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Abstract

This research examined the effects semantic information and availability of attention on source decisions. A doctor character and a construction worker character presented statements consistent, inconsistent, and neutral in regards to their profession and stereotypes. The instance of revealing the profession of the 2 characters was done at encoding or at retrieval. The availability of attention was only manipulated during test as being full or divided. Divided attention decreased source memory for stereotypical items, profession doctor items, profession construction worker items, and neutral items. There were more misattributions for profession doctor consistent and inconsistent items when schema was available at test only. Overall, profession doctor items presented by the doctor and profession construction worker items presented by the construction worker were remembered better than inconsistent items. A bias calculation indicated more bias to attribute items in a schema consistent manner, regardless of actual source. The results indicate the encoding schema protects against reliance on schematic information to make a source decision, and dividing attention depletes source memory availability. The effects of biased guessing versus criterion shift in altering source attributions are discussed.

Source Attributions and Semantic Memory: Effects of Stereotypes

Source monitoring refers to "the set of processes involved in making attributions about the origins of memories, knowledge, and beliefs," (Johnson, Hashtroudi, & Lindsay, 1993, p.3). Successful source monitoring enables the individual to accurately testify in court, avoid plagiarism and remember whether or not medications have been taken, to name just a few natural contexts. However, schemas, stereotypes, and cognitive ability may influence the decision processes involved in source monitoring (Sherman & Bessenoff, 1999), especially since it is theorized that source monitoring utilizes prototypical concepts. For example, when considering the source of a particular statement, a comparison of the aspects of the memory is taken (e.g., more perceptual and contextual information in general than semantic detail) and these qualities may be matched with available schemas (Johnson et al., 1993). The interplay between one's ability to accurately monitor source while influenced by schemas and cognitive loading is the focus of the present study.

According to Johnson et al.(1993), people commonly make quick (or heuristic) memory discriminations in the process of remembering with controlled (or systematic) processes occurring less frequently. In judging the source of a memory heuristically, people use criteria based more on familiarity, inferences, readily available information, and schemas, whereas systematic processes operate by inspecting perceptual and contextual details (Chaiken, Lieberman, & Eagly, 1989) along with heuristic processes (Hicks & Marsh, 1999; Johnson et al., 1993; Johnson & Raye, 2000). In addition to deciding whether the heuristic or systematic processing of a memory is appropriate, the individual also has to make distinctions between internally and externally generated

memories. There are three general source monitoring instances: internal-internal discriminations, internal-external discriminations, and external-external discriminations. The manner in which specific characteristics of the memory trace are evaluated depends on the nature of the decision processes. On average, a memory with more sensory (sound and color) and contextual (spatial-temporal arrangement) characteristics is likely to be attributed to an external source, whereas a memory with more cognitive operations (internal thoughts or imagination) or semantic (gist) details will be attributed to an internal source (Johnson et al., 1993). In using these criteria, the source decision depends upon averages, or prototypes, of the qualities of the memory. The particular interest of this study is the individual's ability to make external-external discriminations.

To make an external-external source attribution, the decision may rely on the matching of sensory and contextual information with an appropriate schema. Consider trying to decide whether Sally or Mandy made a statement, an external-external decision. If your memory includes a particular location where the conversation took place, and this particular location is only consistent with your schema for Sally, then you will ascribe the statement to Sally. In this example of heuristic decision making, the "Sally Schema" as represented in the mind strongly influences the final decision. However, if the source attribution has important consequences (e.g., information for scientific research or prison time) then more systematic, rigorous criteria would be used in addition to the schema heuristic. The perceptual and contextual details of the location would have to be scrutinized more thoroughly. You may only accept Sally after remembering the specific details of the location that were unique to the date the statement was made, in addition to her physical and vocal characteristics (Johnson et al., 1993).

Schemas and stereotypes are two examples of conceptual information that are often used heuristically. Schemas are a "configuration of general knowledge about objects and events," (Haberlandt, 1999, p.98). They represent our prototypical expectations of situations, people, and objects based on prior knowledge (Bayen, Nakamura, Dupuis, & Yang, 2000; Haberlandt, 1999). As previously discussed, this prior knowledge is hypothesized to influence source decisions (Bayen et al., 2000; Johnson et al., 1993). Bayen et al. (2000) assert people may use two methods of source-identification: matching perceptual details remembered to the source and guessing based on schemas. If the source asserts stereotypical-consistent information, then schemas are used in source attribution if sufficient information is not remembered. In guessing the source, individuals make assumptions according to their schemas about the information remembered then guess accordingly. Referring back to Sally and Mandy, the heuristic decision was a guess based on the available schema of Sally.

