DO CROSSLINGUISTIC DIFFERENCES IN EVIDENTIALITY MARKING AFFECT SOURCE MONITORING?

by

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ABSTRACT

What effect does encoding a source have on memory? Languages differ in the way they encode sources of information about events. English speakers for example do not have to encode whether or not information about an event was seen directly or acquired indirectly. Turkish speakers, however, use evidential markers to distinguish between information that was directly or indirectly acquired. Looking at the cross-linguistic differences for source, we compared the performance of two languages and their memory for events. We manipulated events in order to elicit inference, which is an indirect source. We tested participants' accuracy for memory of sources for these inferential events as well as memory for object changes. Participants had their response time recorded. Half the participants simply viewed the scenes, and the other half viewed the scenes and had a concurrent distractor task. Although there was a difference in accuracy between tasks, the results show there were no differences between languages for accuracy of memory of events, but there was a difference in response time.

Chapter 1

INTRODUCTION

Who was the first president of the United States? The answer is easy, George Washington. How did you first find out this information? This question is harder to answer. You may have learned it in first grade, or from a parent, or from a friend. The setting to which you acquired that information is known as a source. This process of attributing the origin of a memory is known as source monitoring.

Certain languages require speakers to encode, usually in a verb, whether or not they have directly observed the event or the state of affairs. English is not one of these languages, and indicating whether something was directly seen or indirectly acquired is optional in speech. Turkish speakers, on the other hand, must encode with a morphological marker at the end of a verb whether they witnessed an action happening or acquired the information in some indirect way.

The theory of linguistic determinism states that the language one speaks will determine the way a person thinks (Whorf, 1956). A less strict version of linguistic determinism is linguistic relativity. The linguistic relativity hypothesis states the idea that culture, through language, will affect the way we think (Gumperz & Levinson, 1996). Given these differences in the way that speakers of Turkish and English encode sources in language, the current study asks whether we will also see differences in their memory for those sources.

In what follows I describe a study that was designed to investigate the three phenomena of source monitoring, inference, and cross-linguistic differences of source encoding. I will provide the foundational frameworks as to why we picked these different topics. I will then describe our study and the results. Our hypothesis will be that given the different ways English speakers and Turkish speakers encode sources, the accuracy for remembering those sources will be different from one another. We predict that the Turkish use of evidential markers will increase their accuracy for the memory of sources.

Source Monitoring

Sources go deeper than just remembering parts of the scenes. The source of a memory for an event refers to the conditions under which the memory was acquired and all of the components of the spatial, temporal, and social context of the memory (Johnson, Hashtroudi, & Lindsay, 1993). Accessing these source features when remembering an event is called source monitoring. Source monitoring refers to the set of processes involved in making attributions about the origins of memories, knowledge, and beliefs (Johnson et al., 1993). Different types of sources are direct observation, inference, and hearsay. Direct observation occurs when a person perceives things occurring in the world around them. Inference is a conclusion based on the available evidence. Hearsay is information from other people to a different person who had no direct observation of the information. Our study will specifically look at inference and direct observation.

Many times is it hard to remember whether you or another person made a statement. You might also have difficulty remembering whether you *said* something or if you simply *thought* it. The memory for different sources like these falls under the category of reality monitoring. Source monitoring is a specific kind of reality monitoring (Johnson et al., 1993). Reality monitoring is defined as discriminating memories of internally generated information from memories of externally derived information (Johnson et al., 1993). Understanding reality monitoring helps to understand source monitoring because it helps describe the difference between external source monitoring and internal source monitoring. External source monitoring is discriminating the difference between externally derived sources (Johnson et al., 1993). An example would be distinguishing whether a given statement held in memory was made by person A or person B. Internal source monitoring is discriminating between an internally generated source and an externally generated one, which is separating the difference between what one thought and what one said or perceived.

Our study will attempt to test the errors that are made when a person uses the different processes of external and internal source monitoring. These processes can occur without awareness of making these decisions about source. Source monitoring processes may be "automatic," and other source monitoring tasks can be considered more "controlled" (Johnson et al., 1993). Our study will attempt to look at the more "automatic" processing that occurs.

Johnson and colleagues (1993) claim that source monitoring is not directly retrieving an abstract tag or label that specifies a memory's source. Instead, the activated memory records are evaluated and attributed to particular sources through decision processes performed during remembering. Source monitoring requires the person to retrieve information from memory records, which relies on the quality of the information about the events initially presented.

The processes involved with source monitoring are being investigated in relation to a variety of psychological capacities extending from eyewitness memory and persuasion, to amnesia and aging. People reconstruct a source based on aspects of their memory.

Why is this question important?

Source monitoring draws on perceptual cues that are extracted from memory. Because memory is not perfect, relying on one's memory introduces errors to source monitoring. Eyewitness testimony creates one of the most ideal situations for testing source-monitoring errors (Lindsay & Johnson, 1989). The original situation and the information immediately after the event concern the same topic, people, and environment. These similarities make it difficult for people to discriminate the difference between memories of the actual event and memories of the post-event. Many studies test the nature of those errors when there is misleading information and eyewitness testimony.

Lindsay and Johnson (1989) tested participant memory for the source of information by introducing new information that was designed to mislead them. The purpose of the study was to examine the possibility that eyewitness suggestibility might lead to errors when participants were instructed to remember memories that were derived from a source. The misleading information tested during recognition tasks may induce the participants to make source-monitoring errors on critical items.

