

Cognitive Consolidation:
Does Organization Stabilize Information
Increasing Its Resistance To Change?

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Abstract

This study was an attempt to determine whether a cognitive process analogous to the neurobiological process of consolidation exists; if it does, when a subject integrates and acts on a set of information, cognitive consolidation would manifest itself in the information's subsequent increased resistance to change. A decision task was used to promote the active organization and consolidation of information. Sixty introductory psychology students were asked to make a hypothetical hiring decision based on a partial or complete set of information. I then observed the effect when a new piece of information was added to, or removed from, each set of information after the initial decision was made. Subjects altered their decision in response to newly presented information, indicating the information was not resistant to change. The decision making process failed to demonstrate a "cognitive consolidation" of information occurred.

Cognitive Consolidation:

Does Organization Stabilize Information
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What happens when we learn new information? A naive starting assumption might be that we simply accumulate information, adding new information to our collection in a purely additive way. By this view, the process of organization connects individual pieces of information together but each piece still maintains its own essential individuality (Howe, 1985, p.36). Subsequent information is merely "added on", much like another bead-on-a-string (Wertheimer, 1945, p.237).

Gestaltists were the first to reject this traditional view (Wertheimer, 1945, p.8). The Gestaltists showed that the pieces of information being received interact with each other to form a structured whole. We actively organize our everyday perceptions into "unitary structured wholes", such as things, figures, events, etc., rather than a mosaic of independent elements. The principles of perceptual organization not only govern simple forms of perception but also govern complex processes such as attending, consolidating, organizing, and storing information

efficiently in memory (Nisbett & Ross, 1980; Helson, 1987/1915; Hothersall, 1984; Kohler, 1947; Coren, Porac & Ward, 1984; Snodgrass & Feenan, 1990; Srull, Lichtenstein & Rothbart, 1985, p. 317).

The completion of this organizational process produces what the Gestaltists called "closure". Zeigarnik (1927/1967) studied how the lack of closure influences the retention of information in memory. Zeigarnik presented subjects with a series of tasks, half of which they were allowed to finish, and half of which were interrupted before they could be completed. The uncompleted tasks were recalled twice as often as finished tasks. Zeigarnik theorized that when a subject sets out to perform a task, they experience tension or a "quasi-need" to complete it. "If a task is not completed, a state of tension remains and the quasi-need is unstilled (p. 306)." This tension or quasi-need facilitates recall of the interrupted task.

While the Gestalt psychologists focused on general principles governing perception, psychologists developed the idea of "schema" to describe how the specific knowledge already acquired would influence the organization of new information. Schema are 'top down' or 'conceptually driven' processing mechanisms that

"structure knowledge into coherent wholes, organize experience, and facilitate supplementation of the data given with information that can be readily retrieved from memory" (Nisbett & Ross, 1980, p.168). The activation of one piece of information in a schema quickly leads to the activation of all the other information that are connected to it within this integrated structure.

Schema are important explanatory devices to help illustrate how existing information assimilates and organizes new information to form a single, unified memory. Once a schema has been formed, it may prove remarkably resistant to attempts to integrate further information. Tversky and Kahneman (1974) refer to this failure in adjustment as "anchoring". A corollary is the primacy principle; information acquired earlier has more impact than that acquired later. Much research in a variety of situations has demonstrated these principles.

Leeper (1935, cited in Schneider et al, 1979, pp.3-4) demonstrated that once perceptual information has been structured into a coherent schema or Gestalt, perceivers continue to perceive and organize information in a manner consistent with that schema.

Leeper redrew an ambiguous picture that could be perceived as either an old woman or as an attractive young woman to emphasize either the old woman or the young woman. Subjects were initially shown one of these redrawings, then the original ambiguous picture was presented. Subjects found themselves "locked in" to the original interpretation and unable to see the other.

Perceivers actively attempt to integrate new information with existing information or schemas. Sulin and Dooling (1974) presented subjects with a passage about a famous person. Some were told that it was about a 'Carol Harris'. Subjects in another group were told the passage described Helen Keller. In the final test, given to all subjects, sentences from the passage were mixed with new sentences which actually described Helen Keller, such as "she was deaf, dumb and blind". After a five minute delay, memory for both groups was quite accurate. One week later, subjects in the Helen Keller group were more likely to answer that they had previously read these new sentences. Sulin and Dooling's results indicate that the passage information is gradually integrated with preexisting knowledge. That is, on the delayed recognition test, subjects responded on the basis of their holistic schematic

knowledge (Alba & Hasher, 1983, p. 218). In a related experiment, Dooling and Christiaansen (1977) found that performance on the final test depended upon whether the Helen Keller information was presented before reading the passage, immediately after reading the passage or just before the final test. Manipulation of information regarding the identity of the main character immediately after the reading led to more errors on the final test. Memory was affected by the introduction of a single piece of information (Wright, 1960, cited in Bingham, 1975).

Similarly, Gestalt social psychologists, such as Asch argue that the first information received establishes a schematic representation or Gestalt to which the next piece of information is assimilated (Asch, 1946, cited in Schneider, Hastorf & Ellsworth, 1979, pp.55 & 180). In a series of experiments, Asch showed that when positive information about a person is presented before negative information is presented, the general impression is more positive than it is when the reverse order is used.