From the evidence that people make schema-based guesses in recognition tests (e.g., Brewer & Treyens, 1981; Erdfelder & Bredenkamp, 1998; Grasser & Nakamura, 1982; Grasser, Woll, Kowalski, & Smith, 1980; Locksley, Stangor, Hepburn, Grosovsky, & Hochstrasser, 1984; as cited in Bayen et al., 2000), Bayen et al. formulated the guessing hypothesis which states that when a source covaries strongly with certain information (schemas and stereotypes), that information is consulted to make source decisions. According to the guessing hypothesis, then, the use of schemas as source cues will fail when a source behaves in a manner inconsistent with the schema (e.g., a bully being nice). However, research shows that stereotype-inconsistent information can be remembered just as well and often better than consistent information (Bayen et al., 2000;

Mather, Johnson, & DeLeonardis, 1999; Sherman & Bessenoff, 1999), suggesting that schemas effect episodic memory beyond mere guessing (Bayen et al., 2000). Three hypotheses are described by Bayen et al. to explain superior memory for stereotype-inconsistent information: the attention hypothesis, the schema-copy-plus-tag model, and the associative model.

The attention hypothesis (e.g., Brewer & Treyens, 1981; Erdfelder & Bredenkamp, 1998; Friedman, 1979; as cited in Bayen et al., 2000) asserts that schema inconsistent information receives more attention and is therefore better remembered. The schema-copy-plus-tag model (Grasser, Gordon, & Sawyers, 1979; Grasser & Nakamura, 1982; Grasser et al., 1980; as cited in Bayen et al., 2000) offers a reason why inconsistent information would be distinctive in memory. Because there is a contrast between the activated schema and what is being encountered, the inconsistent information is stored separately from the schema in memory, thus making it memorable. Finally, the associative model (e.g., Hastie, 1980; Hastie & Kumar, 1979; Srull, 1981) suggests that inconsistent information forms more associative links within the memory thereby creating improved memory for stereotype-inconsistent information.

As noted by Sherman and Bessenoff (1999), hypotheses that inconsistent information for episodic memory will be better recalled or recognized have been extensively researched, but the effect of schema and stereotype-inconsistent and consistent information with source memory is under studied. The following three studies considered semantic influences on source memory.

Mather et al. (1999) investigated the effects of self-focusing and age on participants' reliance on stereotypes in source decisions. This investigation is unique in

that the authors presented two sources that have a primary and a secondary schema associated with them, in addition to stereotype-inconsistent information. The procedure consisted of two women speaking on videotape. Each woman had a primary schema that was explained to the participant before encoding and presented statements consistent with that primary schema, inconsistent statements, statements from her secondary schema, and filler statements. For example, one woman may say 12 Democratic statements for the primary schema, six Democratic-inconsistent (or Republican) statements, six statements about being an athlete, and four filler statements. One subset of participants was also instructed to reflect on how strongly they thought the speaker felt about the statements, and another subset was instructed to focus on how they personally felt about the speaker's statements. In addition to varying focus, participants of different ages were tested as young (17-21) or old (62-85). At test participants read all 48 statements along with 24 new statements proportionally broken down into dominant schema-consistent and secondary schema-consistent.

Results from Mather et al. (1999) showed main effects for age and focus. Older participants and self-focus participants tended to use stereotypes more often. Another main effect of age and focus existed for correct source attribution of schema-inconsistent information. Self- focused and older adults made incorrect source attributions for inconsistent information more than other-focus and younger adults, suggesting a strong reliance on stereotypes to make source attributions.

Bayen et al. (2000) hypothesized that source memory for unexpected information will exceed source memory for expected items only if schemas are activated at encoding. They use a multinomial model to measure source attribution that includes true source

memory and guessing to test their hypothesis. Experiment 1 tested people's reliance on schemas to make source attributions about scenes. College participants were presented with object names paired with one of the two scenes ("bedroom" or "bathroom"). Eighteen items were fairly unexpected for the paired scene, and 18 were fairly expected for the scene. Later the participants made a source decision as to the scene the object was originally paired with or if the object name was new. The results indicated that when the object name was expected for bedroom there was a significant probability of guessing bedroom and vice versa, regardless of the true source. Also, their measure of pure source memory indicated that source memory was equivalent for items in expected and fairly unexpected sources.