Participants were presented with one photograph and an accompanying narrative that was used to describe the scene. The narrative was either misleading, i.e. containing items that were not in the photograph, or it was a control narrative that described the scene accurately. The narrative was between-subjects as the participants were only shown one photograph. Participants were then tested in a between-subjects design where they were either in yes/no recognition or source-monitoring condition.

During the testing, all participants were given a list of items, which they needed to identify. Participants in the yes/no were asked to identify *seeing* the objects, in order to avoid confusion of the text. The source monitoring participants were told to identify whether they had *seen* the item in the picture, *read* in the text, *seen* and *read* it in the text, or *neither*. They were instructed to identify to classify identification after seeing the stimuli.

Participants in the yes/no recognition task in the mislead condition were more likely than those given the control narrative to identify an item as *seen* when it was only *read*. Participants in the control and mislead source-monitoring condition did not differ from one another, providing evidence that the source-monitoring questions cued the participants to be more aware of what they actually saw. The participants were not told in advance what they would be looking for in the scene.

Lindsay and Johnson (1989) found that orientating subjects to making source-monitoring judgments eliminated the effect of eyewitness suggestibility. The yes/no recognition task showed that participants were making a judgment on their familiarity with the scene or the text, whereas in the source-monitoring task participants were basing their judgments on source-relevant information. Our study tests the suggestibility of memory in a different way than misleading participants. Source monitoring errors are among the most common in memory failures (Lindsay & Johnson, 1989).

Testing the effects of misleading information is useful for investigating the malleability of memory. McCloskey and Zaragoza (1985) posit, for example, that information that misleads a participant does not necessarily overwrite or delete information in memory. The participants may not form the correct memory because they were missing some critical marker, or they may forget something before the misleading information is presented. McCloskey and Zaragoza (1985) found that participants who were presented with no misleading information were likely to forget the critical details of an event or spontaneously forget, which led them to guess on the test trial. Those who were presented with the misleading information did not just guess, but rather remembered the misleading information and used that part of their memory to answer a test trial. This shows that misleading information did not cause participants to forget, but the correct memory was never stored in the first place. Their results bring up the issue of source in that the participants believed they had seen the misleading information. The participants demonstrated an error in identifying the *source* of their information, and believed that they were seeing an event that they did not actually see. The information may overlap with the original memory or the original memory may not have been stored correctly in the first place.

Intraub and Hoffman (1992) tested the memories of participants who were given photographs and accompanying texts for those photographs. Their results show that participants misattributed information they had read as being information they had seen in the photographs. Belli, Lindsay, Gales, and McCarthy (1992) found that participants were far more likely to make the error that they remembered seeing something when they actually read about it, as opposed to the error of saying they read about something they had actually seen. According to Johnson and colleagues (1993), "reading about an event will give rise to imagery related to the event, whereas viewing an event is less likely to give rise to imagined reading" (p 5).

In addition to Lindsay and Johnson (1989), there have been other studies that vary the way they test source monitoring and the effects on memory. Johnson, Kounios, and Reeder (1992) include reaction times and the participants' memory for that scene and found that source monitoring depends on higher levels of differentiation of memory than does old/new recognition. In order to come to this conclusion the reaction times were measured. These response times can reflect a number of factors. For example, if participants have a faster reaction time it might demonstrate that their memory is better because it would not take as long to retrieve the memory.

Our study tests participant's ability to differentiate scenes that are drawn from different points in the timeline of an event; we test their memory of different parts of a event. Instead of testing misleading information and text, we will be testing the errors that occur when the participant may create an inference based on a given scene.

Inference as a Type of Source

As shown in the studies summarized above, source memory can be influenced by many factors. One of these factors is an inference that one makes from the information given in a scene. Inferences rely heavily on the information that is presented within the scene and simple manipulations can change the inferences that are drawn from that scene.

Taking the example of footprints in the snow, as in Figure 1, which demonstrates the ambiguity that is presented within the scene.

Figure 1 Photogra afragou, 2012)

A person will make an inference from a photograph if there were only marks on the snow as shown in Figure 1. The viewer would be unable to decide where exactly the footprints came from. A number of conclusions could be drawn from the photograph such as a bear making the footprints or a person making the footprints. When shown Figure 2, the inference of a bear making the footprints is stronger than the other photographs, but it still cannot be confirmed. Despite exactly what a person would be thinking about the photograph the main purpose of this example is that inference comes with uncertainty and there are many ways in which to manipulate the information in a scene in order to create or reduce uncertainty.

Figure 2 Photogra 012)

Despite this uncertainty, people use inference as a way to gather information about a scene. Prior studies have used misleading information in order to test participants' ability to remember the sources of events, but inference is a new way to test the effects of suggestibility errors in source monitoring.

Cross-Linguistic Differences in Source Encoding

Our study focuses on the differences between encoding of direct versus indirect source in a language. Evidentiality is the linguistic encoding of source. Languages use evidential markers to indicate whether a piece of knowledge arises from a first-hand or non-firsthand source. When English speakers are relaying information about a particular event, they do not need to encode whether the information was acquired directly or indirectly. Thus sentence (1), which may be uttered whether the speaker directly observed the bear walk or just heard about it. If they are speaking the past tense, Turkish speakers do need to specify whether they acquired something from a direct or an indirect source in the past tense. Turkish uses morphological markers at the end of the verb to indicate whether or not information was acquired something directly, as in sentence (2a), or indirectly, as in sentence (2b). Turkish speakers use [–dI], to indicate that they saw the event (Aksu-Koç, et al 2009). When something was learned indirectly, Turkish speakers will use [–mIş], which signifies that the speaker may have, for example made an inference about the event on the basis of physical evidence (Aksu-Koç, et al. 2009). These morphological changes depend on the context of the sentence as shown below in 2a and 2b and will change depending on the content.

