EMOTION-INDUCED BLINDNESS ELICITS NO LAG-1 SPARING

by

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A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Arts in Psychology

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ACKNOWLEDGMENTS

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ABSTRACT

Emotion-induced blindness refers to the impaired awareness for stimuli following an emotional stimulus. This effect bears resemblance to the attentional blink, a phenomenon in which detection of a second target is impaired if it appears soon after the first. Lag-1 sparing is a common characteristic observed in the attentional blink, such that targets just one position after the first target are spared from the "blink" despite its close proximity. Recent emotion-induced blindness evidence suggests that emotion may act upon a set of different mechanisms (namely, a spatiotemporal competition between the distractor and target) that disrupt earlier than those of the attentional blink. The characteristic lag-1 sparing of the attentional blink, however, would not be predicted in this account for emotion-induced blindness. In the present study, the impaired response accuracy for targets presented one position after emotional distractors suggests that emotion-induced blindness elicits no lag-1 sparing. These results support spatiotemporal competition as a candidate mechanism underlying emotion-induced blindness, and suggest that emotion-induced blindness may result from different underlying mechanisms than those of the attentional blink.

Chapter 1

INTRODUCTION

Emotionally arousing distractors can impair the awareness of closely following targets in a rapid stream of stimuli – a phenomenon known as emotion-induced blindness (Most, et al., 2005). In a typical emotion-induced blindness task, participants respond to a single target that is presented sometime after a distractor. When the target is presented closely after an emotionally arousing distractor, there is great impairment in target detection (Most, et al., 2005; Smith, et al., 2006; Most, et al., 2007; Most & Jungé, 2008; Kennedy & Most, 2012). This effect bears phenomenal similarity to the attentional blink (Chun & Potter, 1995), a widely studied attentional phenomenon that also demonstrates detriments in task performance for targets in a rapid stream of stimuli. In a typical attentional blink task, participants search for two targets, and awareness of the second target (T2) is often impaired if it is presented too soon in time after the first target (T1).

Despite their similarities on the surface, recent evidence suggests that emotion-induced blindness may stem from a different set of mechanisms than those involved in the attentional blink (Most & Wang, 2011). The attentional blink is traditionally believed to be a result of a bottleneck of resources available to process T2 (e.g., Chun & Potter, 1995; see Dux & Marois, 2009; Martens & Wyble, 2010 for reviews of attentional blink theories). As such, a highly influential attentional blink theory is that

the phenomenon works in two-stages: an initial stage that captures attention and then a second, limited capacity stage that comes soon after the first (Chun & Potter, 1995). Accordingly, many theories of the attentional blink suggest a relatively late-stage post-perceptual processing issue as the culprit behind the phenomenon (see Dux & Marois, 2009).

Recent emotion-induced blindness findings, however, suggest that the impairment for target detection in emotion-induced blindness may occur earlier than that proposed for the attentional blink. When participants searched for a single target in two simultaneously presented streams of stimuli (with the target equally likely to appear in either stream), the impaired awareness for the target after an emotional distractor was restricted to the spatial position of the emotional distractor (Most & Wang, 2011). If the impairment stemmed from a later-stage bottleneck, one might expect the impairment to be pronounced across the entire visual field, such that the target in either stream could be processed at an early perceptual stage, but not stored in a secondary, post-perceptual stage. The spatial specific impairment, however, suggests an earlier disruption in perception of the target after an emotional stimulus.

Instead, emotion-induced blindness may result from spatiotemporal competition between the emotional distractor and the target that occurs earlier than the relatively late-stage accounts of the attentional blink (see Wang, Kennedy, & Most, submitted). It may be that the distractor and target compete in early perceptual processing, with the emotional distractor being a dominant competitor for representation. The spatiotemporal competition account for emotion-induced

blindness suggests that the impairment observed in emotion-induced blindness is a result of the emotional distractor and the subsequent target competing in time and space for meaningful, conceptual representation.