The impact new information has on existing information depends on the degree to which the existing information is organized. Schema resist change once

information has been organized. In a series of experiments, Dailey (1952) tested the effects of making a premature conclusion on an observer's perception of another person. Dailey asked subjects to read several autobiographical sketches and to predict how the people in the sketches would respond to specific items on a personality inventory. Some subjects made predictions after reading half the sketch and again after reading all of it. Other subjects made predictions only after reading the entire autobiography. Dailey compared their observations to how the person in the sketch had actually responded themselves on the personality inventory. The subjects who read the entire sketch at once were significantly more accurate in their predictions of how the stimulus person in each case would respond than the other subjects were, both in their preliminary and in their final predictions. Making a decision after reading only half the information apparently led to the premature organization of information into a coherent whole, thus preventing the subjects from fully incorporating additional information in the second half of the autobiography.

Once information has structured or activated an existing schema, experimental subjects find it difficult to erase that information, even when instructed to do so. For example, in a trial situation opening statements present jurors with the facts and issues. Researchers theorize that opening statements serve to structure or activate existing schema, influencing any further processing and interpretation of new information presented during the trial. Only information that is relevant and important to the currently activated schema will be encoded (Pyszczynski & Greenberg, 1981, pp.434-5; Alba & Hasher, 1983). In a simulated trial, Pyszczynski and Greenberg (1981) found even if the evidence was not exactly as promised in the opening statement, "early hunches" by jurors influenced their responses to individual segments of testimony and final verdicts, despite the fact that jurors are specifically asked not to treat opening statements as evidence.

A judge's cautionary instructions to the jury to ignore or disregard testimony already presented cannot erase or remove its effects (Doob & Kirschenbaum, 1972 cited in Ellison & Buckhout, 1981, pp. 167-171). Carretta and Moreland (1983) tested this on mock

juries. They found that despite a judge's instructions, inadmissible evidence biased subjects' final verdicts and their behaviour during the group discussions.

Carretta and Moreland (pp.291-2) concluded that jurors are either unwilling or unable to negate inadmissible evidence, despite instructions to do so.

Is this resistance to change something that happens as soon as new information is received? Most discussions seem to imply this view by their silence on this point. However, Wickelgren (1977) has made the interesting suggestion that a gradual process of "consolidation" occurs, such that a schema's resistance to change increases over time. Consolidation, he said, goes on for years, the greatest rate of consolidation occurs during the first few minutes following learning, and decreases progressively over time. Wickelgren speculated that as a result of an ongoing consolidation process, the longer a memory has been established, the less susceptible (or fragile) the memory becomes to the normal processes of forgetting or to disruption, e.g., from a head injury or electroconvulsive shock therapy. Squire, Slater, and Chace (1975) demonstrated that electroconvulsive shock on patients with mental disorders produces retrograde amnesia (which is a loss

of memory for events just prior to the shock) for the names of television programs aired one to three years before the treatments, but not for programs aired four to seventeen years prior to the electroconvulsive shock.

Wickelgren's term may be borrowed from work on the neurophysiology of memory which demonstrates the existence of a biological consolidation process which affects the development, maintenance and retrieval of memories. These studies suggest an analogy to a possible "cognitive consolidation" process.

Scientific advances in understanding consolidation processes come from both clinical observations and neuropsychobiological attempts to explain learning and memory in lower animals. Historically, in their "perseveration-consolidation" hypothesis Muller and Pilzecker (1900, cited in Weingartner & Parker, 1984) proposed that neuronal activity following a 'sensory event' continued to 'reverberate' in the brain until a stable memory trace is formed or 'consolidated'. During this initial labile period, the physiological processes underlying memory are subject to interference. Later, Hebb (1949) proposed that this reverberating activity causes actual chemical or

structural changes in the brain making information less vulnerable to disruption (Kalat, 1984; Albert, cited in Weingartner & Parker, 1984; Miller & Marlin, cited in Weingartner & Parker, 1984; Zechmeister & Nyberg, 1982). Trauma from head injuries accompanied by retrograde amnesia, would interrupt the reverberatory stage of memory processing, preventing the actual physical modification of the brain necessary for consolidation (Hebb, 1949; Zechmeister & Nyberg, 1982, p.79).

The concept of "cognitive consolidation" as used in this discussion is different from that of Wickelgren and the neurophysiological analogue in an important way; for both of those processes, consolidation is a gradual function of the passage of time and not dependent on any intervening cognitive activity. The present model links consolidation to an action by the subject. It proposes that during and immediately after the presentation of information, that information is in a state of relative lability and new information can be integrated relatively easily. However, once a subject actively integrates and acts on a body of information, that action renders the schema formed by the information more resistant to disruption by new input.

We define "cognitive consolidation" operationally as a discontinuous change in the resistance to disruption of a schema; this change occurs when a subject is instructed to combine and make a decision based on a set of information, and it manifests itself in an increased resistance to change of the information following such a decision.

The present study explores how we acquire new information. It takes as a starting point the active organizing model originally developed in Gestalt psychology and then further elaborated in modern schema theory. It attempts to extend this model by postulating the concept of a cognitive consolidation process, which is triggered when we integrate and act on information, and whose effect is to render a schema more resistant to change.

