zeigarnik effect today

The phenomenon, for many years referred to as “the interrupted task paradigm” or by similar designations, would appear to have acquired its creator’s name around the middle of the last century: In his dissertation on motivation, Atkinson (1953) uses the term *Zeigarnik effect* for the first time. As of the writing of the current article, Zeigarnik’s dissertation article has been cited 367 times according to PsycInfo and 1,155 times according to Google Scholar.

Beginning with work by Schlote (1930), whose results were not supportive of Zeigarnik’s, numerous researchers carried out related studies, enticed by this provocative phenomenon and by Lewin’s increasing influence. In particular, a study by Marrow (1938) was often pointed to. He followed Zeigarnik’s logic, testing 30 participants using a series of 20 paper-and-pencil tasks including circling vowels in a paragraph, adding numbers, listing recently read books, and the like. He obtained an IR/CR ratio of 1.77, with 25 participants showing $I > C$, three showing $I = C$, and two showing $C > I$. His results clearly bolstered Zeigarnik’s findings and generalized them to a different type of material. But as it turned out, many results over the ensuing years were not as supportive of Zeigarnik’s reported phenomenon.

Prentice (1944) was the first to discuss the thorny complications with this line of research. There were sufficient problems that by 1950, Sears (p. 113) questioned the value of the interrupted task paradigm in no uncertain terms: “When a research operation requires as much discussion of its ‘psychological meaning’ as interruption does, it is time to find a new operation.” Hovland (1951, p. 677) summarized that “there have been a number of failures to confirm the appearance of the phenomenon.” Alper (1952, p. 78) concurred: “Few investigators could unequivocally reproduce Zeigarnik’s findings,” and argued that findings differed dramatically depending on the participant’s personality.

After almost 40 years, the work that followed Zeigarnik’s dissertation was reviewed by Butterfield (1964) and by van Bergen (1968). In his review, Butterfield (1964, p. 309) concluded that “the Zeigarnik effect is far from being the invariable result in ITP [interrupted task paradigm]. Frequently, more completed than incompleting tasks are recalled.” Instead, Butterfield summarized the numerous studies that had investigated individual differences factors in memory for interrupted tasks, concluding that there was no universal pattern but that what was observed might vary as a function of what could be broadly described as motivation, intriguing given that investigating motivation was what initially led to Zeigarnik’s work.

The first and most influential illustration of this “no universal pattern” conclusion was provided by Atkinson (1953) in his dissertation where he observed that, when provided with skill-oriented instructions, individuals high in need

achievement showed better memory of incomplete tasks – the Zeigarnik effect – whereas those low in need achievement showed the reverse. He argued that the goal of the individual dictated the outcome: “When the goal is to experience feelings of success and personal accomplishment, then persistence of the interrupted activity in recall and subsequent resumption of it are instrumental to attainment of that goal. When, however, the goal is to avoid feelings of failure, non-recall of past failures and presumably non-resumption of previously failed activities are instrumental to the avoidance of renewed feelings of failure” (Atkinson, 1953, p. 387). Weiner, Johnson, and Mehrabian (1968) suggested that high-need achievement individuals showed a Zeigarnik effect because they chose to rehearse the interrupted tasks, agreeing with Caron and Wallach (1957) that the effect, when it occurred, was due to differential learning, not differential recall. The simple interpretation was that highly motivated individuals want to remedy their failures whereas less motivated individuals want to forget their failures.

Given this pattern of results in individual differences studies, it is not surprising that the Zeigarnik effect has been difficult to replicate with unselected participants: Butterfield (1964; see p. 315) reports a host of studies that have failed to find better memory for the incomplete tasks. He also underscores the important observation, made earlier by Osgood (1953, p. 587), that: “inability to show that I and C tasks are equally well learned is a crucial shortcoming of ITP as a measure of retention since the original learning opportunity is frequently shorter for I than for C tasks” (Butterfield, 1964, pp. 315-316). Indeed, one could certainly imagine that the longer exposure to the completed tasks than to the incomplete tasks might be expected to produce better, not worse, memory for the completed tasks, if total time on task is relevant (see, e.g., Cooper & Pantle, 1967).

Van Bergen (1968) was inspired by Cartwright’s (1959, p. 33) statement that “when Zeigarnik’s original conditions have been exactly reproduced the same findings have been obtained” and by a clear belief in the importance of replication, particularly based on her Chapter 3 summary of the post-Zeigarnik literature. Consequently, she began her own precise replication in 1961. She tested 34 participants, mostly university students, at her home. In trying to replicate exactly, she faced a number of problems, notably when precisely the interruption should occur, but used her judgment. Her results showed absolutely no difference in recall up to the first hesitation. Using Zeigarnik’s preferred ratio – IR/CR – the value was .88, and the number of participants showing $I > C$ was nine, the number showing $I = C$ was five, and the number showing $C > I$ was 20. Van Bergen reports that the pattern was unchanged when all of the recall data were examined, and that her participants did not systematically recall the interrupted tasks first. She then tried to precisely replicate Marrow’s (1938) study as well. Again,

there was no advantage for the interrupted tasks: She observed an IR/CR ratio of .88 and the number of participants showing $I > C$ was three, $I = C$ was six, and $C > I$ was 11. Substituting a new experimenter, she very closely replicated this pattern in another experiment with 25 participants. She carried out several additional experiments, one with only three of the 20 tasks being interrupted, another using a different set of materials, and another testing children: All failed to produce any evidence of Zeigarnik's pattern.