Experiment 2 used professional groups as the schema to retest the guessing hypothesis that "schema-based guessing of the source occurs when items are expected for the source that presented them… no guessing bias should occur when participants cannot draw on a schema" (p.489). The authors added neutral items to the list to test whether schema-based guessing would occur when no schema is useful. College participants were presented with 48 statements for Tom the Doctor and Jim the Lawyer. Each character, or source, presented equal numbers of doctor statements, lawyer statements, and equal expectancy statements. However, participants did not know the professions for each source during the encoding phase. At test, the participants were told that Jim was a lawyer and Tom was a doctor and to make a source decision about the statements they had been presented with previously. The results indicated that correct source identification was best when the source presented expected items, and no significant

difference was found for equally expected items. However, this advantage for schema consistent items was found to be due to guessing, rather than in true source memory.

The Bayen et al. (2000) study introduced valuable data on schema-consistent information, mainly that participants will use schemas or prior knowledge in addition to, or to compensate for, a lack of source memory. These findings confirm Johnson et al.'s (1993) source monitoring framework. However, source memory for unexpected items was not significantly better than for expected items, and the authors postulated that use of items that are more than "somewhat" unexpected may produce significant results. Sherman and Bessenoff (1999) explored items with salient differences in expectancies.

Johnson et al. (1993) predicted that time constraints or divided attention would diminish encoding of memorial details and restrict decision processes. Interference in either of these stages will disrupt source memory. Sherman and Bessenoff (1999) examined the effect of cognitive load during retrieval on source attributions while also manipulating the stereotypicality of the statements made. Their stimuli included two lists of friendly and unfriendly behaviors. Participants were told at encoding that the experimenters generated the first list and the second list depicted actions of a skinhead or a priest named Bob. On day one, participants read both lists. The second list included an equal number of friendly, unfriendly, and neutral items that had been reported by Bob. Depending on the depiction of Bob by the experimenters (skinhead or priest), some of the statements were stereotype-consistent and some stereotype-inconsistent. At test, one day later, the items from List 1, List 2, and 30 new items (List 3) proportional in number as consistent, inconsistent, and neutral were presented. Participants were told to call any List 2 items old, and List 1 and List 3 items new. In addition, some participants were

under cognitive load. Results showed that participants under normal retrieval conditions misjudged the source (or list) equally as much for consistent and inconsistent information. However, when cognitive capacity was low, participants showed effects of familiarity and schemas. Misattributions from List 3 were equally likely for consistent and inconsistent information, but stereotype-consistent items from List 1 were more commonly misjudged as old (i.e., belonging to List 2). These results indicated that when familiarity is high and cognitive availability is low, participants will rely on stereotypes to make source attributions.

The role of cognitive control in the application of stereotypes in source monitoring is not so clear. Sherman and Bessenoff (1999) demonstrated that people were more likely to incorrectly apply stereotypes about sources only under a cognitive load. This data is consistent with other social-cognitive research which argues that people will utilize stereotypes in everyday behavior when full cognitive control is less available to oppose the use of stereotypes (i.e., under time pressure or divided attention). However, the Bayen et al. (2000) study demonstrated that under full cognitive ability, people incorrectly applied schematic knowledge about a source's profession. Bayen et al. argued that people strategically applied this information only when the target item being judged was consistent with one of the source's professions. Yet the description of this strategy is consistent with its characterizations as a systematic source decision process (Johnson et al., 1993; Johnson & Raye, 2000). More systematic decision processes should be most affected by the availability of cognitive capacity. Mather et al. (1999) also found similar schematic bias in source decisions under full attention.

Thus, full cognitive control is useful in reducing the incorrect application of stereotypes (e.g., Sherman & Bessenoff, 1999), but not useful in reducing the incorrect application of profession schemas (Bayen et al., 2000). One plausible hypothesis is that in the Bayen et al. paradigm, people under divided attention may not show a profession-related guessing bias. If this bias is the result of a systematic, controlled decision process, the depletion of cognitive resources should reduce the use of this process. The effect of divided attention, then, might actually remove the bias, in addition to reducing true source memory accuracy. Sherman and Bessenoff's results would suggest the opposite prediction. Divided attention would presumably increase the bias by causing an even greater reliance on profession schemas during the source test. This prediction is consistent with work showing that schemas are activated and used somewhat automatically (Sherman & Bessenoff, 1999).

One major difference between these two studies was availability of the schematic information concerning the sources. In the Sherman and Bessenoff (1999) study, the information was available at encoding, whereas this information was only made available before the test phase in the Bayen et al. (2000) study. Using Bayen et al.'s paradigm, Hicks (2001) has shown that when the professions of the two sources are known before encoding, the profession-related guessing bias is diminished. This condition is more analogous to the Sherman and Bessenoff study. Therefore, a more complete prediction for the current study is that a profession-related bias is more likely under full attention only when the professions are known during encoding. Such a result would suggest that a schematic source bias is present as the result of either an increased or decreased cognitive load, depending entirely on when the schematic information itself was learned.