(1) English

The bear walked.

(2) Turkish

a. Ayı yürü-dü.   Direct
The bear walk- past direct
"(I saw that) the bear walked."

b. Ayı yürü-müş   Indirect
The bear walk-past indirect
"(I heard/inferred that) the bear walked."

Because English and Turkish speakers use morphological markers differently to describe the source of a scene we expect there to be differences in the way that they encode the scene and then remember that scene. According to linguistic relativity, language affects the way a person looks, encodes, and remembers the world (Gumperz & Levinson, 1996). Languages encode the world differently in all types of ways and we expect the encoding of a source to improve memory of the source of an event. Specifically, the effects of these evidential markers should facilitate the ability to retrieve the source of a memory. Turkish speakers specify the source from which they acquired their information. Turkish speakers linguistically encode this source of knowledge, which may make their memory for sources more accessible than English speakers. This could affect their accuracy in remembering sources, as well as the speed with which they retrieve this information.

Goals of Our Study

In this study, we present an experiment that will test whether a strong inference affects a person's memory. We hope to find a relationship between internal source monitoring and inferential processing and we would like to explore how an inference about a particular event will affect the memory for that event. We would also like to see the difference between speakers: Will the accuracy for memory in Turkish be higher because of the ways that language encodes sources? We will also be testing whether the source of a memory comes from direct evidence, which would be externally generated or it is coming from inference, which would be internally generated. Using the information of evidentiality, would Turkish individuals have a higher accuracy because their source encoding of a scene?

We will present participants with pictures of people in completed actions during training, then ask them to judge whether they've seen each photograph or if it is a new photograph. For example we may show a completed action such as Figure 1, with footprints across the snow, then show Figure 2, and test whether or not they have made this internally generated inference and remember it as the photograph they originally saw. We hope that creating these inferential scenes will induce an error of memory of source that may be different across English and Turkish. Because Turkish source in verb morphology, Turkish speakers may be less likely to misremember an inferred event as the original one, since they directly encode whether or not they have seen an event. English speakers may think about Figure 1, “Footprints were made on the snow,” whereas Turkish speakers might think “Footprints were made on the snow-indirect.” When retrieving their memory and comparing to Figure 2, English speakers may be less able to differentiate between the different time points than Turkish speakers.

In order to effectively test the effects of linguistic background, we are going to have a task that blocks a speaker’s access to language during the experiment, making it difficult for them to use language to encode and thereby remember a scene. By providing a distracting linguistic task concurrently with the presentation of the stimulus, we will be able to detect the performance of the participants when language is removed from the performance of the task (Trueswell & Papafragou, 2010). This would be considered a linguistic interference, which would prevent the participants from labeling the scenes, thus demonstrating their performance without the use of language. This is necessary in order to determine whether any difference that we see between English and Turkish speakers exist because of the overt use of language to facilitate memory or because of deeper cognitive differences between speakers of the two languages.

We will also be using scenes that depict an object change, where there will be two versions of the single event with one item different e.g. Figure 2 with a bear versus Fig. 2 with a moose. These changes will help establish a baseline measure of memory between the two speakers and should not differ because of source encoding.

Hypothesis

According to linguistic relativity, there will be a difference between English and Turkish speakers in the way they see and remember the world. We expect that there will be a lower error for the inferential photographs for Turkish speakers in the condition without the linguistic interference. Linguistic relativity also predicts there may be a higher accuracy in conditions with linguistic interference as well. We will also be measuring their response times for the memory of the scenes. These differences will also show how fast the participants are responding when they are correct.

The shadowing task will provide us with data that should show the participants for English and Turkish performing similarly. If linguistic relativity is not present the English and Turkish speakers should perform the same on all kinds of changes, which will provide evidence for the theory of linguistic relativity.

CHAPTER 2

METHOD

Subjects

Data were collected from 32 native speakers of Turkish. Ercenur Unal, a graduate student in the Language and Cognition Lab, recruited and tested the Turkish participants. The age range of the Turkish participants was 19-23 years old. The participants were recruited in Istanbul, Turkey. The participants all filled out a consent form, as approved by the University of Delaware Institutional Review Board (IRB). The Turkish participants were given their instructions in their native language and received course credit for their participation.

Data were also collected from 32 native, monolingual speakers of English. The English participants were recruited at the University of Delaware from the Psychology-100 subject pool. The participants all filled out a consent form and received course credit when they completed the experiment. English speaking participants were also given instructions in their native language.

Materials

48 pairs photographs that were shown were timeline changes (n=24 Figures 3A and 3B), object changes (n=24 Figures 3C and 3D) and fillers (n=48 Figure 3E).

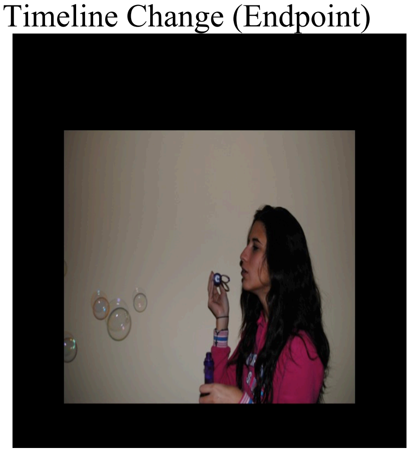
One photograph in each pair showed people engaged in various actions which were used as target familiarization images for two different within-subjects tasks: an inference task (timeline change) and an object memory task (object change). The other photograph in each target pair was used in a memory task.

