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Implicit Spatial Cues in Language

Melissa R. Fox

FLORIDA STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

IMPLICIT SPATIAL CUES IN LANGUAGE

By

MELISSA R. FOX

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Melissa Fox defended this thesis on July 16, 2015.
The members of the supervisory committee were:

Michael Kaschak
Professor Directing Thesis

Walter Boot
Committee Member

Arielle Borovsky
Committee Member

The Graduate School has verified and approved the above-named committee members, and certifies that the thesis has been approved in accordance with university requirements.

To my family and friends.

ACKNOWLEDGMENTS

I would like to thank my advisor, Dr. Michael Kaschak, for his guidance throughout the research process.

I would also like to thank Cassie Berry, Julie Carranza, Amanda Kowalsky, Jane Komsky, Tim Kutta, and Angele Yazbec, my fellow graduate students, for their suggestions, comments, and discussions, which have improved the quality of this research project.

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ABSTRACT

Previous studies have found interactions between the meaning of a word and the spatial position of the word (Barsalou, 2008; Zwaan and Yaxley, 2003). Some studies find that words or sentences with a directional component facilitate detection toward the congruent spatial direction (e.g., Šetić & Domijan, 2007; Dils & Boroditsky, 2007; Dils & Boroditsky, 2010; Pecher et al; 2010). For instance, the word "jump" would cue toward the top of a screen. Other studies find the opposite effect, where words with implicit spatial meaning show an interference effect (e.g., Bergen et al, 2007; Estes et al, 2008; Dils & Boroditsky, 2010). In these cases the word "jump" would result in faster reaction times to stimuli in the bottom of the screen. This experiment attempts to answer this controversy by looking at temporal effects. These differences might be due to inhibition of return (Posner & Cohen, 1984). If that is the case, one would expect to see a timeline where there is a facilitation effect followed by interference. Results of the study show no effect of time, however there were strong item effects. Most sentences consistently showed either a facilitation or inhabitation effect across all times. This suggests that these effects are modulated by the items that are used.

CHAPTER 1
INTRODUCTION

Previous studies have shown that language comprehension often involves the automatic activation of mental imagery (Lebois et al. 2014). For instance, in order to answer the question "Which is taller, a pen or an average cell phone" most people report comparing mental representations of the two objects. Grounded cognition theorizes that processing language activates internal representations of previous experiences. For instance, reading the word "bird" activates a simulation of what it would be like to experience a bird (Zwaan & Madden, 2005). This imagery has the potential to facilitate or inhibit performance on tasks.

Recently spatial representation has been linked to higher forms of cognition, specifically conceptual understanding (Barsalou, 2008). For instance, words associated with a specific spatial direction can influence attention toward that direction. This paper will focus on mental imagery in relation to spatially salient language. This language could be either words or sentences that specifically indicate one direction or another. For instance the word "ground" indicates a downward direction while the sentence "The bird flew in the sky" indicates an upward direction. Several studies have shown that the position a word is in can affect word processing (18). Zwaan and Yaxley (2003) found that response times in a semantic judgement task were faster for word pairs that were in their iconic order ("attic" presented above "basement") as opposed to the opposite order ("basement" presented above "attic").

Mental spatial representations induced by language can affect the relevant axis of motion. For instance, after hearing the word "bird" attention is changed in the vertical axis. Richardson et al. (2003) found that listening to sentences with a directional component interacted with performance on a visual discrimination task involving the same axis indicated by the sentence. However there is some controversy about the direction of the interaction.

Many studies have found facilitation, speeding detection toward the congruent spatial direction. For instance, Šetić & Domijan (2007) found that words for flying animals were responded to more quickly when presented at the top of a screen, while the opposite was true for words describing nonflying animals. Dils & Boroditsky (Dils & Boroditsky, 2007; Dils & Boroditsky, 2010) asked participants to read a story describing upward or downward motion. Afterwards they were asked to interpret an ambiguous bird, which could be seen as flying

upward or diving downward. They found that participants were more likely to interpret the figure as flying upward after reading a story describing upward motion. Pecher et al. (2010) showed participants nouns that either belonged in the sky or ocean, and asked them to answer (yes or no) if the noun presented belonged in the sky (or ocean depending on the group). Response times were faster for yes responses than no responses, showing a congruent advantage.