The current study was designed to provide a test of these hypotheses. A source monitoring context that incorporates features of the Mather et al. (1997) study, the Sherman and Bessenoff (1999) study, and the Bayen et al. (2000) study will be used. People will be exposed to statements by, and descriptions of, two sources: a doctor and a construction worker. Each source will be associated with an equal number of profession-consistent and inconsistent information, as in the Bayen et al. study. Also, each source will be associated with a smaller number of statements consistent with the other source's profession to ensure some ambiguity in conditions when the profession information is not available during encoding. Additionally, as in the Sherman and Bessenoff study, each source will be associated with stereotypes consistent with his profession (e.g., "My son goes to Harvard" for the doctor) and an equal number of inconsistent with his profession (e.g., "I read the magazine Popular Mechanics"). The present study, however, introduces a difference in socioeconomic and education levels of the two sources. This difference may increase the effectiveness or use of stereotypes. Finally, each source will be associated with a number of neutral statements that have nothing to do with his profession or any profession-related stereotypes (e.g., "I like broccoli").

For neutral items, as in the Bayen et al. (2000) study, misattributions should not follow a particular pattern. Because these neutral items do not match any available stereotype or schema, they will be evaluated with different decision criteria. Divided attention may reduce source memory for these items in general, but no interaction is anticipated. Also, this design provides an opportunity to establish whether or not a typicality effect will be produced. Although Mather et al. (1997) did not find a source

memory difference for schema-inconsistent versus consistent information items, the general literature on the use of schemas suggests that there should be a difference (e.g., Bower, Black, & Turner, 1979). When the profession schema is available at encoding, profession-inconsistent items may actually be remembered better than profession-consistent statements. This would be the result of inconsistent information being considered as a contrast to the expectation created by the available schema. Because the contrast between the schema and a schema-inconsistent item will not occur at encoding, no such advantage should be found when the profession is given only at retrieval. For stereotypical and profession items, an interaction is expected, and it is unclear whether main effects will result. It is expected that when the schema is available at encoding, there will be essentially no bias under full attention and some bias under divided attention. When the schema is available at test only, it is expected that there will be less bias under divided attention than full attention.

Norming Study

Method

Participants. One hundred and twenty undergraduate students (males and females) were recruited from Louisiana State University and given extra credit for their participation. Participants were tested in groups of 5-15 people, and the sessions lasted approximately 25 minutes.

Materials. Two lists consisting of 54 items each: 11 stereotype-consistent for the doctor (e.g., I enjoy yachting.), 11 stereotype-consistent for construction worker (e.g., My wife says I've got a foul mouth.), 21 profession-consistent for the doctor (e.g., I wear a mask to combat disease.), 21 profession-consistent for the construction worker (e.g., I

bring my lunch to work.), and 10 neutral items (e.g., My favorite color is red.). Beside each statement was a scale ranging from 1-7 where 1 was defined as most likely construction worker, 4 was equal likeliness, and 7 was defined as most likely doctor. One list consisting of all 108 items with the choices "old" and "new" beside each statement was used as the recognition test. One compact disc with a random sequence of digits spoken at a regular interval by a male voice with 3 odd digits occurring every 30-45 seconds, and one compact disc with a random series of one high and one low pitch tone played at a regular interval with three high pitched tones occurring every 30-45 seconds were used with the experimental groups.

Design and Procedure. This is a norming study to ensure statements given by the doctor and construction worker are considered stereotype and schema- consistent or inconsistent and to identify the best procedure for dividing attention. Participants were given the list consisting of 54 items randomly presented. The participants were instructed to rate each statement on a scale from 1-7. After rating the statements, 60 participants were given a memory test under one of the two cognitive loading procedures. Thirty participants were asked to listen for three odd digits in a row, and 30 were asked to listen for three high pitched tones in a row. All participants were asked to indicate hearing the target by placing a mark on the left margin of their paper. The attention-dividing task occurred simultaneously with deciding if the presented statements were old or new. A control group of 60 participants did not complete the recall/divided attention task.

Results

An average of the ratings was computed, and any item with a score greater than or equal to 5 was considered doctor consistent. Any item with an average of 3 or less was

considered construction worker consistent. Any item with an average rating greater than 3 and less than 5 was considered neutral. From the scores of the original 108 items, 80 were used in the Experimental Study(see Appendix for complete list): 16 profession-consistent for the doctor, 16 profession-consistent for the construction worker, 12 stereotype-consistent for the doctor, 12 stereotype consistent for the construction worker, and 24 neutral items.

The average number of incorrect attributions of old or new was calculated for numbers versus tones to identify the most efficient way to divide attention. There was no statistical difference in the number of errors made, indicating each method divided attention equally as well. The tones were used in the experimental design because they were more uniform, easier for the participants to hear, and nonverbal.