There were 24 timeline changes, which were inferential events each with an endpoint and a midpoint. Timeline changes create an inference because people need to differentiate if they inferred the end of the event, or saw the middle of the event. An example of an inferential event had one endpoint event, which depicted a person with bubbles at the edge of the scene and her face pulled away from the bubble wand (Figure 3A). The corresponding midpoint event showed the same person blowing bubbles (Figure 3B). Each of these inferential scenes had two versions depicted in separate photographs.

The other type of change were object changes. There were 24 object replacements events. One example was a man with a bowl of apples (Figure 3C) and then that same man with a bowl of pears (Figure 3D). Each of these object change events has two versions shown in separate photographs.

The 48 fillers showed actions in different stages, which we again classified as either midpoints or endpoints (Figure 3E- endpoint). Descriptions of all photographs used as stimulus items are located in Appendix A.

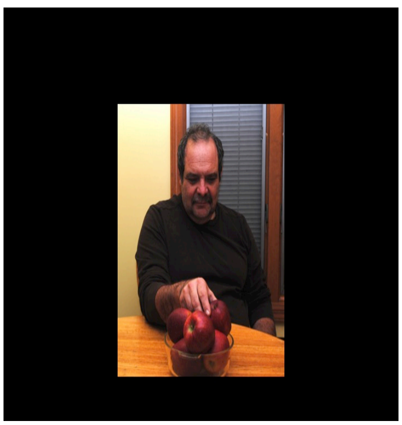
A. Timeline Change (Endpoint)

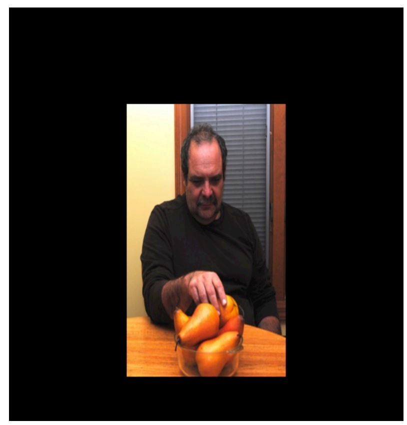


B. Timeline Change (Midpoint)

C. Object Change (Man with apples)

D. Object Change (Man with Pears)





E. Filler (Man crushing can of soda)

Figure 3 Photographs used in the experiment

Design

The design of the study had two different blocks of trials, Block A and Block B. Each block of trial had Training Phase and a Memory Phase.

During the Training phase, photographs were presented in a randomized order for 1.5 seconds. The Training Phase featured one version of the timeline events, the Endpoints (Figure 3A), one version of the object change events (Figure 3C), and 48 fillers (Figure E). In total the Training Phase had 96 total photographs.

The Memory phase then presented the second half of the timeline change event, which were the Midpoints and the other version of the object change event (Figure 3D), and the same 48 fillers. The Memory Phase also consisted of 96 photographs, which were randomized independent of the order of presentation in the Training Phase. The breakdown of events is shown in Table 1.

Training Phase	**Memory Phase**
24 Endpoints	24 Midpoints= Changed
24 Object Changes	24 Object Changes= Changed
48 Fillers	48 Fillers= Same
Total= 96	Total =96 (48 changed + 48 same)

Table 1 Breakdown of the events in each block

Procedure

The study was run using E-Prime run on a Dell Latitude E6520 Computer. Participants were asked to fill out consent forms and demographics questionnaires. Participants were assigned to the Shadowing or the No-Shadowing condition. After the participants had filled out their consent forms, they started the experiment.

The first part of the experiment was the Practice Phase. The participants were shown these photographs in order to prepare them for the types of differences they might be seeing as well as the general set-up of the experiment. Like the actual experiment, the Practice Phase had two portions: a Training Phase and Memory Phase. Participants in the No-Shadowing condition simply had to watch the experiment. The participants in the shadowing condition were instructed to count out loud when the first photograph was shown starting from the number one.

The Practice Training Phase included 4 photographs, an Endpoint photograph, an Object Change photograph, and 2 Filler photographs. In the Practice Memory Phase the Endpoint changed to Midpoint, the object change featured a replacement, and the fillers stayed the same. For each item presented in the Memory Phase, participants were instructed to identify whether or not they had seen the exact photograph before and to respond by pressing the keyboard; half of the participants were instructed to press A for Yes and L for No and the other half of the participants were instructed to press L for Yes and A for No. The same correspondence between keys and response was used for the duration of the experiment for each participant.

After the participants finished the Practice Phase the instructions on the computer led participants them into the Training Phase of the first block of trials (either Block A or Block B depending on condition). Participants in the No-Shadowing condition, they watched the Training presentation with no further instructions. Participants in the Shadowing condition were asked to count out loud starting from 100 while viewing the photographs.

After participants finished the Training Phase, the instructions told them there was going to be a Memory Phase. The participants were asked during the Memory

Phase to indicate for each item whether or not they had seen the photograph before. The participants were instructed to press the keyboard as described above. Their reaction times were recorded by eprime.

