MEMORY-GUIDED SELECTIVE ATTENTION

by

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A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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ABSTRACT

Memory-guided selective attention

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Evidence across a wide variety of attention paradigms shows that environmental cues can trigger adjustments to ongoing priorities for attending to relevant and irrelevant information. This context-specific control over attention suggests that cognitive control can be both automatic and flexible. For instance, in selective attention tasks, congruency effects are larger for items that appear in a context associated with infrequent conflict than in a context associated with frequent conflict. Since the to-be-presented context cannot be predicted or prepared for in advance, attention is assumed to be rapidly updated on-the-fly, triggered by the currently presented context. Context-specific control exemplifies how learning and memory processes can influence attention to enable cognitive flexibility. However, what determines the use of previously learned associations still remains unclear. In the current study, we examined whether task-relevance would influence the learning and use of context cues in a flanker task. Using a secondary counting task, context dimensions associated with differing levels of conflict were made task-relevant or -irrelevant across the experiment. In short, we found that making new contextual information task-relevant caused participants to ignore a previously learned context-attention association and adopt a new context-specific control strategy; all without changing the experimental stimuli. This result suggests that task-relevance is a key determinant of context-specific control.

DEDICATION

Dedicate it.

ACKNOWLEDGEMENTS

Acknowledge them.

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CHAPTER 1

INTRODUCTION

Section 1

Selective attention is commonly investigated using interference paradigms such as the Stroop (1935) and flanker (Eriksen and Eriksen, 1974) tasks, where participants identify a target while ignoring a response-congruent or -incongruent distractor. Performance is typically better on congruent versus incongruent trials and the difference—the congruency effect—taken as an index of attentional priorities. Large congruency effects are thought to reflect ineffective filtering of the distracting stimuli whereas small congruency effects are thought to reflect effective filtering. By probing factors that systematically alter congruency effects, we can then make inferences about processes that control attentional filtering. For example, manipulating the frequency of conflict via the proportion of congruent versus incongruent trials has shown to influence the size of the congruency effect.

Section 2

Typically, a high proportion congruent experiment produces large congruency effects, whereas a low proportion congruent experiment produces small congruency effects (Logan and Zbrodoff, 1979; Lowe and Mitterer, 1982; West and Baylis, 1998). This result is usually explained as strategic control, where participants increase attentional control under high-conflict demands and relax attentional control under low-conflict demands (Logan, 1980; Logan and Zbrodoff, 1979; Logan, Zbrodoff, and Williamson, 1984; Lowe and Mitterer, 1982).

Sub section

Recent work however, has demonstrated that attentional control is not only adjusted by top-down regulation, but can also be triggered automatically by environmental cues (Brosowsky and

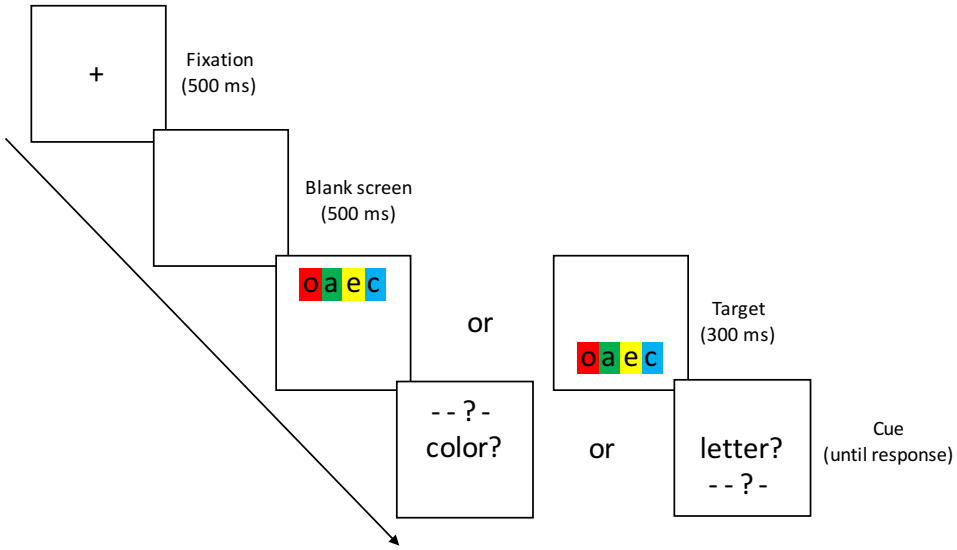

Figure 1.1: Illustration of the trial sequence for all experiments.

Note that the target could appear above or below the fixation. The identity cue (”Color?” or ”Letter?”) always appeared in the center of the screen while the position cue (”- - ? -”) always appeared in the same location as the target. Participants were instructed to report either the letter or color in the cued position.