The present research will use a mock hiring situation to study cognitive consolidation. In a hiring situation, an employer receives a collection of information about a candidate and then makes a decision based on that information. Research data indicates the presence of a disability reduces the candidate's chances of receiving a positive hiring decision. In an actual field test Farina and Felner

(1973) found that psychiatric patients have greater difficulty obtaining employment. Their subject obtained 32 job interviews, presenting himself as either having travelled for the previous nine months or having been hospitalized in a mental institution for the previous nine months. In the latter condition, the interviewer was "less friendly", described the chances of finding a job at the company as poor and offered fewer jobs. A later experiment by Stone and Sawatzki (1980) supports Farina and Felner's findings. Subjects in Stone and Sawatzki's study were each given the resume of a job applicant with a psychiatric, physical, or no disability present, and with a good or poor work history and then subjects were shown the same taped interview. Their results indicated that job applicants described as having two hospitalizations for nervous breakdowns had a lower probability of being hired despite a good work record.

Specifically, the study addresses the issue of what happens when a piece of information (on the presence or absence of a disability) is added to or removed from a body of information after an initial decision has been made. When additional information is presented after the first decision it should have less

impact on existing schema, if consolidation has occurred. Subjects who decide their candidate is qualified and are willing to hire the candidate based on information that does not include the disability, should not significantly alter those decisions when given additional information about the candidate's disability. Those subjects who were fully informed about the disability and were unwilling to hire the candidate should not significantly alter their decision on being told to ignore the information on the candidate's disability.

Alternatively, the decision process may be less determined by intervening cognitive action than by the context in which information is received. Information is more salient when it is introduced by itself than when it is part of the initial presentation. As a result, such new information would alter the initial schematic representation, modifying subject's subsequent decisions. If this is the case, results should show that subjects uninformed about the disability will then rate their candidate's qualifications and their own willingness to hire more negatively than those who were fully informed about the candidate's disability at the beginning. Conversely,

fully informed subjects should in fact, reverse their negative decisions when specifically directed to ignore information on the candidate's disability.

Method

Subjects

The subjects were 60 introductory psychology students at Algoma University College. They participated in two class groups. Individuals in each group were randomly assigned to either Condition A or Condition B, for a total of thirty subjects in each condition. Subjects received bonus points from the course instructor for participating in the experiment.

Materials

Each subject was given three job applications with interviewer comments written on each form (see Appendix A). In Condition A, the job applications described each applicant's educational and work related background and interests. Interviewer notes varied for each candidate as follows:

Brown: "Applicant is interested in opportunity for advancement"

Johnson: "Applicant pleasant, self possessed and well groomed"

Elliott: "Applicant appears eager and highly motivated"

Subjects in Condition B were given the same application forms for the same applicants. Interviewer notes were identical except for Brown which read: "Applicant is interested in opportunity for advancement. Applicant reports she left last job because she was hospitalized for "emotional problems", but says she is fine now". After reading the three applications, subjects filled out a seven point scale evaluating each applicant's qualifications and indicating the subject's "willingness to hire".

Procedure

At the beginning of the experiment, the experimenter explained, "In this experiment you will each be asked to assume the role of a personnel director responsible for making hiring decisions in a hypothetical company. The purpose of the experiment is to study the critical variables in the hiring process". These instructions were given to all subjects in both conditions.

Coversheet Instructions: The coversheet on each booklet read: "In this experiment we are interested in knowing how a 'prospective employer' like yourself processes information and makes a hiring decision. Your job applicants are applying for the position of Front Desk Clerk at a hotel in Sault Ste. Marie. You will be asked to rate each applicant's qualifications and to rate your "willingness to hire" each of the applicants".

Condition A. In Condition A, each subject was presented with three job application forms. After reading the applications, each subject was instructed to rate their impression of each applicant's qualifications on a Likert scale of -3 to +3 for "definitely not qualified" to "definitely qualified". Each subject was then asked to rate their "willingness to hire" each applicant on a Likert scale of -3 for "definitely no" to +3 for "definitely yes". Subjects were then told to turn the page. On the next page, subjects were instructed to "try and re-evaluate the candidates with the following change: please make your evaluations as you would if the interviewer's notes had ALSO included the following information on JUDY BROWN:

Applicant reports she left last job because she was hospitalized for "emotional problems" but says she is fine now. Subjects were now asked to complete another response form rating their impression of the applicants qualifications and their "willingness to hire".

Condition B. Subjects in Condition B were given the same job applications but with the complete interviewer notes for Brown. After reading the applications, the subjects rated each applicants qualifications and then their "willingness to hire" each applicant. Subjects were then asked to "Please make your evaluations as you would if the interviewer's notes on Judy Brown had included just "Applicant is interested in opportunity for advancement" and NOT "applicant reports she left last job because she was hospitalized for emotional problems, but says she is fine now".

Delayed Recall. One week later both groups of subjects were given a delayed recall test and asked to remember their evaluations of the applicants qualifications and their willingness to hire each applicant when they made their second decision.

Results

Two subjects were removed from the study, one for violating instructions and the second randomly chosen from the other group to equate group numbers, (n=29).

