

Eye Movements During Motivational Argument Processing

by

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### Abstract

Previous research on tailoring health messages suggests that consumers are more influenced by narrators that are similar to themselves (e.g. in age, race, gender, or even clothing). This bias is part of a larger documented effect termed the ‘in-group argument bias.’ Understanding the covert mechanisms of this bias will aid in creating more efficacious public health initiatives. The current study investigated such mechanisms through tracking subjects’ eye movements during processing of health promotional narratives presented by in-group and out-group authors. Though an in-group argument bias was not observed, eye movement and rating data provided insight for creating more engaging and effective health promotional narratives.

Key Words: eye-tracking, in-group, out-group, gender, persuasion, health narrative, elaboration likelihood model

### Eye Movements During Persuasive Argument Processing

The main goal of any health promotional initiative is to produce positive change in individuals' health behaviors. Often these initiatives take form as a health promotional narrative. Narratives offer encouraging, autobiographical information about a range of health topics. Research shows that such narratives are indeed successful in creating positive change in behaviors, even more so than objective statistics, (de Wit, Das, & Vet, 2008; Reinard, 1988). Research in the field of persuasive arguments suggests that the efficacy of health promotional narratives may be mediated by the characteristics of the narrative's author. In order to create more effective health materials, it is important to understand the subtle factors that underlie the precipitation of attitude change. The current study seeks to understand the cognitive mechanisms underlying the persuasiveness of health promotional narratives through analysis of eye movement patterns during processing of narratives paired with authors who match and mismatch subjects in gender.

Health narratives are often accompanied by a picture of an author who may or may not match the reader on characteristics such as race, gender, and age. According to the in-group bias of persuasion, these differences between author and reader could crucially influence the narrative's perceived persuasiveness. An in-group is defined as any group that an individual might identify with, contrarily, an out-group is a group that an individual does not identify with. Membership with an in-group can be based on something innate and personal, such as race or gender, or something arbitrary such as shirt color. The in-group bias of persuasion occurs when an individual finds the same argument more persuasive when it is presented by an in-group member than when presented by an out-group member. In multiple studies, (Guadagno, Balscovich, Bailenson, & McCall, 2007; Mackie, Worth, & Asuncion, 1990; Mackie, Gastardo-

Conaco, & Skelly, 1992), subjects have rated arguments from an in group source as significantly more persuasive than the same arguments stemming from an out-group source. In addition, in-group arguments were remembered better, even when processed faster (Mackie, Worth, & Asuncion, 1990; Mackie et al., 1992).

In order to understand the in-group argument bias, it is important to first understand how persuasive decisions are made. Work by Richard Petty, John Cacioppo and colleagues offers an explanation for how differing levels of engagement with materials leads to differences in perceived persuasiveness. The specifics of this system are outlined in the Elaboration Likelihood Model (ELM), (Petty and Cacioppo, 1986)

The ELM states that if a subject engages with an argument to a high degree (high elaboration) they will determine the argument to be persuasive provided that they also carry a positive (pro attitudinal) view for the author's position and that the argument is of high quality. However, if the individual engages in high elaboration, but the author's view is counter attitudinal or if the argument contains flaws, the reader will be more likely to pick-up on these negative aspects and thus be less persuaded by the argument. This high elaboration theory is deemed the 'central processing route.' On the other end of the processing spectrum is the 'peripheral processing route' which predicts that individuals who do not engage in "thoughtful consideration of the message's arguments and evidence" (O'Keefe, 2008) (low elaboration) will use heuristic (peripheral) cues to determine the persuasiveness of a message. Heuristic cues include such characteristics as the credibility of the presenter as determined by the subject, and how much the subject likes the presenter (a liked presenter should produce a higher persuasion rating than a disliked presenter), (O'Keefe, 2008).

In summary, the ELM predicts that high levels of engagement will produce feelings of persuasion when the argument is strong and pro-attitudinal for the reader. High levels of engagement are produced when the subject spends time and energy thinking about the material. Low levels of engagement will also lead to feelings of persuasion. Low levels of engagement are activated when a reader uses heuristic clues from the argument's author to judge the validity of the argument. Heuristic clues that lead to persuasion include such characteristics as the author's perceived credibility and how much the reader likes the author.

