Previous research suggests that verbally describing featural elements of a spatial memory may subsequently interfere with an individual’s ability to access and utilize complex, configural spatial knowledge. The present experiment investigated whether the negative effects of verbal elaboration result from inappropriate verbal processing of perceptual information at test, or from a modification of the memory induced by the verbalization procedure. Participants were asked to study a map depicting a small town and then to describe either featural or configural aspects of the map, or an unrelated memory. Measures of featural and configural knowledge were then obtained. No significant differences were observed between the three conditions on either measure suggesting that verbal elaboration neither hindered subsequent access to, nor modified participants’ memory of the map. Theoretical and methodological issues related to the failure to replicate prior research are considered.
THE EFFECTS OF VERBAL PROCESSING ON SPATIAL MEMORIES:
VERBAL OVERSHADOWING AND SPATIAL REPRESENTATIONS

A Thesis

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Introduction

As one’s experience with an environment increases, so too does an understanding of how the environment is organized. With continued interaction, an individual may develop the ability to make inferential judgments about aspects of the environment that have not been directly experienced. Understanding the psychological processes that underlie how spatial knowledge is acquired and developed has formed the basis for much of the early work in spatial cognition. One of the most influential models was proposed by Siegel and White (1975), which suggests a hierarchical relationship among different kinds of spatial knowledge that are acquired over the course of learning (see also Thorndyke & Hayes-Roth, 1982). According to this model, when learning a new environment, an individual first acquires information about the landmarks in their surroundings. Their representation of the environment becomes more extensive as information about the routes between landmarks is acquired. Finally, a survey representation is derived from the acquired landmark and route information that allows the individual to make configural and inference judgments about the environment.

There has been a substantial amount of research examining the distinction between route and survey representations, and their differentiation has been a prominent means of conceptualizing spatial knowledge (Aginsky, Harris, Rensink, & Beusmans, 1997; Hirtle and Hudson, 1991; Taylor & Tversky, 1996; Thorndyke and Hayes-Roth, 1982). Each form of knowledge is thought to confer unique types of information that allow an individual to interact with the environment in specific ways. For example, route knowledge is conceptualized as knowledge of proximal locations in an environment, but does not necessarily represent the configural relationship of those locations beyond the route (Hirtle & Hudson, 1991). Knowledge of a route between two points allows an individual to make dichotomous decisions about direction (i.e., forward or backward) and to estimate traveled distances along the route between those two points based on their current location. However, as routes become increasingly complex, knowledge of a route does not ensure that an individual can accurately estimate the straight-line distance between any two points, infer novel routes between landmarks, or determine the locations of unseen, distant landmarks. These types of judgments are greatly facilitated by an internal ‘map’ of the environment (i.e., a survey representation) that allows an individual to make judgments based on the configuration of features (Hirtle & Hudson, 1991).
Although there has been a substantial amount of research examining the initial acquisition and development of spatial representations (e.g., Appleyard, 1970; Moeser, 1988; Siegel & White, 1975; Thorndyke & Hayes-Roth, 1982), there has been comparatively little that has examined the stability and reliability of stored representations over time. For instance, it is unclear whether route and survey representations—once acquired and developed—decay at different rates, are equally supplemented with increased experience, or whether they are equally influenced by recall and use. In an attempt to answer this latter question, Fiore and Schooler (2002) examined whether access to spatial knowledge is inhibited as a result of elaboration (e.g., attempts to communicate one’s knowledge of an environment to another person). To evaluate this possibility, Fiore and Schooler asked participants to describe their memory for a map and found that, under certain conditions, access to survey type knowledge was inhibited as a result of elaboration. The elaboration procedure used was an extension of the verbal overshadowing paradigm which is briefly reviewed below.

*Verbal Overshadowing*

Although verbal communication, whether inter-individual or internal, is often beneficial (e.g., acquiring new knowledge through conversation or rehearsing information to improve memory; Benjamin & Bjork, 2000; Craik & Lockhart, 1972; Geiselman & Bjork, 1980; Greene, 1987), the effects of verbal processing are not always positive. This is especially true when an experience or stimulus cannot easily be expressed in words (Melcher & Schooler, 1996; Schooler, 2002). For example, visual stimuli such as colors or faces are often difficult to describe precisely, even when perceptual distinctions among stimuli can be readily made; imprecision in verbal descriptions may be inadequate to specify a target from a set of similar distractors. When stimuli do not lend themselves to easy articulation, attempts to describe them in detail can adversely affect recognition if the verbal description is subsequently relied on to make a discrimination judgment (Schooler & Engstler-Schooler, 1990).