In her dissertation, Van Bergen (1968, p. 267) stated in her final paragraph that “the problem of the selective recall of uncompleted and completed tasks must be regarded as one of those ‘questions which seem to lead nowhere’,” and argued that this phenomenon, which she referred to as a “non-problem,” should be “discarded.” She made this argument on two principal bases. The first was the seven new experiments comprising her dissertation (chapter 5), where she reported that “in none of them was this phenomenon verified” (p. 220). The second was her comprehensive review of the replication attempts in the literature (chapter 6), where she reported that “Of the studies which were intended to show a Zeigarnik effect, less than half actually did so” (p. 249). In fact, by actual count, less than a third of the 44 papers that she considered as replication attempts reported a Zeigarnik effect. She even went on to assert, notwithstanding Butterfield's analysis, that “The studies on personality variables did not offer a substantial contribution to the clarification of the study of selective recall” (p. 249).

There have been isolated studies relating to the Zeigarnik effect since the late 1960s, but very few (e.g., Seifert & Patalano, 1991). It is likely that the detailed reconsiderations provided by Butterfield (1964) and by van Bergen (1968) go a considerable way to explaining why the phenomenon, despite being well known in cognitive psychology and indeed in other disciplines, is rarely cited in modern textbooks. At best, it would appear to hinge on certain individual difference characteristics; at worst, it is simply not replicable. Yet the core idea has remained better known than the criticisms. As one illustration, in the idea of “need for cognitive closure” (Kruglanski & Webster, 1996, p. 263), Zeigarnik's core idea can be seen to live on as “a desire for definite knowledge on some issue ... [that] ... represents a dimension of stable individual differences as well as a situationally evocable state”.⁷ Her phenomenon may, then, be an instance of a provocative and appealing idea that, once let out of the box, is nearly impossible to put back in. As Butterfield (1963, p. 56, quoted by Van Bergen, 1968, p. 267) concluded in his

dissertation, task interruption “has become one of those instances in the history of psychology when a technique rather than a concept is the focus of intense experimentation.” There are certainly many precedents in Psychology and indeed in other sciences.

Hedwig Ida Auguste von Restorff⁸

Hedwig von Restorff was born 14 October 1906 in Berlin, Germany.⁹ Her parents were Elisabeth Marie Karoline Juliane von Plessen (born 14 December 1886) and Major Reinhold Louis Wilhelm von Restorff (born 27 March 1869). She had one brother, Wilhelm Louis Gustav von Restorff, born just over 5 years after her on 27 January 1912. Von Restorff's schooling began at a private elementary school (a Lyceum) in Zossen, about 50 km south of Berlin and then at another Lyceum in Heiligengrabe, about 120 km north of Berlin, where she earned her certificate in 1922. She was then admitted to the equivalent of high school at the State Augusta School in Berlin, obtaining her certificate in science in 1925. A year later, she obtained her certificate as a Lyceum teacher. Two years later, while in university, she passed additional exams in Greek and Latin at the provincial school college in Berlin, obtaining an additional high school certificate.

Von Restorff was admitted in 1926 to Friedrich Wilhelm University to study new languages, later specializing in philosophy, psychology, and natural science. She continued her studies in Jena in 1928 and in Berlin until 1932. In Berlin, von Restorff worked with the influential group of Gestalt psychologists in the Psychological Institute, where her dissertation was supervised by the Director, a major figure in Gestalt psychology, Wolfgang Köhler (for a biography, see Ley, 1990). The famous study (von Restorff, 1933; no English translation has ever been published, but see Köhler & von Restorff, 1995) was in fact her dissertation, titled “On the effects of the formation of a structure in the trace field.” The work was done collaboratively with Köhler, and she was awarded the PhD magna cum laude (with honors) on her birthday at age 27. Like Zeigarnik's dissertation, von Restorff's dissertation appeared in *Psychologische*

⁷ A more recent concept would apparently make the opposite prediction from Zeigarnik's: Under the fading-affect bias, the affect deriving from positive events persists in memory longer than does the affect associated with negative events (see Skowronski, Walker, Henderson, & Bond, 2014), assuming that incompletion is conceived of as negative event.

⁸ This sketch was compiled from a number of sources, initiated from an encyclopedia entry written by David Murray (2012) and then using original documents from von Restorff's years at Friedrich Wilhelm University provided by the university.

⁹ Murray (2012) gives her birthdate as 14 December 1906, but the curriculum vitae that she submitted with her dissertation lists her date of birth as 14 October, as does Geni, the family tree website (<https://www.geni.com/people/Hedwig-Ida-Auguste-Dr-phil-et-med/6000000033525189271>). Interestingly, von Restorff's mother is listed in Geni as having been born on 14 December (<https://www.geni.com/people/Elisabeth-Marie-Karoline-Juliane/6000000033525169940>), likely the source of the confusion.



Fig. 4 Hedwig von Restorff at the time of her dissertation, from the archives of Humboldt University of Berlin (NS-Doz. 2, Nr. ZD I 0877)

Forschung. Figure 4 presents a picture of her around the time of her dissertation; Fig. 5 presents a photograph of her dissertation document. Intriguingly, her curriculum vitae at the time indicate that she attended lectures by Köhler, Wertheimer, and Lewin, with the inclusion of Lewin's name the only evidence that I have found of any overlap with Zeigarnik.

The rise of the National Socialist (Nazi) party to become the dominant force in the Reichstag, the German Parliament, following the July 1932 election cast a long shadow over the Psychological Institute. This may have been especially the case because the Psychological Institute was located in an annex to the Kunstgewerbe Museum, originally the Kaiser's Palace. Köhler, an outspoken critic of the policies of the Nazis (see Crannell, 1970; Henle, 1978), fought to retain control of the Institute for himself and his colleagues and for his students/collaborators, who at the time included von Restorff, Karl Duncker,¹⁰ and Otto van Lauenstein.¹¹ But in 1935, all three collaborators were

¹⁰ Famous for proposing the idea of functional fixedness in problem solving (Duncker, 1945), Duncker was exiled from Germany in 1935 and initially took up an assistantship with Frederick Bartlett in England. Shortly thereafter, he immigrated to the USA where he took a position as assistant to Wolfgang Köhler at Swarthmore College. Suffering from continuing depression, for which he had been under treatment, Duncker committed suicide at age 37 (see Schnall, 1999).

dismissed, at which point Köhler wrote to a friend in the USA that “The government has decided in May [1935] to dismiss all the assistants who were trained by me and in June, during the term, they were suddenly forbidden to continue their work and their teaching: Duncker, von Lauenstein, and von Restorff,” adding that “I am not yet sure whether I shall be able to place them somewhere” (from a letter quoted by Henle, 1978, p. 944). Because of these events, Köhler left Berlin for Swarthmore College in the USA in 1935. The Psychological Institute was then put under Nazi control, effectively ending its scientific influence.