Likewise, traditional findings in the attentional blink may not transfer to emotion-induced blindness. These differences can help determine the extent to which the phenomena differ mechanistically, and gain insight on how they operate. Lag-1 sparing is a common characteristic of the attentional blink, referring to the commonly spared impairment for T2 when it appears *immediately* after T1 (e.g., Chun & Potter, 1995). However, until now, it is unknown if emotion-induced blindness similarly demonstrates a lag-1 sparing effect when the target is presented immediately after the distractor.

Given its prominence and peculiarity, lag-1 sparing has been an important and informative piece of the attentional blink phenomenon for attentional theories. To explain Lag-1 sparing, some consider a slugglish closing of an attentional "selection gate" to T1, such that T2 sneaks into the processing that would be temporarily suppressed if there were a longer lag between them (Raymond, et al., 1992; Shapiro, Raymond, & Arnell, 1994). Others consider a two-stage process, such that all items are initially conceptually represented, but a second stage of working memory consolidation is capacity limited and has no resources available to T2. According to this account, lag-1 T2 items benefit from the processing dedicated to T1 because of their close proximity (Chun & Potter, 1995).

Recent evidence also demonstrates that lag-1 sparing can go beyond a single item after T1 in the attentional blink. When three targets are presented consecutively, target accuracy for the third is high, but if a single distractor separates the two targets, accuracy is impaired (DiLollo, et al., 2005; Olivers, Stigchel, & Hulleman, 2007; but see Dell'Acqua, Jolicoeur, Luria & Pluchino, 2009 for an alternative account). That is, despite the same temporal position relative to the first target, accuracy for T2 two temporal positions away depends on if another target or an intervening distractor separates the targets. This finding resulted in a flurry of new theories, including the temporary loss of control (TLC) hypothesis (DiLollo, et al., 2005), eSTST theory (Bowman & Wyble, 2007) and boost and bounce theory (Olivers & Meeter, 2008; Olivers, et al., 2007). For example, the temporary loss of control (TLC) account identifies the intervening distractors as the reason for the blink, such that processing of T1 causes the system to lose control of the input filter, and distractors that do not fit the attentional settings will disrupt the processing (DiLollo, et al., 2005). When targets with the same category are presented in a row, however, there is no need to adapt the input filter, and so all become available to process.

The present study was designed to specifically explore lag-1 sparing in emotion-induced blindness. Previous emotion-induced blindness studies have found that emotional distractors impair accuracy for lag-2 targets, but it remains to be known how the distractors affect lag-1 targets. By testing the accuracy in target detection when the target immediately follows the emotional distractor, the presence or absence of lag-1 sparing can inform theories of emotion-induced blindness. If spatiotemporal

competition is a valid candidate account for the effect, no lag-1 sparing should occur. The theory predicts impairment at an early representational stage, such that the distractor competes and dominates for representation at expense of other incoming information, leaving the competitor perceptually degraded. If emotion-induced blindness yields lag-1 sparing, it would suggest that the spatiotemporal competition account is misguided, as the distractor would not have disrupted the earlier perceptual processing of the target. Furthermore, if no lag-1 sparing is observed in emotion-induced blindness, it might suggest that the mechanisms underlying emotion-induced blindness are different than those in the attentional blink.

Chapter 2

EXPERIMENT 1a

In Experiment 1a, performance at lag-1 was compared with performance at lag-2. If lag-1 sparing does occur, accuracy for targets should be significantly better at lag-1 compared with those at lag-2. Instead, if lag-1 sparing does not occur, accuracy at lag-1 should be significantly impaired or no different from accuracy at lag-2.

2.1 Method

2.1.1 Participants

Forty-two undergraduates from the University of Delaware (mean age 19.5; 28 female, 14 male) participated in exchange for course credit. All participants provided informed consent and the experiment was approved by the University of Delaware Human Subjects Review Board. Data from two participants (1 female and 1 male) were excluded from analyses due to computer errors. Data from the remaining 40 participants are reflected in the analyses. All participants were naïve to the purpose of the experiment.