Schooler and Engstler-Schooler (1990) were the first to demonstrate that, under certain circumstances, describing visual memories can hinder one’s ability to access and use a stored visual representation successfully—a phenomenon they called *verbal overshadowing*. In their research, Schooler and Engstler-Schooler presented college students with a video of a bank robbery. After a short interval, they asked half of the participants to provide a detailed description of the robber. When later given a ‘line up’ and asked to identify the robber’s face
from a number of similar faces, participants who had verbally described the robber showed significantly poorer identification accuracy than participants who had not described him.

Current conceptualizations of the verbal overshadowing effect suggest that poor recognition performance results from a disparity between the cognitive processes engaged at encoding and those engaged at retrieval (Brandimonte, Schooler, & Gabbino, 1997; Dodson, Johnson, & Schooler, 1997; Finger & Pezdek, 1999; Meissner, Brigham, & Kelley, 2001; Morris, Bransford, & Franks, 1977; Schooler, 1998; Schooler, 2002; Schooler, Fiore, & Brandimonte). This disparity between encoding and retrieval processes is referred to as transfer-inappropriate processing and occurs when verbal elaboration initiates inappropriate processes (i.e., verbal) not originally associated with the stimulus during learning (i.e., visual). For example, when a novel face is learned, perceptual processes are engaged, and both the features of the face and the configural relationship of those features are encoded. If an individual attempts to describe that face, verbal processes are initiated that perforce focus primarily on featural components because of the relative difficulty of articulating their configural relationship. If verbal processing is then carried over to test, the consequent reliance on featural information is insufficient to distinguish between the target face and similar distractors. Although the configural relationships of a stimulus may be encoded and stored, only the featural elements of the representation are extracted in the process of producing a description.

As one’s ability to describe a stimulus increases, whether due to experience or to a more comprehensive lexicon, one should able to extract more elements from the perceptual representation, thereby decreasing the discrepancy in available information between the verbal and perceptual processes. The hypothesis that inappropriate retrieval processes underlie verbal overshadowing has been supported by examining this claim. When examining domain specific experts with highly developed and specialized lexicons, verbal overshadowing is unobserved (Melcher & Schooler, 1996). The moderating effect of verbal ability has also been observed in non-experts by examining individual differences in verbal ability (Fiore & Schooler, 2002; Melcher & Schooler, 2004). Conversely, increased perceptual expertise in the absence of concomitant verbal development has been shown to increase the likelihood of verbal overshadowing (Fallshore & Schooler, 1995). These findings have lent strong support for a transfer-inappropriate processing explanation of verbal overshadowing.
Verbal Overshadowing and Spatial Representations

As previously mentioned, Fiore and Schooler (2002) have attempted to evaluate the effects of verbal overshadowing on memory for learned spatial information. Adopting Siegel and White’s (1975) terminology, they argued that the route/survey distinction in the spatial literature corresponds to the featural/configural dichotomy used to explain the verbal overshadowing phenomenon. They hypothesized that describing a spatial representation would emphasize the featural components (route knowledge) of the representation and interfere with the use of configural (survey knowledge) information. To test this, Fiore and Schooler presented participants with a map of a small town highlighting a route connecting 16 landmarks. Participants were instructed to memorize the map in terms of the landmarks and the distances between them. Following learning, half of the participants were instructed to write down everything that they could remember about the route and the landmarks along it, while the other half engaged in an unrelated filler task. Participants were then tested by being asked to make straight-line (i.e., Euclidean) and route distance estimations between pairs of landmarks. As hypothesized, participants who described their memory of the route provided significantly less accurate Euclidean distance estimations than did participants in the control condition, but the groups did not differ significantly from the control condition in the accuracy of their route distance estimations. However, individual differences in verbal ability were found to interact with verbalization condition. Verbal overshadowing was observed on the route estimation measure, but only for participants with low verbal ability. No such effect was found for participants with high verbal ability.