After the participants finished the Memory Phase of each block, they were then presented with the Training Phase for the second Block of trials. This Training Phase was Block B, for those who were given Block A first and Block A if for those who were given Block B first. The participants in the No-Shadowing condition were not given any further instructions. The participants in the Shadowing condition were asked to count out loud starting from 200.

After the participants finished the Training Phase of the second block, they completed the Memory Task for that block of photographs. When the participants finished the Memory Phase for the second block, the experiment was finished and they were instructed to leave.

Data analysis

The first type of data that was collected was Yes/No responses to the question, “have you seen it before.” The participants were instructed to answer Yes if they had seen a photograph before, and No if the photograph was new. When coding the data, the results were broken down into correct and incorrect responses. The participants were correct if they answered No when the photographs were new (correct rejection) and Yes when the photographs were the same (hit). The participants were incorrect if they answered Yes when the photographs were different (miss), and No when the photographs were the same (false alarm). Reaction time data was collected from the memory trials and analyzed only for correct responses.

Two participants were excluded from the data analysis, one from each language group. The English-speaking participant was excluded from the Shadowing condition, and the Turkish-speaking participant from the No-Shadowing condition. These participants were excluded on the basis of a dprime analysis. We determined if there was a bias in Yes/No of responses by entering whether the participants' correctly identified the new photographs (correct rejection), correctly identified an old photograph (hit) did not identify a new photograph (miss), or incorrectly identified an old photograph as new (false alarm). If the participant showed a dprime score of over 1, which showed they mostly answered Yes or mostly answered No.

CHAPTER 3

RESULTS

3.1 Accuracy Data

Means for accuracy during the memory phase are shown in Table 2. This accuracy is proportion of responses that were hits or correct rejections.

Type of Stimulus	**English**	**Turkish**
No-Shadow		
Filler	0.85 (+/-0.10)*	0.87 (+/-0.10)*
Object Change	0.76 (+/-0.14)*	0.75 (+/-0.10)*
Timeline Change	0.66 (+/-0.14)*	0.71 (+/-0.13)*
Shadow		
Filler	0.74 (+/-0.12)*	0.67 (+/-0.15)*
Object Change	0.59 (+/-0.11)*	0.58 (+/-0.16)*
Timeline Change	0.55 (+/-0.17)	0.57 (+/-0.14)*

Table 2 Means of response accuracy. *Denotes means that were significantly different from chance (0.50) at $p<0.05$ standard deviation

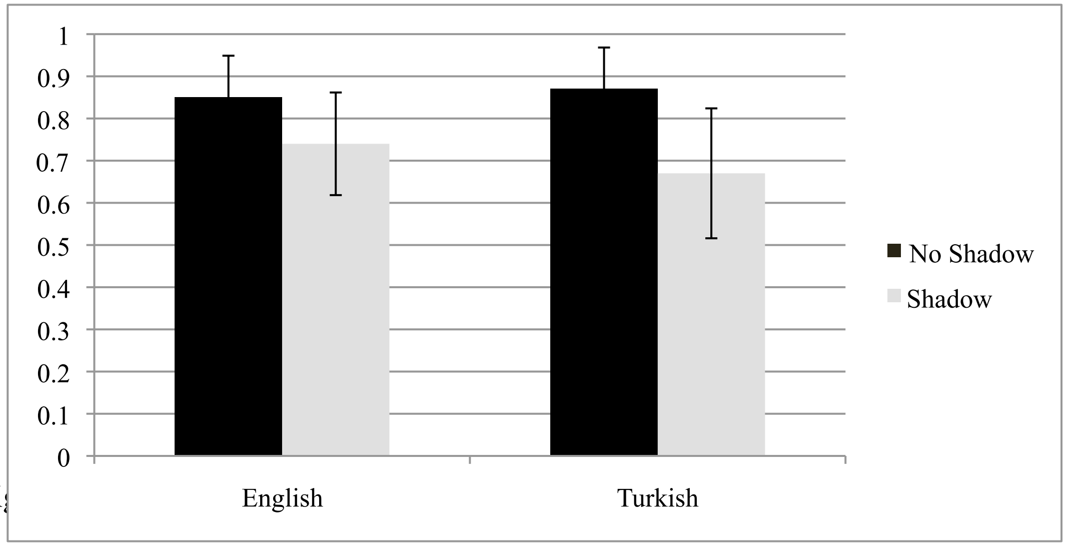
Comparing across No-Shadowing versus Shadowing, the performance drops but the trends in accuracy across language groups remain the same. Across tasks, English and Turkish speakers had the same accuracy for fillers items, as well as for object changes and timeline changes.

3.1.1 Comparisons of Accuracy to Chance

First we ran t-tests to determine whether mean participant accuracy was different from chance (0.5) with at least 95% confidence. The results showed that for the No-Shadowing, accuracy for fillers, object changes, and timeline changes was above chance for speakers of both English and Turkish. In the shadowing condition, on the other hand English-speaking participants were significantly higher than chance for Fillers and Object changes, but not for Timeline changes. As in the No-Shadow condition Turkish participants were significantly higher than chance for Filler, Object changes, and Timeline changes in the Shadow condition.