Experimental Study

Method

Participants. One hundred thirty-seven undergraduate students (males and females) from Louisiana State University who had not participated in the Norming Study were given extra credit for participation. Participants were tested in groups of 1-10 people. Thirty of these participants had full attention during test with schema available at encoding, 42 had divided attention at test with schema available at encoding, 30 had full attention at test with schema available at test only, and 35 had divided attention at test with schema available at test only. Experimental sessions lasted 20-30 minutes.

Materials. A Super Lab Pro (Cedrus Corporation, 1999) presentation was used to present statements made by the doctor (Phillip) and the construction worker (Harry).

Two versions of the presentation were produced for counterbalancing purposes. Both characters presented 40 statements in random order for a total of 80 statements presented to the participant. Of these 40 statements, 8 are profession- consistent; 8 are profession-inconsistent; 6 are stereotype-inconsistent; 6 are stereotype-consistent and 12 are neutral. Each screen of the presentation included a picture of the character, the character's name, and the statement in size 42 font. The pictures of the two men were in black and white and of similar looking Caucasian middle-aged men standing in front of nondescript backgrounds. The names of Harry and Phillip were randomly assigned to the two pictures, but each picture remained with the same name throughout every presentation.

After the presentation, participants were given a sheet of paper with 76 statements (4 statements are neutral fillers at the start and end of the presentation); beside these statements was a Likert scale ranging from 1-6. One is defined as "very sure Phillip," 2 is "somewhat sure Phillip," 3 is "guessing Phillip," 4 is "guessing Harry," 5 is "somewhat sure Harry," and 6 is "very sure Harry." None of the 76 statements were new items. The compact disc with the series of high and low pitched tones was used in the divided attention groups.

Design and Procedure. A 2 (divided attention vs. full attention) x 2 (schema available at encoding vs. schema available at test) x 3 (stereotype consistency- low, neutral, high) design was used in the present study.

First, participants were given the consent form, asked if there were any questions, and then asked to read and sign the consent form. The participants were then given the following information: "You are about to see some statements made by two different men- Harry and Phillip. Please pay careful attention to the sentences because you will be

asked to remember them at a later time." In addition to these instructions, participants in the condition where source was available at encoding were told that Phillip is a doctor and Harry is a construction worker. Eighty statements were shown to the participants with the name and a picture of the character preceding the statement (e.g., Phillip: "My son goes to Harvard"). The two statements at the start and the two at the end were neutral filler items. All statements were presented one at a time in random order for approximately 6 seconds.

After the presentation, a list with 76 items was handed out. Participants were then given instructions to circle one of the six possible choices. If the group was in the condition where source is available at test only, the experimenter explained that Phillip is a doctor, and Harry is a construction worker. If the group was under divided attention, they were also given the following instructions: "While deciding if Phillip the doctor or Harry the construction worker made the following statements, I will play an audio tape. A series of tones will be played, and you are to place a mark on your paper with your pencil any time 3 high pitched tones occur in a row." After the instructions were given for the divided attention groups, the participants performed two practice sessions were they became familiar with the 2 tones and practiced listening for 3 high pitched tones in a row before starting. All participants were given up to 20 minutes to complete the task. After the entire group was completed, the experimenter collected the data, gave extra credit slips, and answered any questions from the participants.

Results

A 2 (item type: doctor vs. construction worker) X 2 (attention: full vs. divided) X 2 (schema availability: encoding vs. test) analysis of variance was performed on the

proportion of doctor correct attributions versus construction worker correct attributions for profession, stereotype, and neutral items. All reported means are marginal means of correct performance unless otherwise noted. For profession doctor items there was a main effect of schema $F(1,133) = 5.02, p < .05$ such that performance with the schema available at encoding ($M = 75.9\%$) was superior to performance with schema available at test only ($M = 68.6\%$). There was a main effect for attention $F(1,133) = 5.70, p < .05$ such that performance was better when attention was not divided ($M = 76.1\%$) compared to divided attention ($M = 68.4\%$). There was a third main effect for profession doctor items of source $F(1,133) = 16.07, p < .01$ such that profession doctor statements made by the doctor were remembered better ($M = 77.9\%$) than profession doctor statements made by the construction worker ($M = 66.6\%$). A source by schema two-way interaction occurred for profession doctor statements $F(1,133) = 9.80, p < .01$ such that no change occurred with doctor presented statements comparing schema at encoding ($M = 77.1\%$) versus test ($M = 74.7\%$), but a reduction in performance did occur with construction worker presented profession doctor items with the schema available at encoding ($M = 78.7\%$) versus test ($M = 58.6\%$).