Following her dismissal from the Institute, von Restorff briefly worked as a research assistant but then chose to enter medical school in 1935, studying at the Pharmacology Institute in the Friedrich Wilhelm University of Berlin. She was awarded her license to practice in 1939 and published a second dissertation in the realm of medicine in 1940. She then stayed on in the Pharmacology Clinic for a year. On 31 January 1942, she married another physician, Helmut Adolph Johannes Trendelenburg (born 1 November 1915, in Hötting, near Innsbruck, Austria), and around that time moved from Berlin, in the northeast of Germany, to Freiburg, in the southwest. Hedwig and Helmut had two sons during the war, Michael Friedrich Reinhold Trendelenburg (born 25 October 1942) and Christian Helmut Wilhelm Trendelenburg (born 3 October 1945). Near the end of the war, Helmut went missing, likely near Kaliningrad, Russia; the date of his death is listed in Geni as 16 April 1945. Von Restorff continued to practice medicine as a family physician in Freiburg until her untimely death on 6 July 1962 at Freiburg. Figure 6 presents a picture of her later in life. She was only 55 years old when she died – like those of her laboratory colleagues Duncker and von Lauenstein, her life, despite several isolated and distinctive highlights, was too short.

The foundation of von Restorff's dissertation

As already mentioned, von Restorff was a student of Wolfgang Köhler, a leading Gestalt psychologist and the Director of the Psychological Institute. Like Zeigarnik, von Restorff's thinking was heavily influenced by the fundamental

¹¹ Because he was Jewish, von Lauenstein had been dismissed from the Institute in 1934, but Köhler successfully fought to have him reinstated later in the year. Von Lauenstein's major contribution was, like von Restorff's, in the domain of memory: He explored “the time error” in psychophysics, essentially the influence of retention interval (e.g., von Lauenstein, 1938). Pratt described (in the preface to Köhler, 1969, p. 15) what happened to von Lauenstein after the dissolution of the Psychological Institute. He moved to England in 1937 and was to move to Rutgers University in 1939. But having returned to Germany in the summer of 1939, when war began in September, he informed colleagues at Rutgers that he was not permitted to leave Germany. While serving in the German Army, he was seriously wounded yet was forced back to active duty near the end of the war. He never returned.

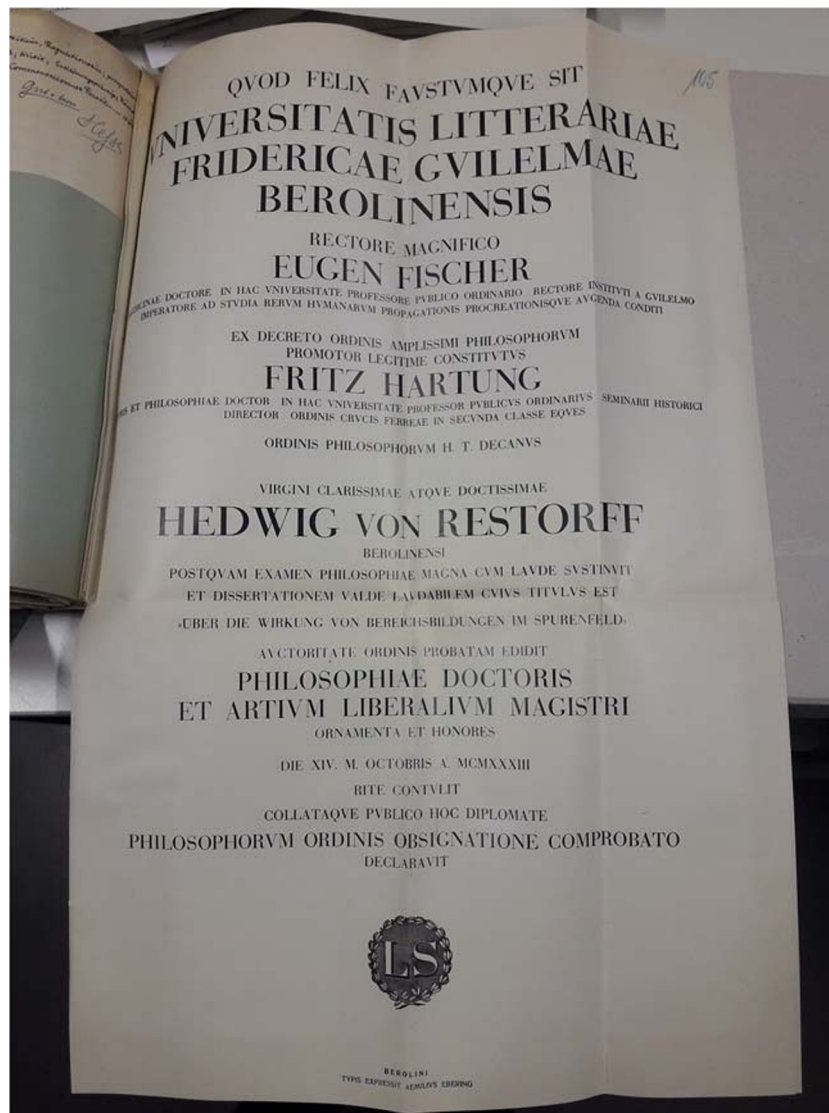


Fig. 5 Hedwig von Restorff's dissertation document, from the archives of Humboldt University of Berlin (Phil. Fak. 01, Nr. 748, Blatt 105)