3.1.2 Analysis of Accuracy on Filler Items

The results were tested using an Analysis of Variance (ANOVA), with subject means for percent accuracy on fillers as the dependent variable and between-subjects independent factors of Language (English, Turkish) and Task (Shadowing vs. No-Shadow). There was no main effect of Language ($F(1,58)=0.766$, $p=0.334$) (Means English fillers 0.79, +/-0.12, Turkish fillers, 0.76 +/-0.16). There was a main effect of Task ($F(1,60)=21.41$, $p< 0.001$), such that participants who were in the No-Shadowing condition had higher accuracy, regardless of the language they spoke (Means No-Shadow=0.85 +/-=0.10 Shadow=0.69, +/-0.14). There was no interaction between Language and Task as shown in Figure 4.



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3.1.3 Analysis of Accuracy on Target Items

The comparisons of accuracy for object changes, and timeline changes across Language and Task are shown in Figure 5. Accuracy for target items was tested using a repeated measures ANOVA, with subject means for percent accuracy on the within-subjects variables of object-replacement and timeline changes. The between-subject independent factors were Language (English, Turkish) and Task (No-Shadowing vs. Shadowing). There was a main effect of the type of stimulus item, ($F(1,58)=6.363$, $p=0.014$) (Means Object 0.67 +/-0.15 Timeline 0.62 +/-0.16). Participants had a higher accuracy for the object changes than for timeline changes. There was no significant effect of Language, ($F(1,58)=0.0.89$, $p=0.767$) (Means English 0.64 +/-=0.14, Turkish 0.65, +/-0.14). There was a main effect of Task, $F(1,58)=16.391$, $p<0.001$ (Means: No-Shadow 0.71 +/-0.11 Shadow, 0.57 +/-0.12). Participants who were in the No-Shadowing condition had a higher accuracy than the participants in the Shadowing condition. There were no significant interactions.

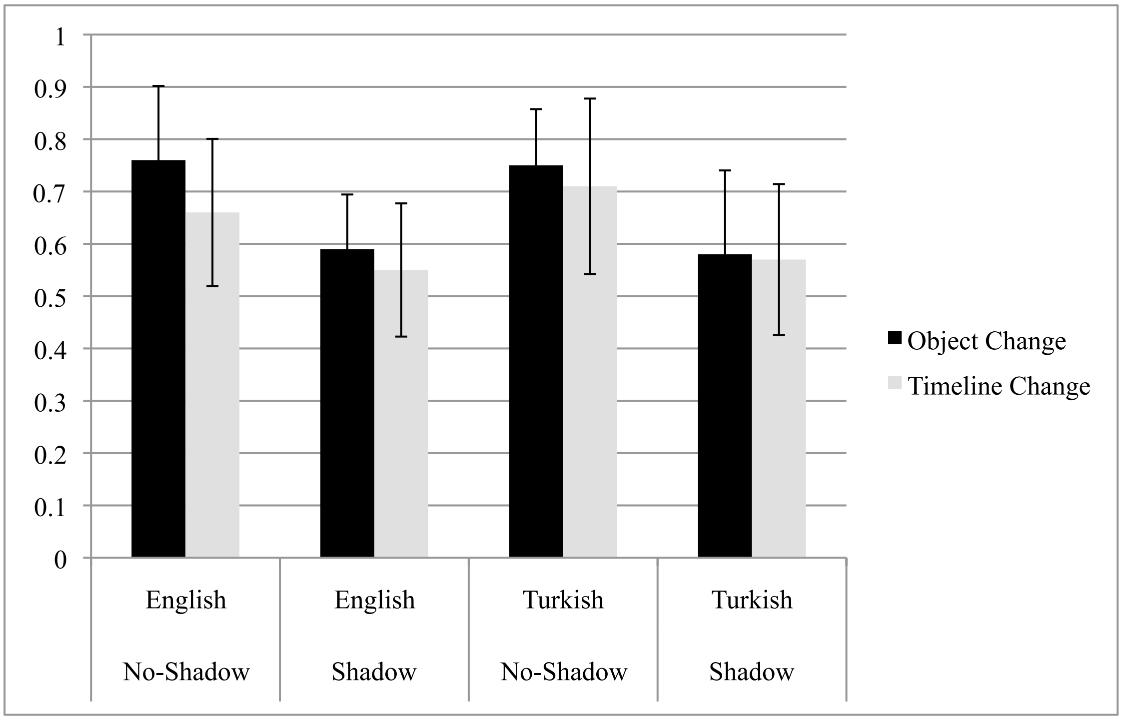

Figure 5 Comparison of subject means for accuracy on object changes and timeline changes for English and Turkish speaking participants in the Shadow and No-Shadow Task.

The lack of an interaction for target accuracy and language demonstrates evidence against linguistic relativity. Comparing across No-Shadowing versus Shadowing, the performance drops but the trends between English and Turkish remain the same. English and Turkish speakers shared the same accuracy on object changes and timeline changes.

3.1.4 Item Analysis

Item means for target accuracy were compared using a repeated-measures ANOVA, with stimulus type as a within-subjects variable (Object Changes vs. Timeline Changes) and as a dependent between-subjects variable of Language (English, Turkish) and Task. There was a main effect of Task ($F(1,92)=0.082$, $p=<0.0$) (Means: No-Shadow 0.72, +/-0.18, Shadow 0.57, +/-17).There was no main effect of stimulus type ($F(1,92)=2.985$, $p=0.089$) (Means Object 0.67 +/-0.14, Timeline 0.62, +/-0.19). There was no main effect of Language ($F(1,92)=0.207$, $p=0.651$) (Means English 0.64, +/-0.19, Turkish 0.65, +/-0.17).

3.2 Reaction Time Data

English and Turkish speakers differed in the their response times for fillers, and the objects and the timeline photographs as shown in Table 3. These reaction times are only for correct responses.