Although subjects were presented with three resumes to simulate an actual employment situation, (see Appendix A) only the amount of information on candidate Brown was manipulated. As expected, there was little variability between the first, second and third decisions in rating candidates Johnson and Elliott for whom no manipulation of information was performed. This can be seen in Table One. However, as Table One also shows, the decisions for Brown do vary; this is most noticeable for subjects in Condition A. The mean scores shown in Figure 1 describe Decision I, II and III on Brown for Question One and Two. As Figure 1 shows having the information on the candidate's disability added or retracted after Decision I, causes subjects' decisions to change in the direction opposite to their first decision.

Insert Figure 1 about here

Only Brown's data was subjected to a repeated measures analysis. Contrary to the hypothesis, both groups changed their ratings over the three decisions. For Question One, there was a significant difference between Decisions I, II and III for Group A but not for Group B ($F(2,28)=13.57$ and $F(2,28)=2.39$, $p<.05$, respectively). Group B's failure to reach significance is probably due to a ceiling effect. See Figure 1. For Question Two, there was a significant difference between Decisions I, II and III for Group A and Group B, ($F(2,28)=10.83$, and $F(2,28)=5.47$, $p<.05$, respectively). See Figure 1.

For Group A, T-tests revealed a significant difference in Decisions I and II for Question One and Two $t(28)=4.70$ and $t(22)=-3.6$ but not between Decision II and Decision III for either question, $t(22)=.20$ and $T(22)=0$ respectively. See Appendix B. This indicates the effect was due to the manipulation of the information, rather than simply repeating the decision. Seven subjects were not present for the follow up test for Group A (Decision III) one week later. Therefore, seven subjects were randomly eliminated from Group A for comparisons between the second and third decision.

For Group B, the same pattern was seen for Question Two with a significant difference between Decision I and Decision II $t(28)=-3.28$, but not between Decision II and III $t(28)=.11$. In summary, subjects in both conditions were responding to the addition or retraction of information following Decision I.

Further analysis was done because an effect occurred. T-tests revealed no significant difference between Decision I Condition A and Decision II Condition B, $t(56)=.23$ and $t(56)=-.25$ for Question One and Two respectively. There is no significant difference between ratings when subjects do not have negative information present (Decision I Condition A) and do have negative information, but are instructed to ignore it (Decision II, Condition B). Both groups of subjects rated the candidate as "definitely qualified".

T tests show a significant difference in a negative direction between Decision II Condition A and Decision I Condition B for Question One, $t(56)=-3.84$. There is a significant difference between having negative information before making a decision compared to having it presented after the first decision. Subjects rate the candidates' qualifications much more

negatively when the information is presented after an initial decision has been made. However, T-tests show no significant difference between Decision II Condition A and Decision I Condition B in Question Two, although ratings are somewhat lower $t(56)=1.41$.

Discussion

The purpose of this study was to examine how we acquire new information. However, the use of a decision task failed to produce evidence that a "cognitive consolidation" of information occurs and increases the schema's resistance to disruption by new information as predicted. In fact, the data showed the opposite effect. Subjects, having made a decision, substantially altered their decision after receiving new information. The effect was due to the manipulation of the information rather than repeating the decision task.

Yet years of research have shown that early-presented information biases the interpretation of later encountered information, influencing final judgments (Nisbett & Ross, 1980). According to Dailey's (1952) findings and courtroom experiments such as Pyszczynski and Greenberg's (1981) once subjects have made their decisions, based on a set of

information, the schema formed by the information should be rendered more resistant to disruption by new input. Nisbett and Ross (1980, p. 45) contend that, if there is any change in the schema, "generally there will be less change than would be demanded by logical or normative standards...". In fact, in the present experiment, once subjects received instructions to ignore or to include additional information, their ratings moved in the direction opposite of their original ratings.

It is difficult to attribute this failure to produce proof of a cognitive consolidation process to the particular task or information used: numerous studies have documented that attitudes toward the mentally ill are exceedingly negative (Farina & Felner, 1973), and a psychiatric disability reliably reduces an applicant's probability of being hired (Stone & Sawatzki, 1980). The interviewer forms an early negative impression of the applicant, based on the presence of a disability, which spreads to other non-impaired characteristics as the interviewer interprets the information to support his decision not to hire (Stone & Sawatzki, 1980, p.97; Wright, 1960, cited in Bingham, 1970).

The pretest appeared to support the existing literature. Subjects in Group B made a negative hiring decision. In the actual experiment however, the net effect of a psychiatric disability was not as negative as anticipated based on the previous research. There are various possible explanations for this finding. One possibility is that evaluations of the applicant's perceived qualifications were not sensitive measures of Group B's attitudes because the key applicant was too well qualified. This resulted in a ceiling effect. The pretest did not detect this. More pretesting and modifications are needed to ensure that each applicant's qualifications (education, work experience and volunteer services) are better balanced. It should be noted that in group B there was a significantly lower "willingness to hire" the applicant.

Another possible explanation is that subjects' are not actively organizing and integrating information as much as a real employer would. It is more likely that subjects may have been responding to the demand characteristics of the experiment, giving the tester what they thought would be the desired response. Several subjects spontaneously expressed the view that the point of the study was to test for hidden bias

towards hiring disabled workers and may have been unwilling to indicate any negative attitudes. Ratings may also reflect a lack of work force experience. Several subjects who indicated they had been in the work force noted the presence of a psychiatric disability would lower the applicant's chances of being hired.