2.1.2 Materials and Procedure

The Psychophysics Toolbox for Matlab was used to present stimuli and gather responses (Brainard, 1997; Pelli, 1997). Stimuli were presented on a 100-Hz CRT monitor measuring 15.2 cm wide x 11.4 cm high. Stimuli were 492 colored, 320x240 pixel photographs. Eighty-four of the images served as the "targets," which were 42 landscape and architectural images rotated 90 degrees clockwise and counterclockwise. Another 168 images served as the "distractors" comprising of 52 negative, 52 neutral, and 52 scrambled images. Negative and neutral images were chosen based on ratings of valence and arousal, and were mostly gathered from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2001), with the rest supplemented from publicly available resources. Scrambled images were the same 52 negative images segmented in an 8x6 grid and scrambled. These served as a control for the low-level properties (e.g. luminance) of the negative images without the important emotional content. The remaining 252 photographs were upright landscape and architectural images that that served as filler images.

The experiment included 3 blocks and a total of 216 trials (72 trials per block). Each trial consisted of a rapid serial visual presentation (RSVP) of 17 images presented at 100 ms each. The single stream of images was presented in the center of the screen against a gray background. Depending on the trial, the distractor appeared at serial position 4, 6, 8, 10, or 12, and the target appeared either one position (lag-1) or two positions (lag-2) after the distractor. After every trial, participants made a button press to indicate if the target was rotated to the right or the left. Participants

heard a beep through headphones if they answered correctly, but heard nothing if they answered incorrectly.

Before starting the experiment, participants were shown examples of emotional images used in the experiment to ensure informed consent. They then engaged in a short practice session with 16 trials, with RSVP rates starting at 200 ms and slowly increasing to the experiment presentation rate of 100 ms. The practice session did not include any distractors. After completing the experiment, participants were debriefed and explained the goals of the study.

2.2 Results

Percentage accuracy in reporting target rotation served as the primary measure of interest. An overall 3 (Distractor Type: negative, neutral, scrambled) x 2 (lag-1 vs. lag-2) within-subjects ANOVA revealed a significant main effect of Distractor Type, $F(2,39) = 41.767$, $p < 0.001$, with the poorest performance in trials with emotional distractors, better performance for those with neutral stimuli, and the best performance in trials with scrambled stimuli (see Figure 2.1).

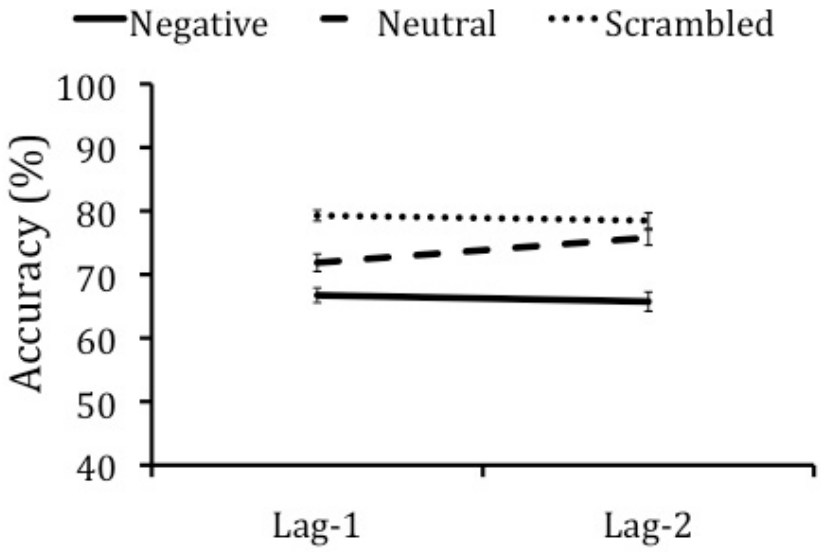

Figure 2.1: Average percent accuracies for target detection in Experiment 1a. Targets were presented one image (Lag-1) or two images (Lag-2) after negative, neutral, or scrambled distractors. Error bars represent standard error.