However, several other studies have found an interference effect. Bergen et al. (2007) used an object categorization task preceded by hearing a sentence with an up or down component. They found that participants detected shapes faster when the location on the screen was the opposite of the direction indicated by the sentence they heard. Estes et al. (2008) used a similar procedure, finding that after reading nouns typically found upward or downward in space (head, foot) performance on a discrimination task in the congruent spatial location was hindered. Dils & Boroditsky (2010) tested whether language induced mental imagery could be strong enough to produce motion aftereffects. Participants listened to stories describing a particular direction, and then judged the direction of a moving field of dots. They found that participants spontaneously created vivid enough mental images to produce direction selective adaption.

Interestingly, similar procedures have led to opposite effects. Dudschig et al. (2012) presented participants with up or down related verbs written in different colors and were asked to answer what color it was with either an upward or downwards movement, or, in another experiment, a stationary up or downwards button press. They found that with both the movement and the stationary response reaction times were faster when the word matched the response key. This indicates a spatial congruency effect. This congruency effect was then replicated with a sensibility judgement rather than a color discrimination task (Kaup et al. 2012). Dudschig et al. (2014) followed a very similar procedure, yet found the opposite result. They presented participants with an upwards or downwards directionally salient noun followed by a colored rectangle. Participants then needed to make an upwards or downwards movement to respond to the color. Unlike Dudschig et al. (2012), Dudschig et al. (2014) found a reversed compatibility effect.

The goal of this project is to figure out why some studies show facilitation effects, while others show inhibition. Two possibilities for these differences are explored. First, the timing of the experiments could have an effect. Secondly, characteristics specific to each directional word could drive the effect.

A possible reason for these differences is in the exact timing of the experiment. Interference and facilitation could represent two stages in the same temporal process. Inhibition of return (IOR) refers to an attentional mechanism that briefly speeds detection to a cued space and then impairs detection to the same location after approximately 300 ms. By suppressing the previously attended space, orientation to new locations is easier. (Posner & Cohen, 1984). It is possible that inhibition of return is causing the difference in effects. If that is the case, the expected finding would be a quick compatibility effect, followed by a reverse compatibility effect after a few hundred milliseconds. For instance, the word "bird" may initially speed direction toward the top of the screen, and after 300 ms or so IOR would impair detection toward the top of the screen. Even a slight change in the timing of an experiment can result in different results. This may be why the literature is so divided.

Another possible explanation is that each word or sentence used may have their own characteristics that may drive the effect one way or the other. Gozli et al. (2013) looked to see if the concreteness rating of the directionally significant word could explain the differences in the effects. They carried out a series of 6 experiments where they presented participants with varying abstract or concrete up or down related nouns, followed by a discrimination task. They found both facilitation and inhibition effects for both concrete and abstract words, indicating that concreteness may not be a factor. However this was just one study, and it is worth looking at again with a larger sample size. Even if concreteness may not play a role, other characteristics of these directional words may have an effect. There may be characteristics specific to each word or sentence that can drive the effect one way or the other. While it does not appear to be driven by concreteness, this is still an avenue worth exploring. Most studies used a small number of items (for instance, Bergen et al, 2007 only used 5 sentences per condition). If a study happened to use words that just acted in one direction they would find a strong effect in that direction. One goal of the present study is to use a greater number of directionally salient words then are typically used, and then look at the items specifically in order to see if different words act differently in the experiment. Familiarity, imagibility and concreteness and well as normed ratings of how related the item is to a specific direction were included in the following experiment.