Although Fiore and Schooler’s (2002) results support their claim that some types of spatial representations are subject to verbal overshadowing, there are two reasons why their results may merit closer scrutiny. First, the procedure used by Fiore and Schooler constrained verbalization participants to describing only the route. This procedure contrasts with those used to examine verbal overshadowing in other domains, in which participants are instructed to describe the stimulus as a whole. By most accounts, it is the resulting inability of participants to articulate configural aspects of a stimulus that causes them to focus on stimulus features in their descriptions rather than the relationship between them, thereby inhibiting any kind of holistic processing at test. In Fiore and Schooler’s case, asking participants to elaborate only the route is analogous to asking participants to describe only the featural elements of, for example, a face.
If participants only attempt to process featural information verbally, while failing to consider the configural relationships between those features, it is unclear to what extent verbal overshadowing has influenced Euclidean estimation accuracy. In the present study, an additional condition was added to Fiore and Schooler’s design in order to evaluate what, if any, effect describing configural information would have on route and Euclidean estimations.

A second reason to reexamine Fiore and Schooler’s findings involves the substantial amount of previous research examining the relationship between verbal descriptions and perceptual processing of spatial information. This research has generally taken one of two forms: (1) following acquisition of spatial knowledge, participants’ descriptions are evaluated for accuracy and thoroughness (Taylor & Tversky, 1992a; Taylor & Tversky, 1996; Emmorey, Tversky, & Taylor, 2000), or (2) participants are provided with narrative descriptions and their ability to form spatial representations based on those descriptions are evaluated (Denis & Zimmer, 1992; Franklin & Tversky, 1990; Bestgen & Dupont, 2003; Shelton & McNamara, 2004a; Shelton & McNamara, 2004b; Taylor & Tversky, 1992b; for a related discussion on the effects of narrative perspective see: Tversky & Marsh, 2000; Tversky, 2004). Research examining participants’ ability to generate narrative descriptions of learned environments has found that participants are quite accurate at recall of landmarks, make few location errors, and do not leave many locations indeterminately located in their descriptions (Taylor & Tversky, 1992a). Concurrently, research has demonstrated that participants almost infallibly construct accurate spatial models of described environments that show effects similar to those exhibited during perceptual learning tasks (Franklin & Tversky, 1990; Bestgen & Dupont, 2003; Shelton & McNamara, 2004b). Taken together, this research suggests that participants are able to generate accurate and detailed narrative descriptions of spatial configurations, and are also able to create accurate spatial representations of an environment when given only narrative descriptions. Such results would not be expected if verbal overshadowing of spatial representations relies on the inability of narrative descriptions to represent complex configural information.

If participants are able to generate accurate descriptions of space, then it is possible that the effects observed by Fiore and Schooler (2002) were a consequence of the type of description participants were asked to generate, rather than simply engaging verbal processes per se. In order to produce the route-based descriptions elicited during the verbalization task, participants
would need to adopt a spatial perspective other than that initially encoded (e.g., a cardinal reference frame would need to be replaced by an egocentric reference frame that changes as the route is ‘traversed’). If a transformation of the initially encoded configurational representation occurred, reliance on the transformed representation at test would likely have led to the reduced accuracy of their Euclidean distance estimations relative to that of control participants. Taylor, Naylor, and Chechile (1999) have provided evidence that spatial goals (e.g., learning the layout vs. learning the fastest route) emphasized during learning can have just such deleterious effects on an individual’s ability to use certain types of spatial knowledge. Similarly, Macrae and Lewis (2002) have shown that recognition performance can be impaired if participants are induced to adopt a local, rather than a global, processing orientation prior to test. Such an account of Fiore and Schooler’s (2002) results differs from a verbal overshadowing explanation in that poor Euclidean estimates result from a transformed perceptual representation—not from inappropriate verbal processing. While a verbal overshadowing account advocates a shift from perceptual to verbal processing between encoding and test, a transformation account proposes perceptual processing of different aspects of the same representation, or a shift between separate representations.

To examine the possibility that a transformation of participants’ spatial representation underlies Fiore and Schooler’s (2002) results, the current experiment attempted to replicate and extend their procedure. In addition to eliciting route descriptions from participants, we asked an additional group of participants to describe the configurational information acquired from the map. If Fiore and Schooler’s results are a consequence of a processing shift, then poorer Euclidean distance estimations should be observed in both verbalization conditions when compared to those of control participants. Conversely, if their results were a consequence of participants relying on a transformed representation of the map, then only participants who described the route should exhibit poor Euclidean distance estimations when compared to control participants. Participants instructed to describe the map as a whole should not show this deficit, but may exhibit poor route distance estimations when compared to control participants. Finally, because verbal overshadowing has been shown to be moderated by cognitive abilities, individual measures of verbal and spatial ability were obtained in order to examine potential moderating factors.
Method

Participants

A total of 121 undergraduate students participated in this experiment in return for course credit in their Introductory Psychology course. One participant voluntarily withdrew from the experiment prior to completing the procedure. The remaining 120 participants were assigned to each of the experimental conditions resulting in three groups of 40, each with equal numbers of men and women. The mean age of participants was 18.7 years (SD = .92) in the Control condition, 19.2 years (SD = 1.24) in the Route condition, and 18.8 years (SD = .92) in the Survey condition.