There was no significant main effect of Lag, $F(1,39) = 0.544$, $p = 0.465$ across conditions, indicating that there was no difference in performance between lag-1 and lag-2.[1] The Distractor Type X Lag interaction was "marginally" significant, $F(2,39) = 3.095$, $p = 0.051$. Post-hoc tests revealed that this difference was strongly driven by the lag difference in the neutral distractor condition, $t(39) = -2.002$, $p = 0.052$. Indeed, a

[1] Like many emotion-induced blindness findings (e.g., Most, et al., 2005), targets following neutral distractors were detected less than those following the scrambled distractors. The neutral distractors in this paradigm still act as an "oddball" in the stream, and do contain motivationally salient images (i.e., faces, people). It is therefore likely that the mechanisms involved from the emotional distractors are similarly involved for the neutral distractors, but to a much lesser degree.

subsequent 2 (Distractor Type: negative vs. neutral) X 2 (Lag-1 vs Lag-2) ANOVA revealed a significant Distractor Type X Lag interaction, $F(1,39) = 4.211$, $p=0.047$. Notably, there was no significant difference between Lag-1 and Lag-2 accuracy in the negative condition, $t(39) = 0.422$, $p=0.675$.

2.3 Discussion

In Experiment 1a, detection of targets after emotional distractors was similarly impaired across lags-1and 2. This suggests that there was no lag-1 sparing observed in emotion-induced blindness.

However, it remains possible that the negative distractors produced an overall decrement in performance, such that the lacking difference between lag-1 and lag-2 represents an impairment that persisted across all lags, and not specific to the early lags. Previous emotion-induced blindness findings suggest that the emotion-induced blindness effect disappears by lag-8 (e.g., Most, et al., 2005). To rule out this alternative account, we next tested lag-1 against lag-8 trials. Performance at these lags should be significantly different if there is no lag-1 sparing, but should be the same if the results of Experiment 1a are a result of an overall decrement in performance from negative distractors.

Chapter 3

EXPERIMENT 1b

3.1 Method

3.1.1 Participants

Fifteen undergraduates from the University of Delaware participated in Experiment 1b in exchange for course credit (mean age 19.4; 9 female, 6 male). All participants provided informed consent.

3.1.2 Materials and Procedure

Experiment 1b used the same materials and procedure as those used in Experiment 1a. Crucially, however, trials with lag-2 were replaced with lag-8 trials in order to compare target detection performance between lag-1 and lag-8.

3.2 Results

An overall 3 (Distractor Type: negative, neutral, scrambled) x 2 (lag-1 vs. lag-8) within-subjects ANOVA revealed a significant main effect of Distractor Type, $F(2, 14) = 7.715$, $p = 0.002$, with the negative distractors inducing the most impairment, followed by the neutral distractors, and finally the scrambled (see Figure 3.1).