In summary, the goal of this paper is to look at both timing and item effects to see if they can explain why spatially salient language driven mental imagery cause both facilitation and inhibition effects.

CHAPTER 2
NORMING SURVEYS

2.1 Word Norming

Before choosing stimuli for the experiment, two norming studies were done to ensure the chosen words and sentences had a directional component. The purpose of the norming experiments was to generate a set of stimuli that are rated highly on each direction (up/down). These norming studies closely followed the same procedure as Richardson et al. (2001). Richardson et al, (2001) used a norming survey to find a few verbs (5 in each category) that met very specific criteria (high and low concreteness, vertical/ horizontal axis of motion, etc.). This norming survey was designed to find a greater number of verbs that had an up or down directional component to them.

2.1.1 Method

2.1.1.1 Participants

Twenty undergraduate students enrolled at Florida State University participated for partial course credit. All participants were native English speakers.

2.1.1.2 Materials

Participants completed a paper survey filled with a list of 150 verbs.

2.1.1.3 Design

Subjects were presented with a verb and four schematic pictures, each picture indicating a different direction (Figure 2.1). They were then asked to imagine themselves in the circle position. Their task was circle the picture that they felt corresponded with the verb. Participants were also given an "unsure" option, so they were not forced to make a choice if they did not think there was a spatial relationship. The order of the verbs was counterbalanced across surveys, as was the order of the schematic representations of up, down, left and right on each trial.

2.1.2 Results and Discussion

Each verb was sorted into a direction based on its most popular response. The words with "up" and "down" associations were of particular interest. Once they were sorted into each direction, the 20 verbs most associated with each direction were chosen. On average, the most salient direction was chosen 50.3% of the time. For the forty chosen verbs the most popular response was chosen an average of 70.6% of the time. Table 2.1 shows the 20 selected stimuli in each category (up and down).

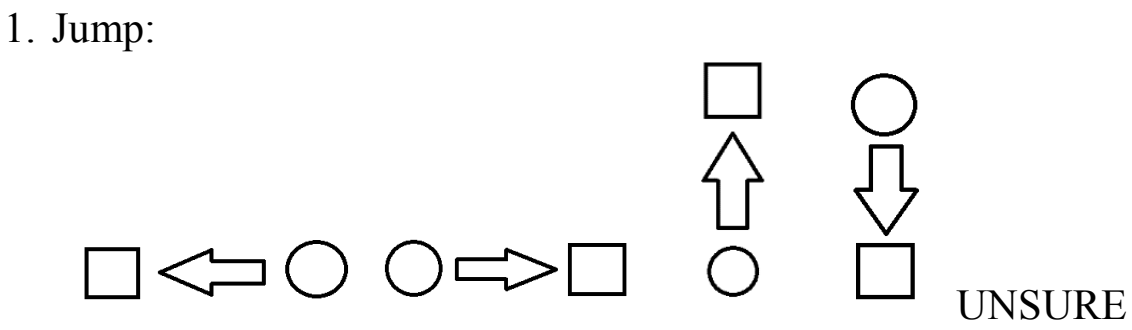

Figure 2.1: An example survey question with schematic pictures.

Table 2.1: Selected verbs with the percent "up-ness" or" down-ness" they were rated.

Up Words	% Responses "Up"	Down Words	% Responses "Down"
Jump	80	Bury	80
Raise	80	Decrease	80
Increase	80	Dig	80
Fly	75	Drop	80
Rise	75	Drown	80
Float	75	Rain	80
Launch	75	Kneel	75
Grow	70	Sit	75
Sprout	70	Stamp	75
Lighten	70	Melt	70
Build	70	Sink	70
Stand	70	Smash	70

Table 2.1- continued

Up Words	% Responses "Up"	Down Words	% Responses "Down"
Explode	65	Snow	70
Juggle	65	Squash	70
Wake	65	Hammer	70
Nod	65	Plant	70
Cheer	60	Tumble	70
Reach	55	Land	70
Smile	50	Chop	65

2.2 Sentence Norming

After selecting the directional verbs, sentences using these words were normed. This ensured that the spatial direction of the words was not affected by the inclusion of the word in a sentence frame.