Materials

To replicate Fiore and Schooler (2002), the map, landmark pairs, and distance measurements used in this experiment were the same as those used in their study. The map depicted a small town with 16 locations identified along a highlighted route (see Figure 1). Each of the landmarks was clearly labeled on the map. Sixty landmark pairs were generated and separated into two sets, each with 30 items, with one set used for route distance estimations and one set for Euclidean distance estimations. Pairs of landmarks were generated such that the route distance and Euclidean distance of each pair were not highly correlated with each other (.20 for route landmark pairs and .21 for Euclidean landmark pairs).

Two individual difference measures were used to evaluate participants’ spatial and verbal abilities. The Map-Reading Test (Money, Alexander, & Walker, 1965; see Appendix A) requires participants to indicate whether each of 36 marked turns on a map represent right or left turns when the route is ‘traveled’ in a specified direction. Participants are required to make their judgments without rotating the map.

![Figure 1. Map presented to participants indicating the route and the 16 landmarks to be remembered.](image)
In order to determine the correct response, participants must imagine their orientation along the route from a continuously changing perspective. Following the procedure used by Zacks et al. (2000), participants were given 20 seconds to judge as many turns as possible. The vocabulary portion of the Nelson-Denny Reading Test, Form G (NDRT; Brown, Fishco, & Hanna, 1993; see Appendix B), was used to evaluate participants’ verbal ability. This is an 80 item test with a time limit of 15 minutes. Each item consists of a short phrase that must be completed by selecting the correct choice from five alternatives.

Procedure

Participants were run individually or in groups of no more than four, and were randomly assigned to either the Control, Route, or Survey condition with the constraint that all participants run during a particular session were in the same experimental condition. After giving informed consent, participants were given packets containing the experimental materials and informed that they would be working through each section of the packets sequentially, and that they should not move on until instructed to do so. Instructions for each section of the procedure were presented both written and verbally.

The first phase of the experiment gave participants an opportunity to learn the map and consisted of three study-test cycles. Participants were initially shown the map and given the following instructions: ‘For this experiment, you will be shown a map depicting a small town. Your task will be to memorize the map in terms of the landmarks on the map and the distance between the landmarks. We want you to focus on the 16 landmarks, each of which will be identified by a name on the map.’ Following these instructions, participants were given approximately three minutes to study the map, then instructed to turn to a blank map and to locate and name as many of the 16 landmarks as they could recall by marking them on the blank map. Participants repeated this study-test cycle two more times before moving on to the next phase. The learning phase took approximately 12 minutes.

When participants had completed the learning phase, they were given verbalization instructions appropriate to their experimental condition. Participants in the Route condition were instructed to describe the route on the map and the landmarks along it in as much detail as possible. In order to emphasize the route elements of the map, participants were encouraged to provide a description detailed enough such that someone else would be able to successfully navigate along the route between any two locations based solely on their description.
Participants in the Survey condition were asked to describe the map in its entirety, as if they were flying over the town. In order to emphasize the configural elements of the map, these participants were instructed to describe the general layout of the town and the landmarks in it such that someone else would be able to recognize it if they were flying over it. Participants in the Control condition were asked to describe an unrelated event (e.g., a memory lapse that they had experienced). All three groups spent 5 minutes completing their respective verbalization tasks.

Following the verbalization task, participants were given the route and Euclidean distance estimation task. Participants’ route and survey knowledge was evaluated by asking them to estimate the route and Euclidean distances between the 60 landmark pairs (presented in two blocks of 30 landmark pairs each). The dependent measure was the mean correlation between the actual and the judged distance for each type of estimation. The order of presentation of the type of distance estimation was counterbalanced within each condition. Upon completion of this task, all participants were given the Map-Reading Test and the vocabulary portion of the NDRT.

**Design and Analysis**

Route and Euclidean distance estimates were analyzed in the context of a 2 (verbal ability: high vs. low) x 2 (spatial ability: high vs. low) x 3 (verbalization: Control vs. Route vs. Survey) between-participants ANOVA. Planned comparisons were performed in accordance with the proposed hypotheses. Gender was initially included in analyses but did not interact with the other independent variables, and was therefore removed as a factor. Analyses were conducted on the correlation between participants’ estimates and the actual distances, separately for route and Euclidean measures. Correlations were converted to z-scores using Fisher’s r to z transformation prior to any analyses. Reported and depicted values present the raw, untransformed correlation coefficients.