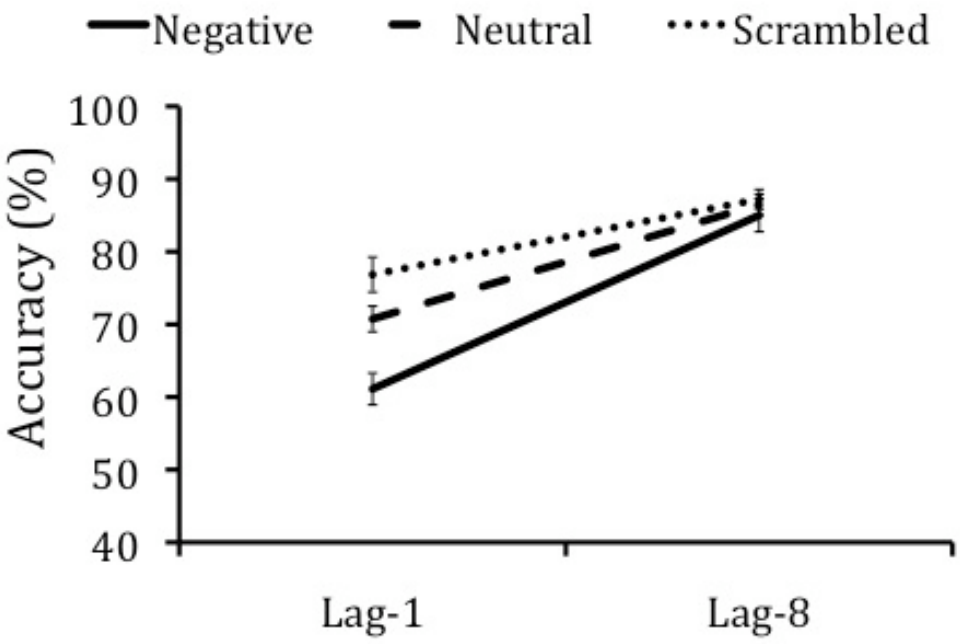

Figure 3.1: Experiment 1b, average percent accuracies for target detection when presented one image (Lag-1) or eight images (Lag-8) after negative, neutral, or scrambled distractors.

The main effect of Lag was also significant, $F(1,14) = 94.5$, $p < 0.001$, such that lag-1 targets were greatly impaired from awareness across distractor conditions compared to those at lag-8. The Distractor Type X Lag interaction was also significant, $F(2,14) = 6.093$, $p = 0.006$, such that the impairment at lag-1 compared to lag-8 was greatest in the negative condition.

Consistent with Experiment 1a, at lag-1, accuracy was significantly impaired in trials with negative (M=61.1%, SD=12.3%) distractors compared to those with

neutral (M=70.7%, SD=10.1%), $t(14)$ =3.790, p=0.002, or scrambled (M=76.9%, SD=15.5%), $t(14)$ =3.807, p=0.002, distractors. However, there was no difference in performance across distractor conditions at Lag-8 (negative: M=85.0%, SD=15.0%; neutral: M=86.5%, SD=11.5%; scrambled: M=87.2%, SD=11.6%), $F(2,28) = 0.377$, $p = 0.690$. Likewise, there was a significant difference between lag-1 and lag-8 performance accuracies in the negative distractor condition, $t(14) = -6.865$, $p < 0.001$.

3.3 Discussion

Data from Experiment 1b support that there was no lag-1 sparing observed in emotion-induced blindness. When targets followed a negative distractor, performance at lag-1 (immediately after the distractor) was significantly poorer than at lag-8 (8 serial positions after the distractor). Combined with the results of Experiment 1a, these results suggest an absence of lag-1 sparing in emotion-induced blindness.

While the performance in streams with negative distractors at lag-1 was comparable to lag-2, and significantly impaired compared to lag-8, it is unclear if the two early lags represent the largest impact of emotional distractors. In order to understand the time course of emotion-induced blindness, Experiment 2 tested across the first four lags following the distractor. If targets at lag-1 incur the greatest impairment from emotional distractors, there should be a gradual increase from impairment across lags after the emotional distractor. If targets at lags-1 and 2 are not the most impaired in emotion-induced blindness, there should be a decrease in accuracy after the first few lags.

Chapter 4

EXPERIMENT 2

4.1 Method

4.1.1 Participants

Twenty-one undergraduates from the University of Delaware participated in Experiment 2 in exchange for course credit (mean age, 19.2; 12 female, 9 male). All participants provided informed consent.

4.1.2 Materials and Procedure

The same general procedure was used in Experiment 2 as in Experiment 1. Participants searched for a single rotated target in a stream of images. The distractor could occur at serial position 4 or 6, and critically, the distance between the distractor and the target could be 1, 2, 3, or 4 positions (lag-1 through lag-4 respectively). With more conditions than the previous experiments, Experiment 2 was made up of 384 trials presented over 4 blocks. Participants also completed three questionnaires after completing the emotion-induced blindness task, however data from those questionnaires are not reported here.

4.2 Results

An overall 3 (Distractor Type: negative, neutral, scrambled) x 4 (lag-1 vs. lag-2 vs. lag-3 vs. lag-4) within-subjects ANOVA revealed significant main effect of Distractor Type, $F(2, 40) = 33.935$, $p < 0.001$, a significant main effect of Lag, $F(3, 60) = 15.461$, $p < 0.001$, and a significant Distractor Type X Lag interaction, $F(6, 120) = 10.283$, $p < 0.001$ (see Figure 4.1).