Previous research on the in-group argument bias has produced competing ideas on which levels of processing are initiated due to the presence of in-group and out-group features. Two research groups investigated the influence of in-group features on processing by analyzing reading times of in-group versus out-group arguments. Mackie et al. (1990) predicted that subjects' similarity to the presenter would cause them to use a higher degree of elaboration when analyzing in-group arguments. Thus in-group arguments would cause subjects to spend more time engaging with the material, leading to longer reading times for in-group versus out-group arguments. Contrary to Mackie et al. (1990), Petty, Wheeler, & Bizer (2000) argued that individuals would take in-group similarity as a heuristic clue, leading to less time spent engaging with in-group arguments and thus faster processing times of in-group versus out-group arguments. Mackie et al. (1992) provides a resolution of the disparity in these two hypotheses. In their study, subjects were presented with the advocated position of the in-group member either before or after presentation of the argument. When the advocated position was announced prior to the argument, subjects showed faster processing times, indicating the use of heuristic clues. In the second condition, participants had relatively longer reading times, indicating the use of the central processing route. In the current study, subjects are aware of the advocated position prior

to presentation of the narratives as they are told that they will be reading health promotional narratives. Therefore, it is predicted that participants will engage the peripheral processing route during analysis of in-group arguments, leading to shorter reading times for in-group narratives as compared to out-group narratives.

In-group biases have also been demonstrated in analysis of visual stimuli, specifically, human faces. In a number of studies subjects have been shown to have better memory for in-group versus out-group faces (for a more complete review see Meissner & Brigham, 2001). These include; greater memory for faces of one's same age (Anastasi & Rhodes, 2005), one's same gender (Cross, Cross, & Daly, 1971), and same race, (Lindsay, Jack, & Christian, 1991; Hirose & Hancock, 2007). Additional in-group face biases include faster rates of change detection for own-race faces (Hirose & Hancock, 2007) and more holistic processing of in-group faces (Michel, Rossion, Han, Chung, & Caldara, 2006). Based on this research, it is predicted that participants in the current study will have more fixations to, and longer dwell times on, in-group images as compared to out-group images.

Though much eye-tracking research has been performed on in-group biases for pictorial stimuli, little work has been done that uses eye-tracking in analysis of in-group biases during reading. One study that has dealt with this area, however, was completed in 2009 by Hannah Faye Chua, Julie E. Boland and Victor J. Strecher at the University of Michigan, Ann Arbor. The Chua et al. (2009) study specifically tested eye movements of smokers who wished to quit. Participant's eye movements were tracked as they read three stop-smoking narratives paired either with an in-group, out-group or neutral image. After reading all three narratives, participants were asked to choose the single narrative they considered most persuasive. Results showed that, as predicted, subjects chose narratives paired with in-group images as being the

most persuasive more often than those paired with out-group or neutral pictures. However, a second hypothesis involving differences in eye-movement during processing of in-group texts and images as compared to other conditions was not able to be correctly evaluated due to experimental design. The current study will build upon this project in particular by overhauling the original design in order to collect data that can be used to analyze differences in eye-movement when reading narratives and looking at images. This study builds on previous research in general through providing quantitative data on the covert mechanisms that lead to the in-group argument bias.

The current study has three major predicted outcomes: subjects will rate in-group narratives as more persuasive than out-group narratives, in-group images will be fixated longer than out-group images due to more holistic processing, and in-group narratives will have faster reading times than out-group narratives due to peripheral processing.

These predictions were tested through asking subjects to read twelve health promotional narratives, each presented by either an in-group or out-group author. As stated above, in-groups and out-groups may be based on any number of characteristics. The current study uses only gender (with race and age held constant) to define these groups in an effort to create salient in-groups and out-groups for the available subject population. In order to create narratives that would be relevant to the subject population (college students), texts presented information on the importance of healthy diets and sleeping patterns.

Participants' eye movements were tracked as they read each narrative and looked at the paired image. Eye movement data gives real time information about subjects' attentional processes that is not available through other measures. After each narrative, participants rated the author and narrative on several qualities, including author likeability and persuasiveness of the

narrative. Data from eye-tracking and rating responses was then used to determine the interaction of in-group narratives and feelings of persuasion, and the distinctive eye movements and attentional processes that lead to higher persuasive ratings. Results from this study have implications for creating health communications materials that will more effectively influence consumers to make healthy changes.

## **Method**

### **Participants**

A total of 76 subjects, (38 males and 38 females), were used for the experiment. Subjects were Caucasian students from the University of Michigan's Winter 2011 subject pool. Data from 8 female subjects and 8 male subjects were not used due to more than five missing data points in any one interest area. In total, data from 30 males and 30 females were used in analysis.

### **Materials**

Materials for this study consisted of 6 in-group and 6 out-group photos, 12 health promotional narratives, and four questions that followed each pairing of photo and narrative. All subjects saw all 12 images and all 12 narratives. For each subject, narratives were randomly assigned a trial number and photo so that each narrative appeared approximately equally often in each trial number and with each photo.

Photographs were retrieved from Google and Bing image searches. The images were chosen to roughly match the age (late teens/early twenties) and race (Caucasian) of the study's participants. Only images of people with average attractiveness were used (i.e. no commercial models) to ensure that images would not vary on salience due to higher levels of aesthetic beauty. All photos were edited such that only the face and shoulders were visible. In-group



photos were defined as those that matched a subject in gender, while out-groups mismatched the subject in gender. All photographs used appear in Appendix A.