2.2.1 Method

2.2.1.1 Participants

Thirty undergraduate students enrolled at Florida State University participated for partial course credit. All participants were native English speakers.

2.2.1.2 Materials

Participants completed a paper survey filled with 40 sentences. The counterbalancing of sentences and pictures was the same as in the word norming study.

2.2.1.3 Design

The design of the survey was the same as the word norming survey, except using sentences rather than just the verbs. All sentences were constructed the same way: The (subject)

(past tense of verb). For example, “The ball dropped”. The sentences were designed to be as simple as possible, with the directionally salient verb as the last word in the sentence.

2.2.2 Results

The sentence norms were found to correlate with the word norms (.617). Table 2.2 shows the sentences along with the percent “up or “down” ratings.

Table 2.2: Selected sentences with the percent “up-ness” or” down-ness” they were rated.

Up Sentences	**% Responses “Up”**	**Down Sentences**	**% Responses “Down”**
The class stood.	96.67	The ball dropped.	100
The rocket launched.	96.67	The boat sank.	93.33
The stadium rose.	96.67	The diver drowned.	90
The athlete jumped.	93.33	The dog dug.	90
The flag was raised.	93.33	The bone was buried.	86.67
The plant grew.	93.33	The grandmother sat.	86.67
The seed sprouted.	90	The catcher kneeled.	83.33
The volume increased.	80	The conductor bowed.	80
The firework exploded.	73.33	The airplane landed.	76.67
The bird flew.	56.67	The smith hammered.	76.67
The toy floated.	56.67	The weather was rainy.	76.67
The workers built.	56.67	Outside it snowed.	73.33
The child reached.	43.33	The play dough was squished.	73.33

Table 2.2- continued

Up Sentences	% Responses "Up"	Down Sentences	% Responses "Down"
The clown juggled.	43.33	The pillow was smashed.	70
The crowd cheered.	40	The sound decreased.	70
The UFO hovered.	36.67	The gardener planted.	66.67
The fox woke.	33.33	The ice melted.	56.67
The pack was lightened.	16.67	The book was stamped.	53.33
The lawyer nodded.	13.33	The chef chopped.	36.67
The daughter smiled.	10	The gymnast tumbled.	10

CHAPTER 3
EXPERIMENT

Previous studies have shown a relationship between language denoting motion and performance on spatial tasks (Richardson et al, 2003). However some studies find an interference effect while others find a facilitation effect. The purpose of this experiment was to examine the time course of these effects to see if inhibition of return was causing these differences, as well as expand the amount of stimuli used. This study followed the same procedure as Richardson et al., (2003) and Bergen et al. (2007). In both these experiments, participants heard a sentence with a particular spatial characteristic and then immediately preformed a visual categorization task. The image in the categorization task (typically a circle or square) could appear in the same or opposite spatial location as indicated in the sentence. This study took a deeper look at the temporal component by using 3 different ISIs (100 ms, 200 ms, and 300 ms) between the end of the sentence and presentation of the image for the categorization task. If IOR is causing these effects, it is expected that there would be a quick facilitation effect, followed by inhibition around 300 ms (Posner & Cohen, 1984).

3.1 Method

3.1.1 Participants

186 undergraduate students enrolled at Florida State University participated for partial course credit. Two participants were excluded from the data because their accuracy for the task was under 65%, while one participant was excluded for answering the comprehension questions with under 80% accuracy. All participants were native English speakers. There were 61 participants in the 100 ms condition, 60 in the 200 ms condition, and 62 participants in the 300 ms condition.

3.1.2 Materials

The experimental stimuli were selected from the norming surveys. 40 sentences, 20 up related and 20 down related were used. 40 filler sentences consisting of non-directionally related words were also included. Participants viewed the stimuli on a 17 in monitor, at a viewing distance of 60 cm.