ideas of Gestalt psychology including, in the realm of perception, the important distinction between figure and ground – as Wallace (1965) and Hunt (1995) both have noted. One of her goals, therefore, was to extend these perceptual ideas to higher cognitive processes, such as memory, echoing Ebbinghaus's (1885) goal half a century earlier. Her prediction was that the similarities of non-isolates (the ground) and their difference from an isolate (the figure) should be critical for memory. She couched this in terms of Köhler's ideas about phenomenal experience and the *phenomenal field* (Köhler, 1929, 1940), which English and English (1958, p. 207) define as “everything, including itself, experienced by an organism at any moment.” The isolate stands out from its surrounding context, the field in which it resides. In this key respect, then, von Restorff's theoretical context rested on a field theory, just as

Zeigarnik's had. Lindahl and Århem (2016) provide a detailed analysis of field theory.

As the reviews by Wallace (1965) and Hunt (1995) both noted, there were precursors to von Restorff's dissertation, notably in the studies of Calkins (1894, 1896), Jersild (1929), and van Buskirk (1932), all of which explored the value of vividness in learning. But von Restorff went beyond vividness, which she did not see as necessary to produce an isolation effect. What mattered, she argued, was salience: The non-isolates were similar in some way(s) and the isolate differed from them; this difference did not have to be physical. Indeed, this perspective is very much in keeping with Köhler's concept of phenomenal field, which relates the physical world to the mental world. Moreover, in a point that is often overlooked, von Restorff saw the potential memory difference as more due to interference among the



Fig. 6 Hedwig von Restorff later in life, downloaded from <http://www.buffinstituteofdesign.com/von-restorff-effect-in-phycology-of-design>

non-isolates – a cost – than to extraordinary memory for the isolate – a benefit – the obverse of how it has usually been described since then.¹²

What von Restorff did

In her dissertation, von Restorff's initial experiments used the isolation paradigm wherein one or more items – the isolate(s) – differed from all of the other items – the non-isolates (which she referred to as the “massed” items). Again, I number the experiments for easier reference; Table 2 presents the data. Experiment 1 involved presenting five lists of eight paired associates, each list made up primarily (four out of eight) of one of the following types of material: nonsense syllables, numbers, letters, non-letter keyboard characters, and colors. The other four pairs were different from the majority and from each other, with one from each of the other four types of material. Table 3 presents an example list. Each list was presented three times for study, with each display of a pair lasting 2 s. After a 6-min conversation break, recall was requested:

¹² I thank Reed Hunt for bringing this point to my attention (see also Hunt, 1995).

Table 2 The results of the nine main experiments reported in von Restorff's dissertation

Experiment	Sample size	Non-isolates	Isolates
1	4	.44	.79
2(all)	5 X 4-5	.43	.75
2a	5	.61	.95
2b	4	.28	.65
3	12	.25	.87
4	15	.50	.68
5	28	.64	.81
6	12	.40	.96
7	15	.22	.70
8	16	.22	1.00
9	84	.22	1.00

This apparently was free recall of pairs, not cued recall of one member of a pair by the other. After 25 min, the next list was presented. Von Restorff reported that “The number of hits is higher in the isolated constellation than in the corresponding massed [non-isolated] constellation, regardless of type of material” (p. 301).

In Experiment 2 (all), von Restorff replicated the Experiment 1 pattern – virtually perfectly – with five groups of participants, each group receiving five successive lists featuring as the non-isolates only one of the five types of material used in Experiment 1. Those five groups were not all treated identically, however, so it is worthwhile to differentiate a couple of them. In Experiment 2a, only one list was presented per day: Overall performance improved relative to when all lists occurred on the same day but the isolate advantage remained quite constant. In Experiment 2b, the presentation rate was decreased from 2.0 to 1.5 s per pair and there was a longer filled delay: This time, overall performance decreased but again the isolate advantage persisted unchanged.

In Experiment 3, she reduced the number of isolates from four to two, expecting a more pronounced advantage for the isolates. There now were six pairs from one set of materials and one each from two of the other sets (deleting letters and colors). Presentation rate was 1.5 s with three repetitions of a list, and lists were spaced several days apart. Her results strongly supported her prediction of an enhanced effect when lists contained fewer isolates.

Next, von Restorff moved to yes/no recognition instead of recall.¹³ In Experiment 4, she presented 15 individual items, consisting of three isolates and 12 non-isolates, with the

¹³ Participants were actually permitted to respond “unsure,” but von Restorff ultimately treated these responses as “No” responses.

Table 3 Sample eight-item paired-associate list from von Restorff's initial experiments

laf	--	rig
#	--	+
dok	--	pir
89	--	46
red square	--	green square
zül	--	dap
S	--	B
tög	--	fem

Note. In this list, taken from p. 301 of her article, there are four nonsense syllable pairs – the non-isolates (referred to as “massed” by von Restorff) – and one each of pairs from the four other sets (number pairs, letter pairs, character pairs, and color pairs) – the isolates

isolates never occurring in the first two or the last two serial positions. There was only one study cycle: All items were displayed simultaneously with a metronome indicating every 1.5 s to go on to the next item. Otherwise, her procedure closely followed that of Experiment 1. Remarkably, to avoid interference at test, the recognition test consisted of only the 15 studied items – there were no distractors – although participants were told prior to test that some items would be familiar and some would not be.¹⁴ She concluded that “tests of recognition yield smaller differences than do tests of reproduction” (von Restorff, 1933, p. 310), and found it interesting that this was true despite the ratio of isolates to non-isolates being smaller in the recognition experiment than in the recall experiments. Experiment 5 was a replication with 18-item lists in which the three isolates were presented in serial positions 4–6. Despite overall greater recognition, the pattern was identical. Experiment 6 was most like what we usually think of today as the von Restorff paradigm: There was only one isolate. Lists consisted of either 19 syllables and one number, or the reverse, with the lone isolate in the middle of the list. Participants studied one list each day with a 10-min retention interval. The isolation advantage was, as she had anticipated, dramatically increased by using only a single isolate.