Crump, 2018; Bugg and Crump, 2012; Egner, 2014; Fischer and Dreisbach, 2015; King, Korb, and Egner, 2012; Mayr and Bryck, 2007).

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CHAPTER 2

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Table 2.1: Add caption

	Trial *n*				Congruency Effect	$n-1$ CSE
	Con		Inc		$(I-C)$	$(C_{(I-C)}-I_{(I-C)})$
Trial $n-1$	*RT*	*ER*	*RT*	*ER*	*RT*	*RT*
Exp. 1A						
Con	626 (22)	2.97 (.55)	658 (22)	3.48 (.48)	32 (7)	-3 (13)
Inc	635 (21)	3.55 (.46)	671 (25)	4.48 (.72)	36 (9)	
Exp. 1B						
Con	753 (21)	2.40 (.51)	832 (25)	3.48 (.53)	78 (10)	36 (12)
Inc	791 (24)	3.58 (.54)	671 (25)	3.23 (.71)	42 (14)	
Exp. 1C						
Con	771 (27)	2.46 (.37)	834 (27)	2.66 (.39)	62 (6)	27 (7)
Inc	794 (25)	2.91 (.40)	829 (26)	2.65 (.38)	35 (7)	
Exp. 2A						
Con	557 (17)	2.36 (.38)	593 (16)	4.36 (.57)	36 (6)	8 (8)
Inc	576 (18)	3.59 (.47)	605 (19)	3.80 (.60)	28 (6)	
Exp. 2B						
Con	568 (20)	1.91 (.37)	638 (24)	4.67 (.61)	70 (5)	33 (6)
Inc	606 (24)	2.83 (.41)	643 (23)	3.78 (.58)	37 (7)	
Exp. 3A						
Con	837 (24)	2.18 (.45)	880 (20)	2.65 (.41)	43 (8)	22 (12)
Inc	855 (21)	2.83 (.40)	876 (22)	2.85 (.56)	20 (8)	
Exp. 3B						
Con	860 (23)	2.54 (.38)	889 (24)	2.38 (.42)	30 (7)	13 (10)
Inc	873 (24)	2.28 (.36)	889 (23)	2.43 (.35)	16 (8)	

Note: This is the note info

CHAPTER 3

Chapter 3's Title

Don't stop now.

CHAPTER 4

Chapter 4's Title

Keep it going.

CHAPTER 5

Chapter 5's Title

Well done.

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APPENDICES

Appendix A: R Code for Chapter 5

Required: R Packages from CRAN

```
if (!require(tidyverse)){
  install.packages("tidyverse")
  library(tidyverse)
}
if (!require(furniture)){
  install.packages("furniture")
  library(furniture)
}
if (!require(here)){
  install.packages("here")
  library(here)
}
if (!require(devtools)){
  install.packages("devtools")
  library(devtools)
}
```

Required: R Packages from GitHub

```
if (!require(MarginalMediation)){
  devtools::install_github("tysonstanley/MarginalMediation")
  library(MarginalMediation)
}
```

Examples from Chapter 5

Figure **??** on page **??**

Monte Carlo Simulation

Notably, the code for both the binary mediator condition and the count mediator condition we run via the Terminal as, once the directory was where the R file was located:

```
Rscript Analyses_MMMC_scriptBinary.R 'c(1:45)'
```