Profession construction worker items showed similar patterns. There was one main effect of source $F(1,133) = 16.87, p < .01$ such that profession construction worker statements made by the construction worker were remembered better ($M = 81.9\%$) than profession construction worker statements made by the doctor ($M = 72.2\%$). A two-way interaction of source by schema $F(1,133) = 9.42, p < .01$ such that no change occurred with construction worker presented statements comparing schema at encoding ($M = 81.0\%$) versus test ($M = 82.7\%$), but a reduction in performance did occur with doctor

presented profession construction worker items with the schema available at encoding ($M = 78.6\%$) versus test ($M = 65.8\%$). There was almost a significant main effect for attention ($p = .054$). There was, however, a strong trend towards diminished performance under divided attention.

Stereotype items for both doctor and construction worker showed the same main effect for attention. Stereotypical doctor items $F(1,133) = 6.34, p < .05$ were remembered better with full attention ($M = 78.5\%$) than at divided attention ($M = 69.6\%$). Stereotypical construction worker items $F(1,133) = 5.89, p < .05$ were remembered better with full attention ($M = 86.1\%$) than under divided attention ($M = 76.5\%$). There were no interactions or other main effects for stereotypical items.

Neutral items showed an expected main effect of attention $F(1,133) = 5.67, p < .05$ such that performance was better with full attention ($M = 80.3\%$) than divided attention ($M = 71.8\%$). In addition, the neutral items showed an unexpected two-way interaction of schema by source $F(1,133) = 5.93, p < .05$ such that for items presented by the construction worker there was no effect from schema available at encoding ($M = 77.3\%$) versus available at test only ($M = 75.5\%$) as predicted. However, neutral items presented by the doctor were affected by time of schema presentation. When the schema was given at encoding memory was superior ($M = 81.1\%$) than when the schema was presented at test ($M = 70.3\%$). There was no indication of an interaction occurring from previous literature or our understanding of the cognitive processes involved with neutral items. Possible explanations range from chance occurrence to biased neutral items.

An additional way bias was measured was using a ratio of correctly attributed statements divided by the total number of statements. For example, consider profession

doctor items. There are 12 profession statements presented by the doctor (consistent) and 8 statements presented by the construction worker (inconsistent). If a participant makes a correct source attribution for 9 of the 12 doctor presented profession doctor statements, there is a 75% correct performance. If the participant makes a correct source judgment for 4 of the 8 construction worker presented doctor items there is a 50% correct performance. By subtracting 50% from 75%, there is a 25% bias for profession doctor items. Neutral items should have close to 0% bias calculation. Table 1 shows the results of this calculation of bias. Using a 2 (schema availability: encoding vs. test) X 2 (attention: full vs. divided) ANOVA several main effects were found. There was a main effect of schema $F(1,133) = 9.80, p < .01$ such that there was more bias towards a response of doctor for profession doctor items at test versus encoding. There was a main effect of schema $F(1,133) = 9.42, p < .01$ such that there was more bias towards a response of construction worker for profession construction worker items at test versus encoding. There were no significant effects for stereotype items.

Using the previous percent bias calculations, the effect of profession schemas versus stereotypes was compared. There was a main effect of schema for doctor items (profession and stereotype) $F(1,133) = 9.72, p < .01$ such that there is more bias at test ($M = .15$) than at encoding ($M = .01$) regardless of item type. However, construction worker items showed main effects for item type $F(1,133) = 5.91, p < .05$ and schema $F(1,133) = 9.64, p < .01$. The item type main effect resulted in more bias towards profession statements ($M = .10$) than stereotype statements ($M = .03$). The construction worker schema main effect was very similar to the effect with doctor items in that there was more bias at test ($M = .12$) than at encoding ($M = .007$).

Discussion

Johnson's source monitoring framework (Johnson et al.,1993) asserts source attributions are dependent upon episodic memory as well as semantic memory. In addition, the criterion and process used to make a source decision can change depending upon biases, availability of memory traces, goals, and environmental conditions. The present study attempted to manipulate biases and environmental conditions to examine the effect on source attributions. As predicted, there was a decreased recall performance under divided attention for all types of profession, stereotype, and neutral items. However, the bias calculation was not affected by dividing attention, suggesting that a heavier reliance on semantic information (schemas and stereotypes) under divided attention may not be the cause of the decrease in correct performance. The decrease in correct attributions and constant level of bias over availability of attention suggests that decision-making criterion or processes under divided attention are not affected by an increasing reliance on schemas but by a decrease in availability of source memory. That is, dividing attention does not force the participant to rely on schemas; dividing attention may actually reduce the ability of the participant to make the profession-related guessing bias proposed by Bayen et al. (2000) because this bias is a result of systematic cognitive processes.