3.1.3 Design

This experiment used a 3 (ISI time) x 2 (sentence direction) x 2 (picture direction) between subjects design. ISI time served as the between subjects variable. Picture direction was counterbalanced between subjects to create two lists, pairing the sentence direction with the opposite picture location. Participants were randomly assigned to each list, and each sentence appeared once in the experiment.

3.1.4 Procedure

Participants initiated each trial by pressing the spacebar, which triggered a central fixation cross along with an audio recording of the sentence. When the sentence finished there was a ISI of either 100, 200, or 300 ms, depending on the condition. After the ISI the fixation cross disappeared and either a circle or square sized approximately 1 degree of visual angle appeared in either the top or bottom of the computer screen. The shapes were located 9 degrees from the fixation cross along the central vertical axis. Participants were instructed to identify each shape as quickly and accurately as possible by pressing the appropriate button. The response buttons used were the "A" and "L" keys on a keyboard. Response buttons were counterbalanced so that half of the participants within each condition responded by pressing the "A" if they detected a circle, "L" if they detected a square, and the other half pressing "A" if they detected a square, "L" if they detected a circle. Comprehension questions were randomly asked to make sure the participant was listening to the sentence. Sentence direction (upwards or downwards related), placement on the screen, and shape were all counterbalanced. Each time condition included the 40 critical stimuli, 20 of which were up related and 20 down related. In each of the 20 up or down related sentences, 10 were paired with each screen location. The experiment took approximately 15 minutes to complete.

3.2 Results

Only participants who answered comprehension questions with at least 80% accuracy were included, this excluded 1 participant. Another two participants were excluded for answering the shape discrimination task with less than a 65% accuracy. The remaining

participants performed at 90% accuracy or higher on the critical trials. Responses that were 3SDs above or below the mean for each participant were removed, along with responses under 100 ms (too fast) and over 3000 ms (too slow). Incorrect responses were also removed.

A repeated measures ANOVA by participants showed no significant effects. There were no meaningful significant main effects of sentence type, object location, or time (All Fs < 1). There was no interaction between sentence direction and shape location $F(1,652) = .523$, $p=.47$, which would show facilitation or inhibition. Time appeared to have no effect on response times. There was no 3 way interaction between sentence direction, picture direction, and time $F(2,652) = .181$, $p=.834$. Table 3.1 shows the mean reaction times.

Each sentence was examined individually. This was to see if the items selected could be driving the effect in one direction or the other. Interestingly, most sentences (34 out of the 40) acted in the same direction over all three time periods. Each item seemed to reliably cause facilitation or interference over all ISIs. Tables 3.1, 3.2 and 3.3 show the difference scores over the three ISIs for items showing facilitation, inhibition, and inconsistent effects respectively.

A series of correlations were done to see if any measureable aspects of the sentence correlate with the average difference scores. If one of the characteristics correlates with the difference scores, it could start to explain what specifically about each sentence drives the effect. Familiarity, concreteness, and imagibiliy of the directionally salient verb were not found to correlate with difference scores, nor with the "up-ness" and "down-ness" ratings from the norming surveys. Table 3.5 shows the correlations.

Table 3.1: Mean reaction time in milliseconds for the object discrimination task in upper and lower quadrants of the screen.

	Upper Quadrant						**Lower Quadrant**					
	100 ms		**200 ms**		**300 ms**		**100 ms**		**200 ms**		**300 ms**	
	RT	**SD**	**RT**	**SD**	**RT**	**SD**	**RT**	**SD**	**RT**	**SD**	**RT**	**SD**
Up (verb)	742	218	685	257	755	437	737	237	678	253	750	396
Down (verb)	735	235	698	284	709	293	721	242	678	267	713	292

Table 3.2: Difference scores (NC-C) for sentences showing facilitation over three ISIs.