**Results**

Participants’ rate of learning was evaluated by examining performance on each successive study-test cycle in the learning phase. Participants’ were considered to have learned the layout of the town sufficiently well for later tasks if they were able to place 90% of the 16 locations within 2 cm of the correct location on a blank map and correctly identify each landmark by name. Participants were categorized into four groups based on how quickly they were able to meet these criteria: 4.2% after 1 learning cycle, 41.7% after two learning cycles,
30.0% after three learning cycles, and 24.2% never met criteria. For participants who did not meet criteria, only 6.7% (eight participants) failed to both name and locate all 16 landmarks on the map by the third repetition. In three cases, participants had the name in the correct vicinity but did not specify the exact location, in two cases single locations were identified without names, in two cases a single landmark was neither located nor identified but had been during the previous learning cycle, and only in one case was a single landmark completely absent through all phases. It was concluded that all participants encoded the map sufficiently well to recognize the place names on the later estimation measures.

As a group, participants across conditions performed poorly on the route distance measure. Correlations between estimated and actual route distances ranged from -.926 to .967 with 29.2% being below zero. To ensure that our analyses applied only to participants who had understood their task, participants with exceptionally poor performance were dropped from further analyses. Because a basic knowledge of the route structure should have produced correlation coefficients greater than zero, we chose zero as the cut off for determining successful route distance estimation performance. This left 85 participants included in the route distance estimation analyses (27 Control, 29 Route, 29 Survey). This criterion was also applied to Euclidean estimates, which left 117 participants in the Euclidean estimate analyses (39 Control, 40 Route, 38 Survey).

Following the analyses of Fiore and Schooler (2002), participants were divided into high and low verbal ability via a median split (mean high verbal = 68.67 correct or 85.8%; mean low verbal = 56.07 correct or 70.1%)1. A median split was also used to divide participants on the basis of high and low spatial ability (mean high spatial = 10.57; mean low spatial = 5.18). There was no significant difference on either the Road Map Test or the NDRT between participants in each condition, suggesting that all groups were of approximately equal verbal and spatial ability.

**Route Distance Estimations**

The mean correlation between the actual route distances and the estimated route distances was .68 ± .12 (for a 95% confidence interval) for the Control participants, .80 ± .09 for Route participants, and .76 ± .10 for Survey participants. Contrary to the findings of Fiore and

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1 Measures of verbal and spatial ability were initially entered as covariates into the model, but this was found to contribute no additional information to the analyses. In order to maintain congruence with previous research, data and results are presented using median splits to facilitate interpretability.
Schooler (2002), route distance estimation was better for both elaboration conditions than for the Control condition (see Figure 2). However, planned comparisons showed no significant differences between groups (all $p$’s $\geq .108$). Neither participants who described the route nor those that described the map as a whole performed differently than Control participants ($F(2,72) = 1.42, p = .248, \eta^2 = .032$).

A main effect of spatial ability was observed, $F(1,72) = 7.169, p = .009, \eta^2 = .081$, with high spatial participants ($M = .82 \pm .06$) significantly more accurate than low spatial participants ($M = .67 \pm .10$) (see Figure 3). Spatial ability did not interact with verbalization condition ($F(2,72) = 0.015, p = .985, \eta^2 < .001$). There was no main effect of verbal ability ($F(1, 72) = 0.669, p = .416, \eta^2 = .008$), nor did verbal ability interact with verbalization condition on route distance estimations ($F(2, 72) = 0.149, p = .862, \eta^2 = .003$).

Euclidean Distance Estimations

The mean correlation between the actual Euclidean distances and the estimated Euclidean distances was $.48 \pm .06$ for Control participants, $.47 \pm .06$ for Route participants, and $.46 \pm .06$.
for Survey participants. Planned comparisons showed no significant differences between groups (all $p$’s ≥ .491). The performance of participants in both elaboration conditions was comparable to that of Control participants ($F(2, 104) = 0.290, p = .749, \eta^2 = .005$; see Figure 2). There was no main effect of verbal ability ($F(1, 104) = 0.013, p = .91, \eta^2 < .001$), nor did verbal ability interact with verbalization condition on Euclidean distance estimations ($F(2, 104) = 0.929, p = .398, \eta^2 = .016$; see Figure 4). There was no main effect of spatial ability ($F(1, 104) = 0.117, p = .733, \eta^2 = .001$), nor did spatial ability interact with verbalization condition on Euclidean distance estimations ($F(2, 104) = 2.41, p = .095, \eta^2 = .041$).