The predicted attention by schema interaction did not present itself in the data. Considering the previous hypothesis that divided attention does not increase bias, but decreases source memory overall, the lack of an interaction is appropriate.

Although there was an interaction of source and schema for construction worker items, there was no main effect of schema for the construction worker items as there was

for the doctor profession statements. Hicks (2001) proposed that the increased correct source attributions when a schema is available at encoding results from enhanced memory for the statements due to improved integration of the types of statements with the schema. However, if the strength of one of the preexisting general knowledge profession schemas is stronger then the other, integration of statements could occur more readily with that schema than the less established schema. An individual has probably had more encounters with doctors than construction workers, college students may be more likely to know more pre-med majors than construction management majors, and "the doctor" is an important role in our society. Assuming this, there would be more features in our general knowledge store for an individual to integrate with the statements for a doctor than a construction worker.

The attention hypothesis, the schema-copy-plus-tag model, and the associative model propose that inconsistent information regarding episodic memory should be better remembered. As Bayen et al.(2000) noted, little research has been conducted with semantic memory in relation to expectedness of items. The present study found a source main effect for profession related items and a source by schema interaction for profession items. Both doctor and construction worker consistent items (e.g., Phillip the doctor presenting, "Most of the people I work with are female.") were remembered better than the inconsistent items (e.g., Harry the construction worker presenting, "Most of the people I work with are female."). In addition, when the schema was presented at test, inconsistent items were recalled worst of all other statements for the doctor and the construction worker. This data is more consistent with Mather et al. (1999) who found a decreased memory for inconsistent items.

The schema by source interaction of the neutral items was unexpected. Construction worker presented items showed no changes from schema at encoding to test. However, the doctor presented items were better recalled when the schema was presented at encoding. As previously discussed, doctor profession schemas may be more salient in our semantic memory and thus easier to build associations to. Also, the discrepancy could be influenced the language used in the items. The items were devised by college-educated individuals, and could have been biased towards a higher reading level associated with the doctor profession. For example, the doctor-consistent item, "I've heard the Monet exhibit is superb," includes an adjective characteristic of high reading and speaking ability. There is no comparable construction worker-consistent statement that utilizes slang or more "everyday" words. In this sense some neutral items may not have been completely neutral. The author is aware of no other studies that use two sources with different SES and educational backgrounds; therefore further research into formulating truly neutral statements across these variables is needed.

The calculated estimates of bias confirm the results of Hicks (2001) and Bayen et al, (2000) regarding profession bias. At schema encoding condition, there was no profession bias to claim, for example, doctor items presented by the construction worker were presented by the doctor. That is, participants relied less heavily of profession schemas (doctor or construction worker) at encoding and more on their actual enhanced source memory to make source attributions. Hicks (2001) proposes that the bias shown for profession items at test schema is not due to guessing but to a shift in the criterion for a correct answer. Bayen et al. hypothesizes this bias was a result of guessing. The statistical measures used to determine the cause of profession bias is beyond the means of

the present study. Another main effect resulted from the calculated bias data. There was more bias toward construction worker profession items than stereotype items. The reason for this trend has not presented itself in the theories regarding guessing bias and criterion shifts. It is unclear why the criterion would be more lenient for profession items than stereotype items for construction worker statement types.

The design of the present study supplements the designs and results of the current literature. A more sophisticated analysis of the data may further supplement the findings of Hicks (2001) regarding the reason for bias (guessing or diminished source memory). The examination of source attributions directly influenced by semantic knowledge is an area under researched in cognitive psychology today. Additional research expanding the current designs and theoretical frameworks is needed in order to fully understand the cognitive processes used in making source attributions.

References

Bayen, U. J., Nakamura, G. V., Dupuis, S. E., & Yang, C. L. (2000). The use of schematic knowledge about sources in source monitoring. Memory and Cognition, 28 (3), 480-500.

Bower, G. H., Black, J. B., & Turner, T. J. (1979). Scripts in memory for text. Cognitive Psychology, 11 (2), 177-220.

Chaiken, S., Lieberman, A., & Eagly, A. H. (1989). Heuristic and systematic information processing within and beyond the persuasion context. In J.S. Uleman & J.A. Bargh (Eds.), Unintended thought (pp. 212-252). New York: Guilford Press.

Haberlandt, K. (1999). Human memory exploration and application. Needham Heights, Ma: Allyn and Bacon.

Hicks, J. L. (2001). [The use of schematic information during encoding and retrieval in source memory]. Unpublished raw data.