Experiments 7–9 were all aimed at the role of distinctiveness and continued the use of only a single isolate. In Experiment 7, participants studied three 10-item lists. A list was studied, there followed 10 min of studying a text, and then there was free recall of the list followed by recall of the text. This procedure was repeated three times in succession. The first studied list was always the comparison condition and contained a number and a syllable in positions 2 and 3 plus

¹⁴ Wallace (1982) also used this technique and reviewed the very few studies that had used it before he did; he apparently was unaware of von Restorff's earlier use of the procedure.

eight other unique items. The next two lists (order counterbalanced) contained either one syllable and nine numbers or the reverse. Placing the isolate early in the list was done to minimize the degree to which it would be perceived as unusual or salient.¹⁵ Relative to the early recall experiments, the isolate advantage was enhanced here, and von Restorff noted that the isolate was almost always recalled very early. In Experiment 8, she moved to lists of eight pairs with only one list per day, otherwise following the same procedure as Experiment 7. This greatly enhanced the isolate advantage. Finally, in Experiment 9, using a large sample of school children (half boys and half girls), she reproduced the result of Experiment 8.

There are several more experiments in the dissertation, but their focus is specifically on proactive and retroactive interference, which von Restorff saw as underlying her phenomenon. In fact, as Hunt (1995) emphasized, her explanation of the isolate advantage focused more on the cost to the non-isolates than on the benefit to the isolate(s). In her view, the similarity of the non-isolates to each other led to interference among them, interference not experienced by the isolate. She related her findings to the earlier results of Ranschburg (1902, 1905), who showed that homogeneous lists were harder to learn and remember than heterogeneous lists. In von Restorff's own words (1933, p. 316), the non-isolates “may be functionally disadvantaged because they belong to a subgroup” whereas the isolate(s) “remain independent (isolated) in the list.”

This dissertation is truly a tour de force. In the end, von Restorff tied her results back to the Gestalt concept of fields, concluding (p. 342) that “items which are not presented in such a monotonous massing achieve much higher values of accurately reproduced items than those in massed positions. This detrimental effect is not only based on the conglomeration of similar items, but also on the field formation and the absorption of items into fields, which benefit from the uniform progression of lists.” In so doing, she firmly established a finding that remains one of the best-known phenomena in the entire memory literature.

Status of the von Restorff effect today

Like Zeigarnik's phenomenon, von Restorff's acquired its name around the middle of the last century: Jenkins and Postman (1948) still called it the isolation effect, whereas Green (1956) first called it the *von Restorff effect*. As of the writing of the current article, von Restorff's dissertation article has been cited 236 times according to PsycInfo and 817 times

¹⁵ Kelley and Nairne (2001) went one step farther and showed that an isolate in the first position, where it could not be seen as an isolate as study began, nevertheless produced a von Restorff effect.

according to Google Scholar, including citations in new empirical work that continues to emerge on her phenomenon (e.g., Chee & Goh, 2018).

By the 1960s, the literature was sufficiently extensive for Wallace (1965) to publish a review article specifically on the von Restorff effect. He divided published studies into three major groupings: (1) physical distinction of an item (e.g., the isolate printed in red with all others in black) versus no distinction (e.g., all items in black), (2) a different type of item (e.g., the isolate is a nonsense syllable with all others being words) versus no difference (e.g., all items are nonsense syllables), or (3) equivalent numbers of items from two sets, with placement of an item from each set amid a sequence of items from the other set (see Siegel, 1943). Wallace then reviewed the evidence with this distinction in mind, and considered possible explanations. He took it as a given that the isolation effect resulted from differential encoding and did not consider possible differential retrieval. As he asserted in his abstract, “isolation facilitates learning of the isolated item” (p. 410). In his summary of theory, he cited such factors as surprise, organization, and attention at the time of learning as key to the effect, admitting that these were “relatively unrefined concepts” (p. 422) and concluding that “At the theoretical level, the von Restorff phenomenon remains a controversial one” (p. 423). There was, however, no such controversy at the empirical level.

Thirty years later, Hunt (1995) characterized the extant explanation of the von Restorff effect as resting on the salience and the consequent differential attention to the isolate, similar to the view with which Wallace had concluded his review. Hunt’s own account, however, differed markedly from this prevailing view, incorporating instead a central tenet of von Restorff’s own explanation: the importance of the similarity among the non-isolates and the difference of the isolate from them. His idea of distinctiveness (see also Hunt, 2013) aligned with von Restorff’s analysis: Because she had observed the isolation effect even when the isolate was the second item in the list (a finding that Hunt replicated; see also Kelley & Nairne, 2001), the isolate could not yet have been perceptually distinct. Hunt clearly saw an important role not just for encoding but also for retrieval: “Distinctiveness enhances memory by facilitating discriminative processes at retrieval” (Hunt, 1995, p. 110).