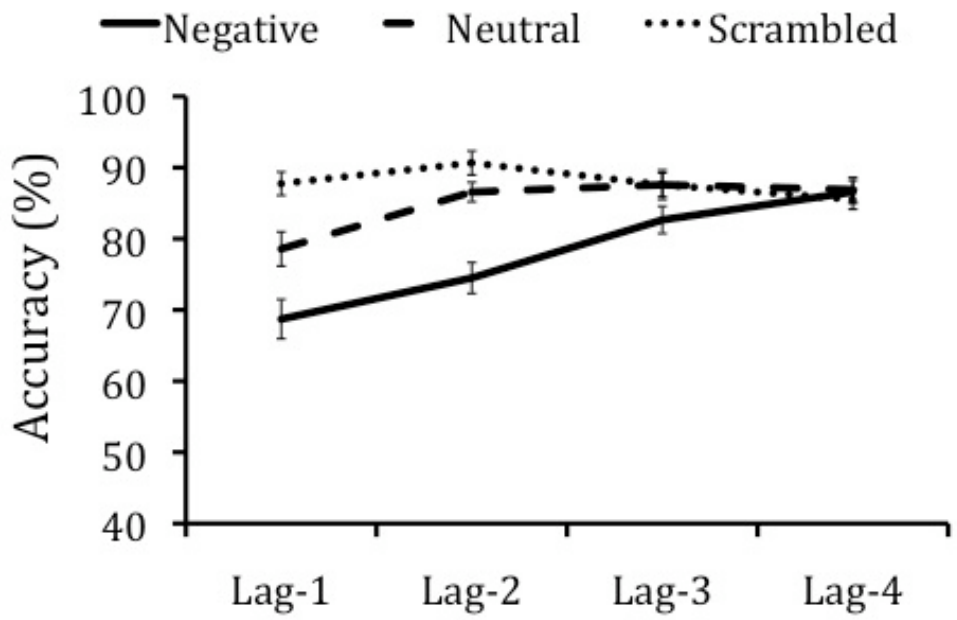

Figure 4.1: Experiment 2, average percent accuracies for target detection when presented one image (Lag-1), two images (Lag-2), three images (Lag-3), or four images (Lag-4) after negative, neutral, or scrambled distractors.

Like experiment 1, accuracy for targets in streams with negative distractors was significantly impaired at lag-1 and lag-2 compared to accuracy in streams with neutral and scrambled distractors ($ts>3.4$, $ps<0.003$). On the contrary, accuracy for

targets after negative distractors did not differ from streams with neutral and scrambled distractors at Lag-3 or Lag-4 (ts<2, ps>0.05).[2] Furthermore, a subsequent repeated measures ANOVA of performance in streams with negative distractors revealed a significant effect of lag, $F(3, 60)=19.731$, $p<0.001$, with the largest impairment at Lag-1. A linear contrast analysis also suggested a significant linear increase in performance between lags-1 and 4, $F(1, 20)=92.717$, $p<0.001$. The partial eta squared for this trend was 0.823, suggesting a strong, linear trend between lag-1 and lag-4.

4.3 Discussion

Experiment 2 demonstrated the time course of emotion-induced blindness over the first four lags following the emotional distractor. Again, replicating the findings of Experiment 1, lag-1 sparing was not observed in emotion-induced blindness, and there was a gradual increase in performance from lag-1 to lag-4 in streams with negative distractors.

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[2] While there was no significant impairment induced by negative distractors compared to neutral or scrambled distractors at lags three or four, the difference in performance at lag-3 between negative and neutral distractors was "marginally" significant, $t(20)=1.947$, $p=0.066$. This further supports the idea that performance gradually increases with time after the distractor.

Chapter 5

CONCLUSION

No lag-1 sparing was observed in emotion-induced blindness, despite its common occurrence in the attentional blink. In Experiment 1, emotional stimuli similarly impaired the response accuracy for targets presented either one (lag-1) or two (lag-2) positions later, but accuracy was significantly improved at lag-8 compared to lag-1. In Experiment 2, the impact of emotional distractors was observed over the first four lags, and accuracy gradually improved from significant impairment at lag-1 to no impairment at lag-4. The spatiotemporal competition account for emotion-induced blindness (see Wang, Kennedy, & Most, submitted) would predict no lag-1 sparing, and these results are consistent what that prediction. These results also suggest that emotion-induced blindness may differ mechanistically from the phenomenally similar attentional blink.