Hicks, J. L., & Marsh, R. L. (1999). Attempts to reduce the incidence of false recall with source monitoring. Journal of Experimental Psychology: Learning, Memory, and Cognition, 25 (5), 1195-1209.

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. Psychological Bulletin, 114 (1), 3-28.

Johnson, M. K., & Raye, C. L. (2000). Cognitive and brain mechanisms of false memories and beliefs. In D.L. Schacter & E. Scarry (Eds.), Memory and Belief (pp. 35-86). Cambridge, Ma: Harvard University Press.

Mather, M., Johnson, M. K., & DeLeonaris, D. M. (1999). Stereotype reliance in source monitoring: Age difference and neuropsychological test correlates. Cognitive Neuropsychology, 16 (3/4/5), 437-458.

Sherman, J. W., & Bessenoff, G. R. (1999). Stereotypes as source monitoring cues: On the interaction between episodic and semantic memory. Psychological Science, 10 (2), 106-110.

Appendix

Doctor, Construction Worker, and Neutral Statements

Profession Doctor

1. You eat too many salty foods.
2. Be sure to take all your prescription.
3. When did you start sneezing?
4. I eat in the cafeteria.
5. Get at least 8 hours of sleep.
6. When someone becomes ill, I always make a cursory examination first.
7. Most people I work with are female.
8. How long have you been sick?
9. I have been vomited on before.
10. Don't drink caffeine with that.
11. Are you taking any other medicine?
12. I wear a mask to combat disease.
13. If you don't feel better in a day, don't go to work.
14. Keep your sprained ankle propped up.
15. Is this problem keeping you awake at night?
16. You will have a heart attack if you don't loose weight.

Profession Construction Worker

1. This floor needs to be repaired.
2. You need to apply for worker's comp.
3. Get down off that platform— you may hurt yourself.

Appendix (continued)

4. My job is physically demanding.

5. I operate machinery most of the day.

6. I sustain injuries due to work.

7. I use a drill.

8. I bring my lunch to work.

9. I wear reflective clothing.

10. I wear a hat as a preventative measure.

11. This back brace is helping my lifting injury.

12. Could you hand me the floor plan to this building?

13. The department of safety is inspecting today, so be extra careful.

14. Our union is meeting tonight to discuss benefits.

15. There is no fighting on the job.

16. There needs to be 4 handicapped ramps going into this building.

Stereotype Doctor

1. My golf clubs are always in my trunk.
2. My son goes to Harvard.
3. I took a few years of French in college.
4. I've heard the Monet exhibit is superb.
5. I subscribe to the *New Yorker*.
6. I donate to several charity organizations.
7. The maid is doing a wonderful job.
8. I belong to a country club.

Appendix (continued)

9. I enjoy yachting.
10. My wife and I are taking a wine tasting class.
11. Our summer home is being redecorated.
12. I love to play tennis at the club.

Stereotype Construction Worker

1. I like going to the rodeo.
2. I subscribe to P*opular Mechanics*.
3. I tinker on the old cars in my backyard.
4. My favorite wrestler is The Rock.
5. I like doing my own home repairs.
6. I like to relax with a cold beer after work.
7. Sometimes you have to settle things with fists.
8. My wife says I've got a foul mouth.
9. Shop was my favorite class in high school.
10. I usually change my own oil.
11. I've never traveled much.
12. Women like it when you whistle.

Neutral

1. My family has picnics.
2. I have a son and a daughter.
3. My daughter is in high school.
4. I have brown eyes.

Appendix (continued)

5. I like to play checkers.
6. My family likes to watch movies together.
7. I don't have a wonderful singing voice.
8. I have a driver's license.
9. My dog's name is Spot.
10. My daughter likes animals.
11. I don't like doing the grocery shopping.
12. I like broccoli.
13. I always go to the gas station on Main St.
14. My wife gave me this watch.
15. I moved to this city about 10 years ago.
16. I spilled soup on my pants.
17. Tomorrow is my 15th anniversary.
18. I love kids.
19. My favorite color is red.
20. I lost my wallet yesterday.

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Table 1

Percent Bias for Profession and Stereotype Items

Schema and Attention	PD	PC	SD	SC	N
Encoding	2.26	-1.39	-.92	1.39	4.16
Full	3.75	-8.75	3.89	-0.55	1.34
Divided	1.23	3.87	-4.37	2.78	6.19
Test	19.81	16.74	9.74	-7.18	-5.07
Full	23.33	-18.75	15.56	-10.56	-7.33
Divided	16.78	-15.00	4.76	40.48	-3.14

Note. PD = profession doctor items; PC = profession construction worker items; SD = stereotype doctor items; SC = stereotype construction worker items; N = neutral items.