Type of Stimulus	**English**	**Turkish**
No Shadow		
Filler	1072.04 (+/-217.14)	1232.07 (+/-358.94)
Object Change	1222.26 (+/-256.66)	1543.02 (+/-345.66)
Timeline Change	1240.04 (+/-360.07)	1532.60 (+/-452.06)
Shadow		
Filler	1037.69 (+/-251.96)	1128.60 (+/-315.48)
Object Change	1236.92 (+/-289.26)	1355.63 (+/-557.58)
Timeline Change	1245.50 (+/-255.26)	1447.22 (+/-511.13)

Table 3 Means of reaction times (in ms) for correct responses

3.2.1 Analysis of Reaction Times for Filler Items

Reaction times for fillers with accurate responses as a dependent variable were assessed in an univariate ANOVA, with between-subject independent factors of Language (English, Turkish) and Task (Shadowing vs. No-shadowing). There was no main effect of Language ($F(1,58)=3.063$, $p=0.085$) (Means English 1103.25 +/-242.42, Turkish 1271.99 +/-349.85). There was no main effect of Task ($F(1,58)=0.919$, $p=0.342$) (Means No-Shadow 1205.88 +/-318.14, Shadow 1168.15 +/-306.07). There was no interaction between Language and Task.

3.2.2 Analysis of Reaction Time for Target Items

Mean reaction time for correct target items were assessed in a repeated-measures ANOVA with Change Type (Object, Timeline) as a within-subjects variable. The between-subject factors were Language (English, Turkish) and Task. There was no significant differences between the type of changes ($F(1,58)=0.123$, $p=0727$) (Means Object 1318.08 +/-268.81, Timeline 1328.92 +/-240.41). There was a main effect of Language $F(1,58)=4.846$, $p=0.032$ (Mean English 1216.02 +/-= 248.33, Turkish 1430.98 +/-=439.22). Turkish speakers had a longer response times for both types changes compared to English speakers. There was no main effect of task $F(1,58)=0.810$ $p=.372$, (Means No-Shadow 1375.18 +/-387.08, Shadow 1271.82 +/-350.87).

CHAPTER 4

DISCUSSION

Our findings did not support our hypothesis that the Turkish speakers would have a higher accuracy for timeline changes in the No-Shadowing task because of their evidential encoding of source. Across tasks, English and Turkish participants in our study did not perform differently on timeline changes in terms of accuracy. There is an overall difference between reaction times to object and timeline changes between English and Turkish speakers, but as the results show, this did not mean they were performing any differently in terms of accuracy.

For Task, memory accuracy demonstrated the same trends in the shadowing and No-Shadowing. English and Turkish speakers did not differ in accuracy, and this was reflected the same for both the Shadowing and No-Shadowing. This is important because we expected differences in accuracy between English and Turkish speakers in the No-Shadowing task because the participants were able to use language for linguistic encoding. This might help facilitate their memory, and for Turkish we expect it to lead to higher accuracy for timeline changes. This was not shown in our results, and our hypothesis was disproved. Accuracy dropped in the shadowing task, compared to the No-Shadowing condition because the task was harder. The accuracies of English and Turkish not being significantly different from one another across both the Shadowing and the No-Shadowing show there are no lasting effects of the differences between languages. It did not occur that the Turkish speakers had an overall improved memory for sources even when language was taken out of the experiment. These results argue against the linguistic relativity view position that the language one speaks affects the way one thinks.

The results also further our questions of the types of errors that the participants are making. The participants are not making the same proportion of errors for the object changes, as they were for the timeline changes, because participants had a higher accuracy for the object changes than for the timeline changes. The timeline change errors came as a result of internal source monitoring errors: participants may not have remembered the difference between what they saw and what they inferred. The results suggest that it is a specific type of memory error, rather than object change errors.

Looking back through our results there are ways to improve the study to learn if cross-linguistic differences exist. In the No-Shadowing task, the participants do not have a task that would take up their mental abilities. It could be that the participants are not using language in both the English and the Turkish. If the participants were not encoding the scenes in language, then the differences between the languages would dissolve because the linguistic component would be taken out. The participants may have used a *thinking-for-speaking* story where they are describing the scenes in this fashion (Slobin, 1996). The *thinking-for-speaking* hypothesis states that when language is used a person will attend to certain aspects of the world while ignoring or deemphasizing others.

Another explanation for the results could be that the English and Turkish participants are encoding the scenes using language, but are not using the past tense to describe them. If the participants were looking at the scenes as actions that were not yet completed or were in the process of completion, they may be encoding the scenes differently. An example would be that the participant might describe the endpoint bubble-blowing scenes as "bubbles floating around in the scene" and then in the memory task describe the changed photograph and encode it as "bubbles being blown." If both the English and Turkish participants were categorizing these photographs in this way the results may be explained that way. However, this explanation may not be not be as sufficient explanation of the data because the participants did demonstrate accuracy for scenes that were might have been labeled differently, as shown by their performance on the object changes. If the participants were using language, they would label this scene, Man reaching Apples, and in the Memory Phase would be aware that this scene was different from Man reaching Pears. If this was the case for the timeline changes there should not be a significant difference between object and timeline, but there is a difference.