Lag-1 sparing is a common occurrence in the attentional blink, but has not been found to occur when T2 appears in a different location from T1, or if T2 requires a "task change" different from T1 (Visser, Bischof, & DiLollo, 1999). For example, in a stream of digits, if T1 is a letter, and T2 is a colored digit, lag-1 sparing is often absent. Likewise, these emotion-induced blindness findings might sound consistent with some theories of the attentional blink (e.g., the TLC theory; DiLollo, et al., 2005), such that the emotional distractor in emotion-induced blindness could grab attention

and exogenously switch the participant's attentional set. However, this explanation cannot easily account for previous emotion-induced blindness data. When subjects searched for a target in two streams, no impairment was found when the distractor appeared in the opposite stream from the target (Most & Wang, 2011). Should it be a temporary loss of control that is responsible for emotion-induced blindness, the impairment should have occurred in both streams similarly.

Recent evidence also suggests that the type of stimulus can alter the extent of lag-1 sparing, such that letters produce a larger lag-1 sparing than pictures of objects (Livesey & Harris, 2011). While these findings speak to the stimuli used in our experiments, the absent lag-1 sparing altogether is in contrast to the attenuated, but significant, lag-1 sparing observed using images of objects instead of letters. Nevertheless, it would be informative if future studies compared the attentional blink and emotion-induced blindness using the same stimuli, so as to inform the extent to which they differ in their pattern of performance recovery after the blink-inducing item.

By demonstrating no lag-1 sparing in emotion-induced blindness, this study is consistent with an early-stage impairment account of the phenomenon, whereas the presence of lag-1 sparing would have made this account hard to consider. Future research should continue to determine the properties of emotion-induced blindness, especially its underlying mechanisms and how it compares to other attentional phenomena like the attentional blink.

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Appendix

IRB Approval Letter

RESEARCH OFFICE

210 Hullihen Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: September 22, 2009

TO: Steven Most, PhD
FROM: University of Delaware IRB

STUDY TITLE: [136021-1] Attentional Guidance by Emotional Salience
IRB REFERENCE #:
SUBMISSION TYPE: Continuing Review/Progress Report

ACTION: APPROVED
APPROVAL DATE: September 22, 2009
EXPIRATION DATE: September 21, 2010
REVIEW TYPE: Expedited Review

Thank you for your submission of Continuing Review/Progress Report materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Elizabeth Peloso at 302-831-8619 or epeloso@udel.edu. Please include your study title and reference number in all correspondence with this office.

RESEARCH OFFICE

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Ph: 302/831-2136
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DATE: September 17, 2010

TO: Steven Most, PhD
FROM: University of Delaware IRB

STUDY TITLE: [136021-3] Attentional Guidance by Emotional Salience
IRB REFERENCE #:
SUBMISSION TYPE: Continuing Review/Progress Report

ACTION: APPROVED
APPROVAL DATE: September 17, 2010
EXPIRATION DATE: September 20, 2011
REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # *7*

Thank you for your submission of Continuing Review/Progress Report materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

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Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Elizabeth Peloso at 302-831-8619 or epeloso@udel.edu. Please include your study title and reference number in all correspondence with this office.

RESEARCH OFFICE

210 Hullihen Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: September 14, 2011

TO: Steven Most, PhD
FROM: University of Delaware IRB

STUDY TITLE: [136021-4] Attentional Guidance by Emotional Salience

SUBMISSION TYPE: Continuing Review/Progress Report

ACTION: APPROVED
APPROVAL DATE: September 14, 2011
EXPIRATION DATE: September 20, 2012
REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # 7

Thank you for your submission of Continuing Review/Progress Report materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

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If you have any questions, please contact Jody-Lynn Berg at (302) 831-1119 or jlberg@udel.edu. Please include your study title and reference number in all correspondence with this office.