Unlike the Zeigarnik effect, von Restorff’s phenomenon is routinely described in textbooks on memory and cognition, and continues to generate novel studies. From a survey of the literature, the effect is clearly robust and readily replicable, although as always in experimental psychology the critical issue is determining an appropriate control condition. Recent work is helping to refine our understanding of the mechanism(s) underlying the effect. To illustrate, returning to Wallace’s (1965) first two categories of isolation effects – a physical change versus a change in item type – Bireta and

Mazzei (2016) argued that benefitting from physical isolation is automatic whereas benefitting from semantic/categorical isolation requires attention. Schmidt and Schmidt (2017, p. 194) agreed that attention during study is essential for conceptual isolates, but also pointed to a “favorable retrieval environment” as important. Chee and Goh (2018) went so far as to suggest that the effect is entirely at retrieval, with the cues for the non-isolates “overloaded” relative to those for the isolate (see Watkins & Watkins, 1975, for the concept of cue overload). There also are studies emerging that examine the underlying brain mechanisms (e.g., Elhalal, Davelaar, & Usher, 2014; Kamp, Brumback, & Donchin, 2013).

My perspective, influenced by those of Kolers (see, e.g., Kolers & Roediger, 1984) and Tulving (1983) and others, is that we cannot really separate encoding from retrieval – that every act of “encoding” involves retrieval and that every act of “retrieval” involves encoding. Perhaps the best summary at this juncture, then, is to say that there both encoding and retrieval contribute to the von Restorff effect, in line with most memory phenomena more generally.

Since von Restorff’s (1933) classic study, there have been many studies published that in some way make contact with her phenomenon. Many have simply reported some version of an isolation effect; considerably fewer have been directed squarely at trying to explain the effect. But in all of them, there has never been any doubt that the effect is a truly robust one. Her phenomenon is still of significant interest in memory research today both because of its robustness and because its boundary conditions and its explanation continue to invite exploration.

Epilogue

That both Zeigarnik and von Restorff worked in the same institute in Berlin within a few years of each other, were very influenced by Gestalt ideas, studied the influence of unexpected events on memory, and published their famous works only 6 years apart in the same journal, are only a few of the remarkable coincidences in their lives. Neither really pursued the work that bears her name, linking them as well to Stroop, who carried out his research in the same period but also did not pursue it (MacLeod, 1991b).¹⁶ Yet despite their proximity in space and time, there is no evidence to suggest that Zeigarnik and von Restorff ever even met. With respect to their scientific contributions, whereas Zeigarnik’s phenomenon now appears not to be a general one and thus is rarely pursued in the literature or included in textbooks, von

¹⁶ Ironically, Stroop (1935) actually used as the neutral verbal condition in his third experiment a character that he saw as letter-like but having no meaning. The character he chose was the swastika (see MacLeod, 1991a).

Restorff's phenomenon is highly robust, continuing to attract research attention and to be a staple in textbooks.