Perhaps the subjects did make valid decisions, but the method of introducing the new information with instructions to ignore or include it, may have produced unusual memorial constraints. Nisbett and Ross (1980) argue that in certain situations in which information is unusual or salient we are more likely to pay closer attention and that information is attended to, modified, encoded, and acted on in direct proportion to its sensory, cognitive and affective salience. "Salience biases refer to the fact that colourful, dynamic, or other distinctive stimuli disproportionately engage attention and accordingly, disproportionately affect judgements" (Tversky & Kahneman, 1974, p.192). In this case, the isolated instructional context in which the information was introduced may have led to the subsequent information about the applicant's history of mental illness having

a strong effect on the initial schematic representation.

In fact, the introduction of new information produced significant contrast effects. According to Jones and Goethals (1972) the new information is compared to information that has already been stored in memory. The early information creates an anchoring effect (Jones & Goethals, 1972; Tversky & Kahneman, 1974). If the new information is different from the preceding information, the discrepancy between the two will be magnified, because of the anchoring effect. For example, "in a series of trait adjectives that are ordered from positive to negative, the later, negative items might be judged more negative because of the anchoring effect of the earlier positive items" (Jones & Goethals, 1972, p.33). As a result, the later-presented information should have a disproportionate effect on the activated schema (Nisbett & Ross, 1980). Subjects who were not informed about the applicant's disability originally, not only altered their "willingness to hire", but also their perception of the applicant's qualifications when new information about the applicant's disability was introduced after the first decision. These subjects responded even more

negatively than subjects who knew about it all along. Similarly, subjects who were asked to ignore information about the disability, altered their decisions, matching the initial decisions made by the group unaware there was a disability. It would appear that information is more salient when it is introduced in isolation than when it is part of a schematic whole.

To sum up, the unexpected findings could be the result of several factors. For one, a ceiling effect may have occurred because the candidate was too well qualified. Subjects mean scores for Decision I and II in Condition B were 72 and 75 respectively, for Question One. The three measures should have better balanced education and work related experience. Another possible explanation is that the experiment may not have produced actual personnel hiring decisions as it was limited to using introductory psychology students as test subjects. Subjects may have been giving the tester what they perceived as the desired response rather than what an employer would actually have done. Finally, the isolated instructional context in which the new information was presented may have made the information more salient than when it was presented as part of a schematic whole. One or more of

these factors may have been operating. This is what is responsible for the obtained results, particularly in the short time frame allotted for subjects to make their decisions.

More time between decisions might have decreased the contrast effect produced by this experiment. According to Jones and Goethals (1972, pp. 33 & 43) contrast effects appear to be facilitated by "successive judgment instructions" especially when "short circumscribed time spans" are involved.

I originally hypothesized that a cognitive process of consolidation exists and is triggered in part by decision making. I expected schema to become resistant to change once a decision had been made although new information would be readily absorbed in the preceding acquisition period. The experimental results, contrary to my hypothesis, showed that schema are amenable to new input even after a decision has been made. Although this experiment did not support the role of decision making in consolidation, it did not disprove the hypothesis that a cognitive consolidation of information occurs. According to the large body of theory and research I reported, once activated or structured, schemata tend to persist beyond what

"common sense or normative considerations might dictate that it should" (Nisbett & Ross, 1980, p. 42). Further experimentation appears to be justified.

A different decision task rather than just the hiring decision used for this experiment could be designed with changes in procedural details. To prevent saliency and contrast effects the individual pieces of information should be presented embedded in other material following the first decision. More time should be allowed between decisions to strengthen consolidation. Further experiments should also test the use of other variables to avoid social implications. Other types of memory tasks such as short-term and long-term memory tasks, problem solving or concept formation tasks that allow subjects to actively organize and integrate information could also be explored.

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- Miller, A.G. (Ed.). (1982). In the eye of the beholder: Contemporary issues in stereotyping. New York: Praeger Scientific. This paper used Miller's chapters on the historical and contemporary perspectives of stereotyping and the social cognition of stereotyping. Miller's book provided citations for Asch's work on the primacy effect and other work on the integration of information.
- Miller, R. R. & Marlin, N. A. (1984). The physiology and semantics of consolidation. In H. Weingartner and E. Parker (Eds.). Memory consolidation: Psychobiology of Consolidation (pp. 85-105). New Jersey: Lawrence Erlbaum Associates. Miller & Marlin explore neurobiological definitions of consolidation and experiments in retrograde amnesia and reactivated memories. They emphasize consolidation as the input of information into passive storage.
- Nisbett, R., & Ross, L. (1980). Human inference: Strategies and shortcomings of social judgment. New Jersey: Prentice Hall. Discusses the limitations and subsequent errors of the human nervous system. It provides the basic concept of

the "active perceiver" and Tversky and Kahneman's heuristic strategies.

Pyszczynski, T., & Greenberg, J. (1981). Opening statements in a jury trial: The effect of promising more than the evidence can show. Journal of Applied Social Psychology, 11(5), 434-444.

Pyszczynski & Greenberg found it is better to exaggerate opening statements even when the evidence cannot support these promises. Opening statements serve to structure schema and the processing of further information, a central idea of schema theory used in this paper.