Health promotional narratives were written to mirror the style of narratives that appear in real health brochures. Model narratives came from The Human Nutrition Program at the Department of Environmental Health Sciences, University of Michigan School of Public Health. All narratives were between 194 and 208 words long. Each story consisted of three (3) paragraphs and followed the same format. The first paragraph contained a statement of the author's problem and why he or she wanted to make a change. The second paragraph gave information on how the author attacked the problem after gaining advice from a trusted source such as a family member, doctor, or friend. The final paragraph outlined how making the necessary changes was difficult at first, but quickly became easier and ultimately paid off. A list of narratives appears in Appendix B.

### **Procedure and Equipment**

Before beginning the eye-tracking portion of the study, each subject completed a brief questionnaire to affirm their gender identity in order to ensure correct coding of in-groups and out-groups for subject data. During eye-tracking, each subject saw an instruction screen followed by twelve trials. Subjects read these instructions:

*General Instructions: In this experiment you will read personal stories about health topics. Each narrative was written by a college student and is accompanied by a picture of the author. After each story you will be asked a few questions about the text and the author. Please read through the stories and look at the pictures as you normally would. After you are finished reading and looking at the picture, press the SPACEBAR to continue.*

*Answering Questions: Each question will ask you to give a numerical rating. Press any number listed below the question to give your answer. Please DO NOT use the numberpad, instead use the numbers above the letter part of the keyboard. You will automatically advance to the next question after giving your answer. You cannot go back to a question, so please choose carefully!*

*IMPORTANT: As you are rating the text and authors, try not to compare them to previous stories and authors. Rate each narrative-author pairing independently of the others you see.*

*When you're ready to start the experiment, press any key to begin.*

Each trial consisted of one screen containing the picture and narrative such that the text was centered on the right half of the screen and the image centered on the left half of the screen. Four rating scale questions followed each narrative/picture pairing. All subjects saw the same four questions after each trial, and questions always appeared in this order; “How persuasive was this narrative?”, “How attractive do you think the author is?”, “How much did you like this author?”, “How much do you identify with the author?” The persuasiveness rating used a 10 point scale with extremes anchored with ‘not at all persuasive’ (1) and ‘very persuasive’ (10). All other questions asked for a 1-7 rating with extremes anchored with ‘not at all’ (1) and ‘very’ or ‘very much’ (7). A sample of a narrative/picture pairing appears in Appendix C. All subjects were fully debriefed after completing the experiment.

An Eye-link II head-mounted binocular eye tracking device (SR Research Ltd., Kanata) was used to capture eye movement data. The eye cameras were set to capture pupil movement at a sampling rate of 500 Hz. Data was gathered monocularly, using the camera that performed best during calibration and validation. The data were collected using SR Research Experiment Builder and Data viewer software (SR Research Ltd., Kanata).

This study was approved by the Institutional Review Board for Behavioral Sciences. IRB Number: HUM00042434

## Results

### Rating data

Rating data for each question were averaged for each subject, giving a list of 60 subjects with data for four (4) rating variables in the two conditions of match and mismatch. A repeated measures ANOVA with gender as a between subjects factor was performed on each rating variable (persuasion, liking, identify, and attractiveness) to investigate effects of condition (match versus mismatch) and gender on rating data.

Analysis revealed a main effect of gender such that female participants reported that they identified with narrative authors more,  $F(1,58)=12.53, p<.05$ , (Figure 1A), found narrative authors more attractive,  $F(1,58)=5.11, p<.05$ , (Figure 1B), and were more persuaded by narratives,  $F(1,58)=5.34, p<.05$  (Figure 1C), than did male participants. A marginal effect of gender on liking suggested that female participants liked narrative authors more than male participants liked the authors,  $F(1,58)=3.93, p=.05$  (Figure 1D).

A main effect of match condition and ratings was found for liking ratings only. Interestingly, participants reported that they liked authors of the opposite gender more than authors of their same gender,  $F(9,50)=19.48, p<.05$  (Figure 1D). Contrary to the predicted outcome, analysis revealed that match condition did not affect feelings of persuasion,  $F(9,50)=.96, p=.33$  (Figure 1C), or identification with the author,  $F(9,50)=1.01, p<.05$ . (Figure 1A). There was no effect of match condition on attractiveness ratings, ( $F<1.5$ ), (Figure 1B).