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References

- Alper, T. G. (1952). The interrupted task method in studies of selective recall: A reevaluation of some recent experiments. *Psychological Review*, *59*, 71–88.
- Atkinson, J. W. (1953). The achievement motive and recall of interrupted and completed tasks. *Journal of Experimental Psychology*, *46*, 381–390.
- Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge, UK: Cambridge University Press.
- Bauer, A. R. (1959). *The new man in Soviet psychology*. Cambridge, MA: Harvard University Press.
- Birenbaum, G. (1930). Das Vergessen einer Vornahme. Isolierte seelische Systeme und dynamische Gesamtbereiche. [Forgetting an intention. Isolated psychic systems and dynamic total spheres]. *Psychologische Forschung*, *13*, 218–285.
- Bireta, T. J., & Mazzei, C. M. (2016). Does the isolation effect require attention? *Memory & Cognition*, *44*, 1–14.
- Boring, E. G. (1957). *A history of experimental psychology*. New York: Appleton-Century-Crofts.
- Brainerd, C. J., & Reyna, V. F. (2004). Fuzzy-trace theory and memory development. *Developmental Review*, *24*, 396–439.
- Burnes, B., & Cooke, B. (2013). Kurt Lewin's field theory: A review and re-evaluation. *International Journal of Management Reviews*, *15*, 408–425.
- Butterfield, E. C. (1963). *Task recall and repetition choice as a function of locus of control components, mental age, and skill vs. nonskill instructions*. Unpublished dissertation, George Peabody College.
- Butterfield, E. C. (1964). The interruption of tasks: Methodological, factual, and theoretical issues. *Psychological Bulletin*, *62*, 309–322.
- Calkins, M. W. (1894). Association. *Psychological Review*, *1*, 476–483.
- Calkins, M. W. (1896). Association: An essay analytic and experimental. *Psychological Review Monograph Supplement*, No. 2.
- Caron, A. J., & Wallach, M. A. (1957). Recall of interrupted tasks under stress: A phenomenon of memory or of learning? *Journal of Abnormal and Social Psychology*, *55*, 372–381.
- Cartwright, D. (1959). Lewinian theory as a contemporary systematic framework. In S. Koch (Ed.), *Psychology: A study of a science*. New York: McGraw-Hill.
- Chee, Q. W., & Goh, W. D. (2018). What explains the von Restorff effect? Contrasting distinctive processing and retrieval cue efficacy. *Journal of Memory and Language*, *99*, 49–61.
- Cooper, E. H., & Pantle, A. J. (1967). The total-time hypothesis in verbal learning. *Psychological Bulletin*, *68*, 221–234.
- Crannell, C. W. (1970). Wolfgang Köhler. *Journal of the History of the Behavioral Sciences*, *6*, 267–268.
- Duncker, K. (1945). On problem solving. *Psychological Monographs*, *58*:5 (Whole No. 270).
- Ebbinghaus, H. (1885/1964). *Memory: A contribution to experimental psychology*. New York: Dover.
- Elhalal, A., Davelaar, E. J., & Usher, M. (2014). The role of the frontal cortex in memory: An investigation of the Von Restorff effect. *Frontiers in Human Neuroscience*, *8*, Article 410.
- English, H.B., & English, A.C. (1958). *A comprehensive dictionary of psychological and psychoanalytical terms: A guide to usage*. New York: Longman, Green and Co.
- Goldstein, K. (1939). *The organism: A holistic approach to biology derived from pathological data in man*. Salt Lake City: American Book Publishing.
- Green, R. T. (1956). Surprise as a factor in the von Restorff effect. *Journal of Experimental Psychology*, *52*, 340–344.
- Henle, M. (1978). One man against the Nazis – Wolfgang Köhler. *American Psychologist*, *33*, 939–944.
- Hovland, C. I. (1951). Human learning and retention. In S. S. Stevens (Ed.), *Handbook of experimental psychology* (pp. 613–689). New York: Wiley.
- Hunt, R. R. (1995). The subtlety of distinctiveness: What von Restorff really did. *Psychonomic Bulletin & Review*, *2*, 105–112.
- Hunt, R. R. (2013). Precision in memory through distinctive processing. *Current Directions in Psychological Science*, *22*, 10–15.
- Jenkins, W. O., & Postman, L. (1948). Isolation and 'spread of effect' in serial learning. *American Journal of Psychology*, *61*, 214–221.
- Jersild, A. (1929). Primacy, recency, frequency, and vividness. *Journal of Experimental Psychology*, *12*, 58–70.
- Kamp, S.-M., Brumback, T., & Donchin, E. (2013). The component structure of ERP subsequent memory effects in the Von Restorff paradigm and the word frequency effect in recall. *Psychophysiology*, *50*, 1079–1093.
- Kelley, M. R., & Nairne, J. S. (2001). Von Restorff revisited: Isolation, generation, and memory for order. *Journal of Experimental Psychology, Learning, Memory, and Cognition*, *27*, 54–66.
- Köhler, W. (1929). *Gestalt psychology*. New York: Liveright.
- Köhler, W. (1940). *Dynamics in psychology*. New York: Liveright.
- Köhler, W. (1969). *The task of gestalt psychology*. Princeton, NJ: Princeton University Press.
- Kolers, P. A., & Roediger, H. L. III. (1984). Procedures of mind. *Journal of Verbal Learning & Verbal Behavior*, *23*, 425–449.
- Köhler, W., & von Restorff, H. (1995). An analysis of the processes in the trace field (trans: Dorsch, A.). Retrieved from http://www.utsa.edu/mind/von_restorff_translation.htm (Original work published 1933).
- Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: "Seizing" and "freezing." *Psychological Review*, *103*, 263–283.
- Lewin, K. (1933/1986). "Everything within me rebels": A letter from Kurt Lewin to Wolfgang Köhler, 1933. *Journal of Social Issues*, *42*, 39–47.
- Lewin, K. (1935). *A dynamic theory of personality*. New York: McGraw-Hill.
- Lewin, K. (1939). Field theory and experiment in social psychology. *American Journal of Sociology*, *44*, 868–896.
- Ley, R. (1990). *A whisper of espionage*. New York: Avery.
- Lindahl, B. I. B., & Århem, P. (2016). Consciousness and neural force fields. *Journal of Consciousness Studies*, *23*, 228–253.
- MacLeod, C.M. (1991a). Half a century of research on the Stroop effect: An integrative review. *Psychological Bulletin*, *109*, 163–203.
- MacLeod, C.M. (1991b). John Ridley Stroop: Creator of a landmark cognitive task. *Canadian Psychology*, *32*, 521–524.
- Marrow, A. J. (1938). Goal tensions and recall: I. *Journal of General Psychology*, *19*, 3–35.
- Marrow, A. J. (1969). *The practical theorist: The life and work of Kurt Lewin*. New York: Basic Books.
- McGeoch, J. A. (1932). Forgetting and the law of disuse. *Psychological Review*, *39*, 352–370.
- McMullin, E. (2002). The origins of the field concept in physics. *Physics in Perspective*, *4*, 13–39.