Supplementary Analysis Based on Participants’ Descriptions of the Map

To ensure that participants in the Route and Survey conditions described the aspects of the map consonant with their instructions, two independent raters evaluated the map descriptions generated by all participants in the Route and Survey conditions. Descriptions were rated on a 5 point scale (1 = purely route, 2 = mostly route, 3 = equally route and survey, 4 = mostly survey, 5 = purely survey) based on the viewpoint (above vs. within), reference terms (e.g., north vs. left), reference objects (e.g., the addressee vs. landmark), orientation (e.g., stable vs. changing), and information included (e.g., limited vs. unlimited) in each narrative (examples are presented in Appendix C). There was strong agreement between the two raters evaluations of description type ($r = .822, p < .05$). However, disparities between the two raters’ evaluations concerning the degree to which a description represented a particular perspective did occur. Thirty-three of the 80 evaluations differed by a value of 1 on the five-point scale, five differed by a value of 2, and
one differed by a value of 3. Disagreements between the raters’ evaluations were resolved by the author who judged which of the two raters’ evaluations was more germane, and assigned that description type value to those participants.

The resulting judged description type significantly correlated with participants’ verbalization condition ($r = .493$, $p < .05$). However, because 27.5% of Route participants’ descriptions and 37.5% of Survey participants’ descriptions did not fall in line with their respective verbalization instructions, participants were reassigned to levels of a new independent variable that coded actual, not assigned, description type: route type (mostly route and purely route), mixed type (equally route and survey), and survey type (mostly survey and purely survey). Participants with mixed type descriptions (approximately 8%) were excluded from these analyses. Of the 51 participants who were included in the route distance analysis after the trimming procedure, 41 had judged descriptions consonant with their instructions, three route participants were categorized as having survey descriptions, and seven survey participants were categorized as having route descriptions. For the Euclidean distance analysis, of the 68 participants remaining after the trimming procedure, 52 had judged descriptions consonant with their instructions, seven route participants were categorized as having survey descriptions, and nine survey participants were categorized as having route descriptions. The analyses described above were then repeated with instructional condition replaced by judged description type as the independent variable.

The results were generally quite similar to the previous analyses (see Figure 5). The mean correlation between the actual route distances and the estimated route distances was $0.68 \pm 0.12$ for the Control participants, $0.76 \pm 0.11$ for Route participants, and $0.77 \pm 0.11$ for Survey participants. A main effect of spatial ability was noted ($F(1, 77) = 6.99$, $p = 0.01$, $\eta^2 = .087$), but no other effects were observed. Planned comparisons showed no significant differences between groups (all $p$’s $\geq .187$). The mean correlation between the actual Euclidean distances and the estimated distances was $0.65 \pm 0.13$ for the Control participants, $0.74 \pm 0.12$ for Route participants, and $0.75 \pm 0.12$ for Survey participants. The analyses described above were then repeated with instructional condition replaced by judged description type as the independent variable.

![Figure 5](image.png)  
Figure 5. Mean correlation between actual and estimated route and Euclidean distances for the three description types. Error bars represent standard errors.
Euclidean distances was .48 ± .06 for Control participants, .47 ± .06 for Route participants, and .47 ± .07 for Survey participants. No effects or interactions were observed. Planned comparisons showed no significant differences between groups (all $p$’s ≥ .77).

Discussion

The current experiment investigated the susceptibility of spatial representations to verbal overshadowing. Fiore and Schooler (2002) have suggested that attempts to describe one’s memory of an environment may subsequently negatively affect one’s ability to access and successfully utilize remembered configural information. This deficit results from a reliance on less appropriate verbal processing rather than the appropriate perceptual processing employed during encoding. Alternatively, it has been proposed that the act of generating a description that differs from one’s experience may require the transformation of a spatial memory from the experienced perspective to another. Reliance on a transformed representation at test may increase the salience of some types of information while hindering access to other types.

Neither hypothesis was supported by the present results. The results suggest that verbally describing certain aspects of a map had no negative effects on subsequent attempts to access and utilize either route or survey type information. When participants were asked to describe the route shown on the map, neither their route nor their Euclidean distance estimations significantly differed from those of Control participants. Similarly, when participants were asked to describe the map as a whole, route and Euclidean distance estimations did not differ significantly from those of Control participants. This failure to replicate Fiore and Schooler’s (2002) results question the susceptibility of spatial representations to verbal overshadowing effects.