and

```
Rscript Analyses_MMMC_scriptCount.R 'c(1:45)'
```

Binary Mediator

```
## Marginal Mediation: Monte Carlo Simulation Study
##   BINARY Mediator
## Tyson S. Barrett
##
## devtools::install_github("tysonstanley/MarginalMediation")

args <- commandArgs(TRUE)
args <- eval(parse(text = args))
library(MarginalMediation)
library(tidyverse)

## Create all combinations of independent variables
cond_binary <- expand.grid(
  samplesize = c(50, 100, 200, 500, 1000),
  effecta = c(.55, 1.45, 2.22),
  effectb = c(.24, .62, 1.068),
  effectc = c(.3)
)

## Population Models
## Binary Mediator
data_genB <- function(ps, reps, samplesize, effecta, effectb, effectc) {
  set.seed(84322)
  Xc <- rnorm(ps)
  z <- effecta * Xc + rnorm(ps, 0, 1)
  pr <- 1 / (1 + exp(-z))
  M <- rbinom(ps, 1, pr)
  Y <- effectb * M + effectc * Xc + rnorm(ps, 0, 1)
  M <- factor(M)
  df <- data.frame(Y, M, Xc)
  bin <- vector("list", reps)

  print(cbind(samplesize, effecta, effectb))
  print(lm(Y ~ M + Xc)$coefficients)
  print(lm(scale(Y) ~ M + Xc)$coefficients)
  med <- amed(glm(M ~ Xc, df, family = "binomial"))
```

```
  for (i in 1:reps) {
    d <- df[sample(ps, samplesize), ]
    pathbc <- glm(Y ~ M + Xc, data = d)
    patha <- glm(M ~ Xc, data = d, family = "binomial")
    bin[[i]] <- mma(pathbc, patha,
      ind_effects = c("Xc-M"),
      boot = 500
    )
    bin[[i]] <- list(
      "IndEffects" = bin[[i]]$ind_effects,
      "DirEffects" = bin[[i]]$dir_effects,
      "Boot" = bin[[i]]$boot,
      "Total" = lm(Y ~ Xc, d)$coefficients,
      "MedSize" = med
    )
    cat("\r", i)
  }
  print(exp(glm(M ~ Xc, family = "binomial")$coefficients))
  return(bin)
}

i = 0
for (j in args){
  set.seed(84322)
  i = i + 1
  cat("\nNumber:", j, "\n\n")

  out = data_genB(1e6, 500,
                  cond_binary[args[[i]],1],
                  cond_binary[args[[i]],2],
                  cond_binary[args[[i]],3],
                  cond_binary[args[[i]],4])

  save(out, file = paste0("Sims_Data/Binary2_",
                          cond_binary[args[[i]],1], "_",
                          cond_binary[args[[i]],2], "_",
                          cond_binary[args[[i]],3], "_",
                          cond_binary[args[[i]],4], ".rda"))

  cat("\nNumber:", j, "\n\n")
  cat("\nConditions Complete:\n",
      " Sample size =", cond_binary[args[[i]],1],
      "\n  A path      =", cond_binary[args[[i]],2],
      "\n  B path      =", cond_binary[args[[i]],3],
      "\n  C path      =", cond_binary[args[[i]],4], "\n")
}
```

Count Mediator

```
## Marginal Mediation: Monte Carlo Simulation Study
##   COUNT Mediator
## Tyson S. Barrett
##
## devtools::install_github("tysonstanley/MarginalMediation")

args <- commandArgs(TRUE)
args <- eval(parse(text = args))
library(MarginalMediation)
library(tidyverse)

## Create all combinations of independent variables
cond_count = expand.grid(
  samplesize = c(50, 100, 200, 500, 1000),
  effecta    = c(.3, .6, 1.1),
  effectb    = c(.084, .265, .49),
  effectc    = c(0, .3)
)

## Population Models
## Count Mediator
data_genC = function(ps, reps, samplesize, effecta, effectb, effectc){
  set.seed(84322)
  Xc = rnorm(ps)
  m1 = exp(effecta * Xc)
  M  = rpois(ps, lambda=m1)
  Y  = effectb*M + effectc*Xc + rnorm(ps, 0, 1)
  df = data.frame(Y, M, Xc)
  poi  = vector("list", reps)

  print(cbind(samplesize, effecta, effectb))
  print(lm(Y ~ M + Xc)$coefficients)
  print(lm(scale(Y) ~ M + Xc)$coefficients)
  med = amed(glm(M ~ Xc, df, family = "poisson"))

  for (i in 1:reps){
    d = df[sample(ps, samplesize), ]
    pathbc = glm(Y ~ M + Xc, data = d)
    patha  = glm(M ~ Xc, data = d, family = "poisson")
    poi[[i]] = mma(pathbc, patha,
                   ind_effects = c("Xc-M"),
                   boot = 500)
    poi[[i]] = list("IndEffects" = poi[[i]]$ind_effects,
                    "DirEffects" = poi[[i]]$dir_effects,
                    "Boot"       = poi[[i]]$boot,
                    "Total"      = lm(Y ~ Xc, d)$coefficients,
```

```
                      "MedSize"    = med)
    cat("\r", i)
  }
  print(exp(glm(M ~ Xc, family = "poisson")$coefficients))
  return(poi)
}

i = 0
for (j in args){
  set.seed(84322)
  i = i + 1
  cat("\nNumber:", j, "\n\n")

  out = data_genC(1e6, 500,
                  cond_count[args[[i]],1],
                  cond_count[args[[i]],2],
                  cond_count[args[[i]],3],
                  cond_count[args[[i]],4])

  save(out, file = paste0("Sims_Data/Count2_",
                          cond_count[args[[i]],1], "_",
                          cond_count[args[[i]],2], "_",
                          cond_count[args[[i]],3], "_",
                          cond_count[args[[i]],4], ".rda"))

  cat("\nNumber:", j, "\n\n")
  cat("\nConditions Complete:\n",
      " Sample size =", cond_count[args[[i]],1],
      "\n  A path      =", cond_count[args[[i]],2],
      "\n  B path      =", cond_count[args[[i]],3],
      "\n  C path      =", cond_count[args[[i]],4], "\n")
}
```

Monte Carlo Simulation Data Analyses

Data Preparations for tables and figures around page **??**

Table **??** on page **??**

Figure **??** on page **??**

Figures **??**, **??**, and **??** on pages **??**, **??**, and **??**, respectively.