- Müller-Lyer, F. C. (1889). Optische Urteilstäuschungen [Optical illusions]. *Archiv für Anatomie und Physiologie: Physiologische Abteilung*, 2 (Suppl.), 263–270.
- Murray, D. J. (2012). Von Restorff, Hedwig. In R. W. Rieber (Ed.), *Encyclopedia of the history of psychological theories* (pp. 1172–1175). New York: Springer. https://doi.org/10.1007/978-1-4419-0463-8_315
- Nikolaeva, V. V. (2011). B. W. Zeigarnik and pathopsychology. *Psychology in Russia: State of the Art*, 4, 176–192.
- Osgood, C. E. (1953). *Method and theory in experimental psychology*. New York: Oxford University Press.
- Ovsiankina, M. (1928). Die Wiederaufnahme unterbrochener Handlungen. [The resumption of interrupted acts]. *Psychologische Forschung*, 11, 302–389.
- Pinkus, B. (1988). *The Jews of the Soviet Union: The history of a national minority*. Cambridge, UK: Cambridge University Press.
- Prentice, W. C. H. (1944). The interruption of tasks. *Psychological Review*, 51, 329–340.
- Ranschburg, P. (1902). Über Hemmung gleichzeitiger Reizwirkungen [Concerning inhibiting simultaneous irritant effects]. *Zeitschrift für Psychologie*, 30, 39–86.
- Ranschburg, P. (1905). Über die Bedeutung der Ähnlichkeit beim Erlernen, Behalten, und bei der Reproduktion [Concerning the importance of similarity in learning, retaining, and reproducing]. *Journal der Psychologie und Neurologie, Leipzig*, 5, 93–127.
- Sahakyan, & Kelley, C. M. (2002). A contextual change account of the directed forgetting effect. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 28, 1064–1072.
- Schlote, W. (1930). Über die Bevorzugung unvollendeter Handlungen [On the preferential character of incompleting acts]. *Zeitschrift für Psychologie*, 117, 1–72.
- Schmidt, S. R., & Schmidt, C. R. (2017). Revisiting von Restorff's early isolation effect. *Memory & Cognition*, 45, 194–207.
- Schnall, S. (1999). Life as the problem: Karl Duncker's context. From past to future: The drama of Karl Duncker. *Papers on the History of Psychology*, 1, 13–28.
- Sears, R. R. (1950). Personality. *Annual Review of Psychology*, 1, 105–118.
- Seifert, C. M., & Patalano, A. L. (1991). Memory for incomplete tasks: A re-examination of the Zeigarnik effect. In *Proceedings of the thirteenth annual conference of the Cognitive Science Society* (pp. 114–119). Mahwah, NJ: Erlbaum.
- Siegel, P. S. (1943). Structure effects within a memory series. *Journal of Experimental Psychology*, 33, 311–316.
- Skowronski, J. J., Walker, W. R., Henderson, D. X., & Bond, G. D. (2014). The fading-affect bias: Its history, its implications, and its future. In J. M. Olson & M. P. Zanna (Eds.), *Advances in experimental social psychology* (Vol. 49, pp. 163–218). San Diego, CA: Academic Press.
- Smith, A. D., D'Agostino, P. R., & Reid, L. S. (1970). Output interference in long-term memory. *Canadian Journal of Psychology*, 24, 85–89.
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643–662.
- Teuber, H.-L. (1966). Kurt Goldstein's role in the development of neuropsychology. *Neuropsychologia*, 4, 299–310.
- Tulving, E. (1983). *Elements of episodic memory*. New York: Clarendon Press/Oxford University Press.
- Van Bergen, A. (1968). *Task interruption*. Amsterdam: North-Holland.
- Van Buskirk, W. L. (1932). An experimental study of vividness in learning and retention. *Journal of Experimental Psychology*, 16, 553–573.
- Van der Veer, R. (2014). *Lev Vygotsky*. London: Bloomsbury.
- von Lauenstein, O. (1938). Sukzessivvergleich von gebogenen Linien [Successive comparison of curved lines.] *Psychologische Forschung*, 22, 343–371.
- von Restorff, H. (1933). Über die Wirkung von Bereichsbildungen im Spurenfeld [On the effects of the formation of a structure in the trace field]. *Psychologische Forschung*, 18, 299–342. [English translation can be downloaded from <http://psychology.olemiss.edu/reed-hunt/>]
- Wagemans, J., Elder, J. H., Kubovy, M., Palmer, S. E., Peterson, M. A., Singh, M., & von der Heydt, R. (2012). A century of Gestalt psychology in visual perception: I. Perceptual grouping and figure-ground organization. *Psychological Bulletin*, 138, 1172–1217.
- Wagemans, J., Feldman, J., Gepshtein, S., Kimchi, R., Pomerantz, J. R., van der Helm, P. A., & van Leeuwen, C. (2012). A century of Gestalt psychology in visual perception: II. Conceptual and theoretical foundations. *Psychological Bulletin*, 138, 1218–1252.
- Wallace, W. P. (1965). Review of the historical, empirical and theoretical status of the von Restorff phenomenon. *Psychological Bulletin*, 63, 410–424.
- Wallace, W. P. (1982). Distractor-free recognition tests of memory. *American Journal of Psychology*, 95, 421–440.
- Watkins, O. C., & Watkins, M. J. (1975). Buildup of proactive inhibition as a cue-overload effect. *Journal of Experimental Psychology: Human Learning and Memory*, 1, 442–452.
- Weiner, B., Johnson, P. B., & Mehrabian, A. (1968). Achievement motivation and the recall of incompleting and completed exam questions. *Journal of Educational Psychology*, 59, 181–185.
- Yasnitsky, A. (2018). *Vygotsky: An intellectual biography*. New York: Routledge.
- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology*, 18, 459–482.
- Zeigarnik, A. V. (2007). Bluma Zeigarnik: A memoir. *Gestalt Theory*, 29, 256–268. [This biographical sketch can be downloaded from http://www.gestalttheory.net/cms/uploads/pdf/GTH-Archive/2007Zeigarnik_Memoir.pdf]
- Zeigarnik, B. (1927). Das Behalten erledigter und unerledigter Handlungen [Retention of completed and uncompleted actions.]. *Psychologische Forschung*, 9, 1–85.
- Zeigarnik, B. (1938). On finished and unfinished tasks. In W. D. Ellis (Ed.), *A source book of Gestalt psychology* (pp. 300–314). London: Kegan Paul, Trench, Trubner & Company.
- Zeigarnik, B. (1959). *Narushenie myshleniya u psikhicheski bol'nyh* [Thought disorder in the mentally ill]. Moscow.
- Zeigarnik, B. (1969). *Vvedenie v patopsikhologiyu* [Introduction to pathopsychology]. Moscow: Izd-vo Mosk.
- Zeigarnik, B. (1971). *Lichnost' i patologiya deyatel'nosti* [Personality and pathology of activity]. Moscow: Izd-vo Mosk.
- Zeigarnik, B. (1973). *Osnovy patopsikhologii* [Foundations of psychopathology]. Moscow: Izd-vo Mosk.
- Zeigarnik, B. (1981). *Teoriya lichnosti Kurta Lewina* [The theory of personality of K. Lewin]. Moscow: Izd-vo Mosk.
- Zeigarnik, B. (1982). *Teorii lichnosti v zarubezhnoj psikhologii* [Theories of personality in foreign psychology]. Moscow: Izd-vo Mosk.
- Zeigarnik, B. (1986). *Patopsikhologiya* [Pathopsychology]. Moscow: Izd-vo Mosk.
- Zeigarnik, B. (2001). *Zapominanie zakonchennyh i nezakonchennyh dejstvij* [Memorizing finished and unfinished actions]. Moscow: Smysl.
- Zeigarnik, B. V. (1965). *The pathology of thinking*. New York: Consultants Bureau.
- Zeigarnik, B. V. (1972). *Experimental abnormal psychology*. New York: Plenum Press.

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