It is possible that the disparity between the current results and those of Fiore and Schooler (2002) are a consequence of procedural differences in these experiments. Although the learning and test materials were identical, there was a difference in the learning procedure itself. Fiore and Schooler assessed participants’ map learning by requiring them to place five randomly chosen landmarks on a blank map. This procedure was repeated for 12 minutes. The learning phase of the current experiment was of a similar duration; however, only three study-test cycles were conducted. During each cycle, participants were asked to locate all 16 landmarks on a blank map. Repeated requirements to interact with all 16 landmarks during the learning phase may have exposed participants to the overall configuration of the map more than the learning procedure used by Fiore and Schooler. Increased exposure to, and interaction with, the map as a
whole may have in turn established as stronger memory trace for the configural elements. It is possible that such a reinforced memory trace allowed for easier reinstatement of perceptual processing during test, thereby making the memory more resistant to the negative effects associated with verbal overshadowing. Replicating the current procedure but varying the amount and type of map exposure during learning may be one way to address this possibility in the future.

Another possible explanation for the disparate results stems from the different levels of verbal ability between participants in the current study and those of Fiore and Schooler (2002). As stated earlier, verbal overshadowing has been shown to be moderated by verbal ability. In fact, Fiore and Schooler observed such an interaction on their route estimation measure. It is potentially important to note that the mean low verbal score in the current experiment was greater than the mean high verbal score reported by Fiore and Schooler (high verbal participants in Fiore and Schooler scored approximately 56%; low verbal participants in the current study scored approximately 70%). Thus, even if verbal overshadowing occurred in the present experiment, it is plausible that it might go unobserved given the relatively high verbal ability of the current sample. However, even with relatively high scores, the moderating effects of verbal ability should still be expected to occur assuming that moderate variability in verbal performance is observed. The lack of this effect of verbal ability in the current experiment argues against this possibility as the cause of the differing results.

Although it has to be acknowledged that verbal overshadowing may have been unobserved for methodological reasons, it is equally possible that the types of spatial knowledge being examined here are not subject to such effects. The argument for the resistance of spatial representations to verbal overshadowing effects relies, in part, on the adequacy of verbal processes to represent and communicate spatial information. Indeed, some researchers have argued that spatial representations derived from maps and narrative descriptions are structurally isomorphic with respect to the configural information acquired. For example, in a series of experiments, Denis & Zimmer (1992) have shown comparable performance on priming, distance-comparison, and mental-scanning tasks between text and map learning participants. Of particular interest was the finding that participants who learned from text constructed representations that accurately reflected metric properties of configural elements that were not
explicitly stated in the narrative. This suggests that complex spatial information can be accurately communicated both perceptually and linguistically.

Of course, the ability to acquire complex spatial knowledge from narratives does not address participants’ ability to generate such narratives. Taylor and Tversky (1992a) examined this issue by asking participants to describe three different maps that varied in scale (a town, an amusement park, and a convention center), and then asked naïve participants to reconstruct the maps based on the descriptions. They found that the descriptions were both comprehensive and precise in conveying spatial information about locations on each map. Additionally, reconstructions of the Town map (comparable in scale to the map employed in the current experiment) had the lowest observed errors in both landmark omission and placement, suggesting that participants were readily capable of producing descriptions that accurately represent complex configural relationships. This, and similar findings, have led to the suggestion that despite structural differences, the linguistic and perceptual processes underlying spatial cognition may share a close functional relationship with respect to the mental representations involved (Denis, 1996).