Schneider, D. J., Hastorf, A. H. & Ellsworth, P. C. Person perception (2nd ed.). Massachusetts: Addison-Wesley Publishing Company. Their book discusses social psychology, particularly stereotypes. Chapter One provided further examples of the perceiver as an active but limited processor of information. Chapter Two provided secondary sources for Asch.

Snodgrass, J.G., & Feenan, K. (1990). Priming effects in picture fragment completion: Support for the perceptual closure hypothesis. Journal of Experimental Psychology: Learning, Memory and

Cognition, 11(2), 316-345. Snodgrass & Feenan experimented with the optimum amount of information needed to produce closure. This definition of "closure" is not used by this paper but their definition of "wholes" was useful.

Squire, L. R., Slater, P. C. & Chace, P. M. (1975).

Retrograde amnesia: Temporal gradient in very long term memory following electroconvulsive therapy. Science, 187, 77-79. Their experiment on memory for TV shows following ECT showed retrograde amnesia affected recent memories but not long term ones. It provides support for the ongoing process of consolidation defined by Wickelgren (1977) and defines consolidation as a stabilizing process, essential for the definition used by this paper.

Srull, T.K., Lichtenstein, M., & Rothbart, M. (1985).

Associative storage and retrieval processes in person memory. Journal of Experimental Psychology: Learning, Memory and Cognition, 11(2), 316-345. Their experiment was not useful but linked processes involved in person perception to those used in other types of cognitive processing.

Stone, C. I., & Sawatzki, B. (1980). Hiring bias and the disabled interviewee: Effects of manipulating work history and disability information of the disabled job applicant. Journal of Vocational Behaviour, 16, 96-104. These researchers found that while subjects rated all job applicants (abled/disabled/good work history/poor work history) positively during a taped interview, when it came to hiring the applicant the disabled job applicant (even with a good work history) was turned down. These results support the use of a psychiatric disability as the independent variable in this experiment.

Sulin, R. A., & Dooling, J.D. (1974). Intrusion of a thematic idea in retention of prose. Journal of Experimental Psychology, 103(2), 255-262. Sulin and Dooling's experiment was to test Bartlett's theory that semantic errors increase with time, as episodic details are lost and the subject has to rely on general meaning. Their experiment provides an example of how new information is integrated with pre-existing information in memory.

Weingartner, H., & Parker, E. S. (Eds.). (1984). Memory consolidation: Psychobiology of cognition. New

Jersey: Lawrence Erlbaum Associates. Weingartner & Parker explore various papers on neurobiological consolidation and its importance to modern memory theories. It is central to the definition of "cognitive consolidation" developed by this paper.

Wertheimer, M. (Ed.). (1945). Productive thinking.

Connecticut: Greenwood Press. Wertheimer outlines a difficult theory of how to improve your thinking. It was not relevant to the paper apart from a few notations on associationism and Gestalt psychology.

Wickelgren, W.A. (1977). Learning and memory. New

Jersey: Prentice-Hall. A book about learning and memory. This paper focuses on the chapter about consolidation as an ongoing neurobiological process that reduces trace fragility.

Zechmeister, E.B. & Nyberg, S.E. (1982). Human

memory: An introduction to research and theory.

California: Brooks/Cole Publishing company. This paper took special interest in the chapters on schema theory and neurobiological consolidation which helped to define each topic.

Zeigarnik, B. (1967). On finished and unfinished

tasks. In W.D. Ellis (Ed.), A source book of

gestalt psychology (pp.300-314). New York:
Humanities Press Inc..(Original work published
1927). Zeigarnik interrupted subjects before they
could complete a task and discovered this
interruption increased subject's recall.
Zeigarnik's experiment proves that Gestalt
principles of perceptual organization can govern
complex cognitive processes.

Author Notes

I would like to thank Dr. Thomas Allaway for his assistance and invaluable comments on previous drafts of this paper. I would also like to thank Dr. Cheryl Reed-Elder for her editing.