In order to confirm whether these linguistic differences would occur with spoken language, it would be a further extension of the study to instruct the participants to describe the scenes. Our study did not specifically ask the participants to detect the source each scene but whether or not they had seen the photograph before. If the participants were asked to tell what was different about a scene this may provide more clues as to whether or not they can remember the parts of the scene rather than describe the contextual aspects of the scene. Other studies found that when the participants were asked directly about the source of a scene that improved the accuracy of their memory (Lindsay & Johnson, 1989). Asking the participants to describe the scenes would also provide stronger evidence for the way they might use language to remember the scenes.

Studying the way people use language as a method for remembering parts of scenes provides insight into the way people remember sources. Although Turkish speakers encode the source from which they learned about information in their speech, it does not help (nor hurt) their memory of that scene. These results contribute to the debate of linguistic relativity. Speakers of a language that obligatorily encodes source do not have improved performance of memory over speakers of a language that has optional source encoding. Our results give us a step of further learning the complexities about memory, and encourage many more questions for the future.

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Appendix A

LIST OF EVENTS

Training Trial	Memory Trial	Stimulus Type
Endpoint	**Midpoint**	
Girl with balloon inflated	Girl inflating a balloon	Timeline change
Girl with bubbles blown	Girl blowing bubble	Timeline change
Girl with cake with icing on it	Girl icing a cake	Timeline change
Candles blown out	Man blowing out candles	Timeline change
Girl with coffee poured into mug	Girl pouring coffee into mug	Timeline change
Man with cracked nuts	Man cracking nuts	Timeline change
Girl with dough rolled out	Girl rolling out dough	Timeline change
Girl with finished painting	Girl painting	Timeline change
Girl finishing squeezing toothpaste	Girl squeezing toothpaste	Timeline change
Girl with bitten apple	Girl biting an apple	Timeline change
Girl with hair braided	Girl braiding hair	Timeline change
Girl with blocks knocked over	Girl with blocks being knocked over	Timeline change
Man pulled paper towel off	Man pulling paper towels	Timeline change
Girl with pizza on plate	Girl eating pizza	Timeline change
Girl with present wrapped on table	Girl wrapping a present	Timeline change
Girl with watermelon cut in half	Girl cutting watermelon	Timeline change
Woman holding up her knitting	Woman knitting	Timeline change
Woman poured chips into bowl	Woman pouring chips	Timeline change
Man dancing with woman	Man dancing with different woman	Object Replacement
Girl eating an apple	Girl eating a banana	Object replacement
Girl folding black shirt	Girl folding white shirt	Object Replacement
Girl opening a container	Girl opening a different container	Object Replacement
Girl opening a jelly jar	Girl opening different jar	Object Replacement

Girl putting on hat	Girl putting on different hat	Object Replacement
Girl putting on moccasins	Girl putting on boots	Object Replacement
Girl with beer mug	Girl with wine glass	Object Replacement
Girl with camera	Girl with different camera	Object Replacement
Girl with Hammer	Girl with Wrench	Object Replacement
Girl with umbrella	Girl with different umbrella	Object Replacement
Girl writing on green paper	Girl writing on pink paper	Object Replacement
Man opening door	Woman opening door	Object Replacement
Man playing with guitar	Woman playing with guitar	Object Replacement
Man reading book	Man reading a different book	Object Replacement
Man watching television	Man watching different channel	Object Replacement
Man reaching for apples	Man reaching for pears	Object Replacement
Man with laptop	Man with different laptop	Object Replacement
Man with red lighter	Man with green lighter	Object Replacement
Man with white bottle	Man with green bottle	Object Replacement
Couple playing with kickball	Couple playing with Frisbee	Object Replacement
Woman cleaning with Swiffer	Woman cleaning with broom	Object Replacement
Woman with beige tablecloth	Woman with green tablecloth	Object Replacement
Woman with fan	Woman with different fan	Object Replacement
Woman with mug	Woman with different mug	Object Replacement
Man cleaning dishes		Filler
Girl cleaning laundry		Filler
Man eating cake		Filler
Girl blowing nose		Filler
Girl breaking window		Filler
Girl brushing hair		Filler
Girl drinking out of glass		Filler
Girl eating popcorn		Filler
Girl getting water from fridge		Filler
Girl moving pot on stove		Filler
Girl opening bag of chips		Filler
Girl opening can of soda		Filler
Girl pouring mix into bowl		Filler
Girl putting on gloves		Filler
Girl putting up frame		Filler
Girl reading at table		Filler
Girl vacuuming		Filler
Girl with closed blinds		Filler
Girl with dropped vase		Filler

Girl with painted fingernails	Filler
Girl with squeezed juice	Filler
Girl with stapled paper	Filler
Girl writing at table	Filler
Man reading newspaper at table	Filler
Man coring an apple	Filler
Man kicking garbage pail	Filler
Man next to raked leaves	Filler
Man with chopped celery	Filler
Man with crushed can	Filler
Man with ripped paper	Filler
Man with shredded carrots	Filler
Girl opening a bag of chips	Filler
Girl opening can of tuna	Filler
Girl opening fridge	Filler
Girl opening jar	Filler
Girl opening wine bottle	Filler
Man pumping water	Filler
Man putting cap on pen	Filler
Woman putting dishes in dishwasher	Filler
Girl putting muffins in oven	Filler
Man putting on a scarf	Filler
Girl putting on coat	Filler
Throwing pizza box away	Filler
Man tying a tie	Filler
Man walking into Room	Filler
Woman arranging flowers	Filler
Woman cleaning table	Filler
Woman ironing, burnt shirt	Filler
Woman putting toilet paper on roll	Filler