If this conceptualization is correct, then it may be inappropriate to relate the verbal overshadowing featural/configural distinction to the spatial route/survey distinction. For example, a principle domain for examining the effects of verbal overshadowing in previous research has been that of face recognition (Brown & Lloyd-Jones, 2002; Fallshore & Schooler, 1995; Finger, 2002; Meissner, 2002; Meissner & Brigham, 2001). Although the ability to distinguish one face from another successfully has often been conceptualized as relying on the processing of both featural and configural information (Bartlett, Searcy, & Abd, 2003; Valentine, 1988; Diamond & Carey, 1986; Sergent, 1984), research also suggests that those elements processed in a configural, or holistic, manner are difficult, if not impossible, to describe verbally (Ashby & Gott, 1998; Kemler Nelson, 1993; Maddox & Ashby, 2004; Thomas, 2001). This implies that participants in verbal overshadowing procedures that use face stimuli are likely describing the features of a face (e.g., eyes, mouth, etc.) in isolation. This conceptualization differs from that espoused in the spatial cognition literature, where configural information is considered to be an integral component of both route and survey representations (e.g., Montello, 1998; Siegel & White, 1975); featural information generally refers to aspects of the environment that involve discrimination processes (e.g., recognizing a landmark) not reliant upon spatial
information per se (Winn, 1991). The conceptual and empirical incongruence between the verbal overshadowing and spatial literatures suggests that either the domain specific information or the processes acting on that information may be qualitatively different enough that the route/survey and featural/configural dichotomies should not be considered analogous to one another.

The results of the present experiment provide indirect evidence for this claim. The failure to replicate Fiore and Schooler’s (2002) results raises doubts about the generality of verbal overshadowing, as well as the potential negative impact processing shifts can have on spatial memories. However, the current experiment is not definitive. Future research may be better served by making a more direct examination of these issues. For example, response measures that rely on distinct cognitive processes at test (e.g., a pointing response versus a categorical verbal response; Avraamides et al., 2004; Wraga, 2003) may provide less ambiguous evidence when evaluating the functional relationship between verbal and perceptual processing of spatial knowledge. While the results of the current experiment, in conjunction with previous findings, can be interpreted as suggesting the possibility of a functional equivalence, gathering more definitive evidence will be a necessary goal of future research before strong conclusions can be drawn.
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Appendix A

Test portion of Road-Map Test.
Appendix B

Instruction and examples of vocabulary portion of Nelson-Denny Reading Test.

PART I. VOCABULARY TEST

DIRECTIONS

A. Do not turn this page of the test booklet until directed to do so.

B. Do not make marks of any kind on this test booklet.

C. Part I, the Vocabulary Test, containing 80 items, is timed separately from Part II, the Comprehension Test. Work only on Part I during the time allowed for it. Do not go on to Part II until told to do so.

D. To make sure you know how to take the test, complete the three practice exercises below.

Practice Exercises


Which word best completes the opening statement? Yes, food is the best answer. Look at the first practice exercise answer row on the answer sheet to see how you are to mark your answer.

P2. To repair is to: F. destroy G. finish H. fix I. work J. show ................. P2.

Mark the space for the answer you think is correct. You should have marked space H, since fix is the correct answer.


What is the letter of the best answer? Mark the space lettered the same as the answer you think is correct. You should have marked space B; numbers is the correct answer.

E. Wait for the signal to turn this page.

F. Now listen carefully to the examiner for further instructions.

MAKE NO MARKS ON THIS TEST BOOKLET
Appendix C
Examples of participant generated route and survey based descriptions.

<table>
<thead>
<tr>
<th>Route Description</th>
<th>Survey Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If someone were to enter the town at the upper left of the map, they should turn</td>
<td>The town is shaped relatively like a rounded triangle. In the northwest corner</td>
</tr>
<tr>
<td>right at the first street to get to the Storage Tanks and the Smokestack. They</td>
<td>there is a Bridge. Next to the Bridge on the east, slightly, there is Lou’s [and]</td>
</tr>
<tr>
<td>could then turn left and take another right to get to the Gray House and the Ball</td>
<td>Memorial. Just south of the Bridge is Pop’s Place. Continuing south one will</td>
</tr>
<tr>
<td>Field. If the person was to continue straight on the main road instead of turning</td>
<td>first come upon a set of Storage Tanks and then a Smokestack. In one continues</td>
</tr>
<tr>
<td>right, they would encounter Pop’s Place at the first corner and then Lou’s and</td>
<td>southeast from the Smokestack there is a Ball Field and just north of that a Gray</td>
</tr>
<tr>
<td>Memorial on the right side of the road. Up ahead is the Police Station and the</td>
<td>House. Continuing north from the Ball Field there is the Police Station, and just</td>
</tr>
<tr>
<td>Post Office. Right after this, the person may go straight or take the first right.</td>
<td>east of that there is a Post Office.</td>
</tr>
<tr>
<td>If they choose to go straight, they will see the Bank on their left and a Dead</td>
<td></td>
</tr>
<tr>
<td>End on the right. If they choose to turn right they would come across a Blue Sign</td>
<td></td>
</tr>
<tr>
<td>and eventually a Traffic Light.</td>
<td></td>
</tr>
</tbody>
</table>