Table 1

Means & Standard Deviations of Applicants' Qualifications

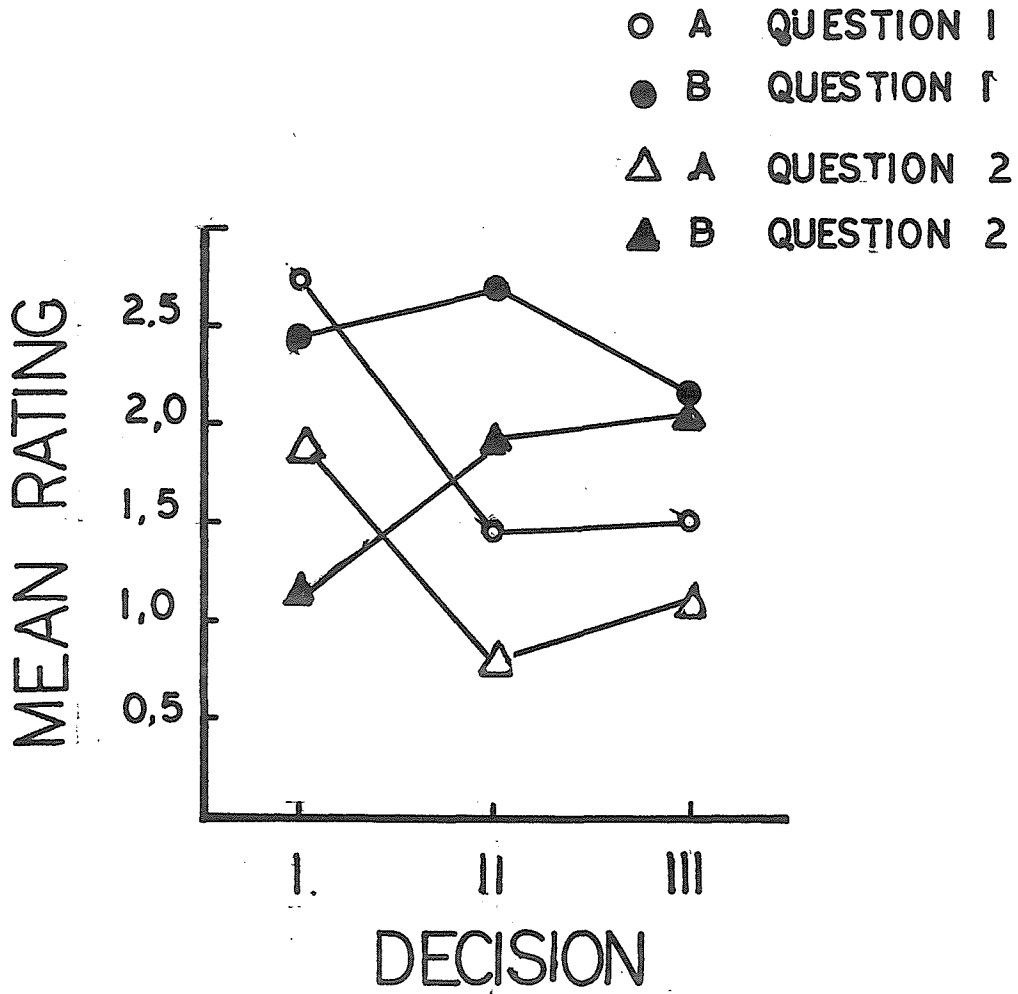
Candidate	Decision I		Decision II		Decision III	
	X	SD	X	SD	X	SD
Condition A						
Brown	2.62	.56	1.48	1.27	1.52	1.12
Johnson	1.41	1.21	1.44	1.12	1.43	.99
Elliott	1.48	.98	1.68	.92	1.34	1.02
Condition B						
Brown	2.48	.82	2.58	.68	2.17	.84
Johnson	1.20	1.01	1.27	.99	1.20	1.26
Elliott	1.41	1.01	1.44	1.02	1.55	.98

Means & Standards Deviations of "Willingness to Hire"

Candidate	Decision I		Decision II		Decision III	
	X	SD	X	SD	X	SD
Condition A						
Brown	1.86	1.12	.79	1.31	1.13	1.01
Johnson	1.24	1.27	1.17	1.16	1.08	1.08
Elliott	1.27	.79	1.44	.86	1.13	.96
Condition B						
Brown	1.20	1.29	1.93	1.38	2.03	1.01
Johnson	1.17	1.10	1.13	1.02	1.20	1.23
Elliott	1.10	1.11	1.03	.98	1.51	.98

Figure Caption

Figure 1. Subject's mean ratings of applicant Brown's qualifications and their "willingness to hire" as a function of decision time.



Appendix A

**SPEER COMPANY
EMPLOYMENT APPLICATION**

POSITION APPLYING FORFront Desk Clerk.....

NAMEJudy Brown.....
ADDRESS32 Windsor St.....
CITYSault Ste. Marie.....
PROVOntario.....
POSTAL CODEP6A 4L6.....
TELEPHONE949-8691.....

EDUCATIONAL BACKGROUND

INSTITUTION	LOCATION	PROGRAM	DIPL/DEGREE	FROM/TO
Lake Superior State University	S.S.Marie Michigan	English & Marketing	B.A.	1982-1987
Sir James Dunn C&VS	S.S.Marie Ontario	Gr. 13		1977-1982

EMPLOYMENT HISTORY

COMPANY NAME & ADDRESS	JOB TITLE & DESCRIPTION	FROM/TO
Peoples' Life Insurance Co S.S. Marie, Ont	Sales Representative	Dec 90 to Jun 91

Provincial Motel Association S.S. Marie, Ont.	: Ass't Conference Coordinator : organizing of details of major : provincial yearly convention, : coordinating between executive : assistant and board	: May 90 : to : Nov 90 : :
Comfort Inns S.S. Marie, Ont	: Front Desk Clerk : dealt with all aspects of guest : relations	: Sep 88 : to : Oct 90 : :
Steel City Marketing Resources S.S. Marie, Ont	: Research and Telemarketing : contract to research local hotel : facilities, involved surveys, : interviews, final report	: Aug 87 : to : Sep 88 : :

SKILLS

bilingual, fundraising, conference planning, public speaking, written and oral communications, organizational and research methods, scheduling, basic bookkeeping, typing, computer skills - wordprocessing, general office practices and equipment

WORK REFERENCES

COMPANY	COMPANY
PERSON	PERSON
POSITION	POSITION
TELEPHONE	TELEPHONE

*** available upon request

INTERVIEWER COMMENTS

Applicant is interested in opportunity for advancement. Applicant reports she left last job because she was hospitalized for "emotional problems," but says she is fine now.