	100ms	200ms	300ms	Average
The sound decreased.	160.3	109.2846	136.6897	135.4248
The ice melted.	106.3333	66.2235	191.2334	121.2634
The gardener planted.	101.6264	104.32	156.2627	120.7364
The conductor bowed.	110.5645	147.4622	97.28414	118.4369
The plant grew.	55.76344	125.7476	153.5195	111.6768
The chef chopped.	135.271	82.43934	101.9376	106.5493
The ball dropped.	74.29032	40.85582	193.5517	102.8993
The bone was buried.	90.94743	82.83648	105.519	93.10099
The weather was rainy.	114.8276	62.05788	66.17857	81.02135
The stadium rose.	124.0962	39.49206	69.65517	77.7478
The class stood.	82.06897	105.9286	34.25926	74.0856
The grandmother sat.	77.72414	121.2149	1.518519	66.8192
The athlete jumped.	79.43493	2.459677	80.59524	54.16328
The clown juggled.	73.7	26.20503	35.26207	45.0557
The fox woke.	46.24074	41.62438	32.92857	40.26457
The volume increased.	35.43011	25.78802	50.63333	37.28382
The UFO hovered.	60.75893	29.01112	3.427842	31.06596

Table 3.3: Difference scores (NC-C) for sentences showing inhibition over three ISIs.

	100ms	200ms	300ms	Average
The workers built.	-30.169	-141.865	-104.421	-92.1514
The crowd cheered.	-96.9143	-54.354	-36.6897	-62.6527
The firework exploded.	-141.879	-79.2322	-92.5119	-104.541
The toy floated.	-86.307	-148.449	-160.7	-131.819
The bird flew.	-131.685	-70.0954	-52.3333	-84.7046
The smith hammered.	-45.3276	-44.9444	-102.574	-64.282
The catcher kneeled.	-126.952	-76.3524	-148.85	-117.385
The airplane landed.	-76.6602	-27.2816	-77.0096	-60.3171
The rocket launched.	-110.989	-104.821	-27.2069	-81.0059
The pack was lightened.	-122.233	-103.987	-19.0484	-81.756
The lawyer nodded.	-85.9327	-42.6786	-44.4167	-57.676
The child reached.	-128.78	-107.815	-40.2113	-92.269
The pillow was smashed.	-70	-72.1609	-97.6638	-79.9416
Outside it snowed.	-108.517	-28.9907	-63.4483	-66.9854
The play dough was squished.	-80.3324	-90.5077	-88.4828	-86.441
The book was stamped.	-145.654	-30.6	-39.7483	-72.0007
The gymnast tumbled.	-97.2167	-64.7721	-71.3667	-77.7851

Table 3.4: Difference scores (NC-C) for sentences that were inconsistent over three ISIs.

	100ms	200ms	300ms	Average
The flag was raised.	2.006158	-131.469	-131.148	-86.8703
The diver drowned.	-61.6919	12.4569	-99.7931	-49.676
The dog dug.	-107.476	37.35377	-47.7414	-39.2879
The seed sprouted.	97.88765	-27.5517	-8.89655	20.47979
The daughter smiled.	74.90714	66.10714	-4.72821	45.42869
The boat sank.	118.9272	-18.0932	46.67972	49.17125

Table 3.5: Correlations for the difference scores.

	Difference score	
	r	**p**
Word Norms	.044	.78
Sentence Norms	.206	.203
Concreteness	.033	.871
Familiarity	-.023	.912
Imagibility	-.025	.905

CHAPTER 4
GENERAL DISCUSSION

It is still unclear why sometimes inhibition is found and other times facilitation. Overall, this experiment did not produce an effect, and the exploration of the effect did not turn up a single cause of the failure.