**SPEER COMPANY
EMPLOYMENT APPLICATION**

POSITION APPLYING FOR Front Desk Clerk.....

NAME Nancy Johnson
ADDRESS 3 George Ave
CITYSault Ste. Marie
PROV Ontario.....
POSTAL CODEP6B 4J9.....
TELEPHONE 949-3382.....

EDUCATIONAL BACKGROUND

INSTITUTION	: LOCATION	: PROGRAM	: DIPLOMA/ : DEGREE	: FROM/ : TO
Algoma University College	: S.S.Marie : Ontario	: Psychology	: Hons. : B.A.	: 1987- : 1992
Bawating C&VS	: S.S.Marie : Ontario	: Gr. 13 : Ont Scholar:		: 1982- : 1987
	:	:	:	:

EMPLOYMENT HISTORY

COMPANY NAME & ADDRESS	: JOB TITLE : & DESCRIPTION	: FROM/ : TO
Zellers S.S.Marie, Ont	: Sales Clerk : assist customers in the purchase of : merchandise and providing : information about merchandise - : departments: toys, pet supplies,	: 1986 : to : now
	: sporting goods, patio, luggage, : picture frames, and automotive - : includes direct contact with the : public as well as the ability to : communicate by way of telephone -	: : : : :

	: replacement cashier	:
	:	:
	:	:
	:	:
	:	:
	:	:
	:	:

SKILLS
research and report writing skills, computer and typing,
interaction with the public and fellow staff, telephone and
paging system, ability to handle cash, active volunteer with
United Way

WORK REFERENCES

COMPANY	COMPANY
PERSON	PERSON
POSITION	POSITION
TELEPHONE	TELEPHONE

*** available upon request

INTERVIEWER COMMENTS

Applicant pleasant, self possessed and well groomed.

**SPEER COMPANY
EMPLOYMENT APPLICATION**

POSITION APPLYING FORFront Desk Clerk.....

NAMEKaren Elliott.....
ADDRESS511 Shannon Rd.....
CITYSault Ste. Marie ..
PROVOntario.....
POSTAL CODE ...P6A 7K3.....
TELEPHONE254-7795.....

EDUCATIONAL BACKGROUND

INSTITUTION	LOCATION	PROGRAM	DIPLOMA/ DEGREE	FROM/ TO
Algoma University College	S.S.Marie Ontario	English		1988- 1989
Bawating C&VS	S.S.Marie Ontario	Gr. 12		1982- 1986

EMPLOYMENT HISTORY

COMPANY NAME & ADDRESS	JOB TITLE & DESCRIPTION	FROM/ TO
Crown Tire Co S.S.Marie, Ont	Accounts Payable Clerk keep track of bills owing, cash and cheques, do bank balances, reconcile accounts, maintain computer records	Jan 91 to now
Met Life Insurance S.S.Marie, Ont	Customer Service Assistant receptionist/secretary	Jun 89 to Dec 90

Please circle your response for each candidate on the following "Guide to Application Evaluation".

1) To what extent is the applicant qualified for the position?
Judy Brown:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

Nancy Johnson:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

Karen Elliott:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

2) Would you hire this applicant?
Judy Brown:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Nancy Johnson:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Karen Elliott

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Now you will be asked to try and re-evaluate the candidates with the following change: please make your evaluations as you would if the interviewer's notes on Judy Brown had included just "applicant is interested in opportunity for advancement" and **NOT** "applicant reports she left last job because she was hospitalized for "emotional problems", but says she is fine now." Answer as carefully and honestly as possible! Please circle your response for each candidate on the following "Guide to Application Evaluation".

1) To what extent is the applicant qualified for the position?
Judy Brown:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

Nancy Johnson:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

Karen Elliott:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

2) Would you hire this applicant?
Judy Brown:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Nancy Johnson:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Karen Elliott:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Now you will be asked to try and re-evaluate the candidates with the following change: please make your evaluations as you would if the interviewer's notes had ALSO included the following information on **Judy Brown**: "Applicant reports she left last job because she was hospitalized for "emotional problems", but says she is fine now." Answer as carefully and honestly as possible! Please circle your response for each candidate on the following "Guide to Application Evaluation".

1) To what extent is the applicant qualified for the position?
Judy Brown:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

Nancy Johnson:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

Karen Elliott:

-3	-2	-1	0	1	2	3
.....
definitely		not	neutral	qualified		definitely
not qualified		qualified				qualified

2) Would you hire this applicant?

Judy Brown:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Nancy Johnson:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Karen Elliott:

-3	-2	-1	0	1	2	3
.....
definitely		no	undecided	yes		definitely
no						yes

Appendix B

Table 2

T-test Summary Table

Decision	Question 1			Question 2		
	I	II	III	I	II	III
Two Independent Samples A & B	0.82	-5.20	-2.50	2.40	-3.80	-3.33
Two Matched Samples A	4.70	0.20	4.95	4.80	0.00	4.34
Two Matched Samples B	-1.42	2.27	1.47	-3.60	0.11	-3.28
	Question 1			Question 2		
Two Independent Samples AI & BII		0.23			-0.25	
Two Independent Samples AII & BII		-3.84			1.41	