Timing in the experiment does not appear to have an effect, in fact it was striking how stable each sentence was. Most sentences (34 out of 40) acted in the same direction (showing either inhibition or facilitation) over all three ISIs. Half of the sentences showed an inhibition effect, while the other half showed facilitation. This is not what we would expect in inhibition of return was in effect. IOR would predict a change from a congruent advantage in the first two time conditions (100 ms and 200 ms), followed by an incongruent advantage in the 300 ms condition. Because the sentences mostly produced results in the same direction over all three time conditions it is unlikely that there is an effect of IOR in this instance.

I also explored individual word characteristics and while we could not pinpoint a reason, it is clear that some words show a consistent effect. The word characteristics examined did not appear to be the cause. This study looked at concreteness, familiarity, imagibility and directional saliency but did not find any significant correlations.

The importance of the items used highlights sampling error. Sampling error across items may explain some of the inconsistencies across studies. Many studies used small sample sizes, and if they happened to use words that cause either inhibition or facilitation they would find an effect in that direction. This study had a well-normed and comparatively large sample of items, and as a result did not find evidence of either facilitation or inhibition.

The fact that results are inconsistent, and that this study failed to find consistent evidence of any such effect may suggest the possibility that imagery is not a necessary part of lexical processing. This can be interpreted as evidence against some forms of the grounded cognition approach. The grounded cognition approach predicts that words with sensory motor features (like a directional saliency) activate simulations which interact with spatial responses. However, this effect seems to be unreliable and inconsistent. This indicates that some grounded features in a word (such as a directional component) may not be automatically activated.

APPENDIX A

IRB APPROVAL LETTER

The Florida State University
Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 4/17/2015

To: Melissa Fox

Address:
Dept.: PSYCHOLOGY DEPARTMENT

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
Directional Language

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and one member of the Human Subjects Committee. Your project is determined to be Expedited per per 45 CFR § 46.110(7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 4/15/2016 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition,

federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is FWA00000168/IRB number IRB00000446.

Cc: Michael Kaschak, Advisor
HSC No. 2015.15390

APPENDIX B
INFORMED CONSENT

Consent Form: Directional Language

I freely and voluntarily consent to be a participant in the research project entitled "Directional Language." This project is part of a study that is being conducted by Melissa Fox, a graduate student in the Department of Psychology at Florida State University.

Procedures

The purpose of this study is to learn more about the way that people learn and process language. You will be asked to respond to stimuli presented on a computer screen. The entire study should take approximately one half hour.

Risks

The study has few potential risks beyond those encountered in everyday life using a computer. I am free to stop participating at any time without penalty.

Confidentiality

My responses will be recorded by a computer onto a data file which will be associated with a unique number code, but there will be no link between this code and my identity. My data will be kept confidential to the extent allowed by law. Data collected will be kept for 10 years, until May 2025.

Compensation

I will be compensated by earning course credit (for participants in general psychology) or extra credit (for participants in other psychology courses) in exchange for my participation. I will earn credit for my participation at the rate of one credit per hour. I may also benefit from learning about the way languages are learned and processed.

Voluntary Participation

My consent may be withdrawn at any time without prejudice, penalty, or loss of benefits to which I am otherwise entitled.

Contact Information

If I had any questions about this consent form, I asked them, and they were answered to my satisfaction. I may contact Melissa Fox:, or Dr. Michael Kaschak: for answers to my questions about this research.

If I have questions about my rights as a subject/participant in this research, or if I feel that I have been placed at risk, I can contact the Chair of the Human Subjects Committee Institutional Review Board, through the office of the Vice President for Research at 850-644-8633 or humansubjects@fsu.edu

Statement of Consent

By signing below, I acknowledge that I have read and understand this consent form, understand he benefits and risks involved in this study, and affirm that I am 18 years or older.

_____ _____

Participant Date

_____

Name of person obtaining consent

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BIOGRAPHICAL SKETCH

Melissa R. Fox

Melissa Fox grew up in South Glens Falls, New York. She attended SUNY Geneseo for undergraduate school, graduating with a Bachelor's degree in Psychology. Melissa entered the Doctoral program in Cognitive Psychology in the fall of 2012.