A significant interaction of match condition times gender was seen for both attractiveness  $F(1,58)=7.18, p<.05$  and liking ratings  $F(1,58)= 112.04, p<.05$ . Paired T-tests showed that

female participants rated authors of their same gender as more likable than authors of the opposite gender (*average difference: .88, SD=1.00*),  $t(29)=-4.81$ ,  $p<.05$ . Contrarily, male participants rated opposite gender authors much more likable than same gender authors (*average difference: 2.13, SD=1.20*),  $t(29)=9.77$ ,  $p<.05$ . These findings show that, overall, female authors were rated as more likeable than male authors. Paired comparisons of attractiveness ratings revealed that female participants gave slightly higher attractiveness ratings to authors of the same gender (*average difference: .21, SD=.55*),  $t(29)=-2.11$ ,  $p<.05$ , while male participants had a non-significant trend in the opposite direction, favoring opposite gender authors ( $M=.22$ ,  $SD=.68$ ),  $t(29)=1.74$ ,  $p>.05$ .

### **Eye movement data**

There were five dependent variables of interest extracted from the eye movement record on each trial; dwell time on text, dwell time on the last paragraph of text, dwell time on image, pupil diameter on image, and saccades between text and image. Dwell times were defined as the sum of all fixations over a particular area of interest. In the current study, dwell times were used to assess time spent looking at particular regions of text and image. Increases in pupil diameter have been shown to correlate with feelings of attractiveness and cognitive load (as described in Granholm, & Steinhauer, 2004 and Hess, & Polt, 1960). As attractiveness was found to correlate with persuasion (discussed below), increases in pupil size may indicate the physiological responses associated with increased feelings of persuasion. Measurements of pupil diameter (mm) during fixations on images from 500 ms after trial start time were used to assess these variations in pupil size. Scene analysis research has shown that saccades are made to areas that subjects find informative (Henderson & Hollingsworth, 1999). Saccades between text and image

in this study were used as an indicator of how participants may use image/author information to make persuasive judgments.

Eye movement data were analyzed in the same way as question rating data. A repeated measures ANOVA with gender as a between subjects factor was run for each dependent variable. Eye movement means by participant gender and match condition not represented in figures are presented in Table 1.

Results showed a main effect of gender on dwell time on text, dwell time on last paragraph and dwell time on image such that male participants looked longer at texts,  $F(1,58)=6.05, p<.05$ , (Figure 2A), last paragraphs,  $F(1,58)=8.52, p<.05$ , (Figure 2B) and images,  $F(1,58)=10.15, p<.05$ , (Figure 2C). compared to female participants. There was no effect of gender on number of saccades or pupil diameter (all  $F$ 's $<1.5$ ).

An effect of match condition on image dwell time showed that participants looked longer at authors of the opposite gender than at authors that matched their own gender,  $F(9,50)=19.86$  (Figure 2C). Match condition did not impact dwell time on text, dwell time on last paragraph, pupil diameter or number of saccades (all  $F$ 's $<1.5$ ).

A significant interaction of match times gender was seen for image dwell time,  $F(1,58)=25.66, p<.05$ . Paired T-tests were performed for each gender group in order to understand the nature of this interaction. Male participants looked longer at images of female authors compared to images of male authors (*mean difference*: 853.42,  $SD=879.52$ ),  $t(29)=5.32, p<.05$ , however, female participants showed no significant difference in time spent looking at images of male and female authors (*mean difference*: 42.12,  $SD=459.39$ ),  $t(29)=-.55, p>.05$ .

## **Correlations**

The current study aimed to investigate factors that lead to persuasion, thus, the relationship between other dependent variables and persuasiveness ratings specifically were of most interest. Correlations between rating data were performed to investigate the relationship between feelings toward a narrative's author and the narrative's perceived persuasiveness. Correlation analysis was also performed between rating and eye movement data to understand how different attentional processes may influence feelings of persuasion. All correlation data is presented in Table 2.

Attractiveness was found to be the best predictor of persuasion,  $r(718)=.67$ , (Figure 3A). Identification with the author was the next best predictor of persuasion with a correlation coefficient of  $.47$ , (Figure 3B). Persuasion also had a positive correlation with liking ratings,  $r(718)=.28$ , (Figure 3C), though this correlation was not as strong as that seen with attraction and identification. Dwell time on text was very slightly negatively correlated with persuasion,  $r(718)=-.08$ . None of the remaining eye movement variables were shown to be significantly correlated with persuasion (text dwell time, image dwell time, last paragraph dwell time, pupil diameter and number of saccades, (all  $r^2 < .05$ ).

Though persuasion itself was only very slightly correlated with eye movements, two of its three predictors were more strongly tied to eye movement data. Higher ratings of attractiveness were positively correlated with longer dwell times on images,  $r(718)=.11$ , (Figure 4A). Liking ratings correlated with both dwell time on image,  $r(58)=.20$ , (Figure 4B), and dwell time on text  $r(718)=.17$ , (Figure 4C). It should be noted that identification had a very slight negative correlation with dwell time on the last paragraph,  $r(718) = -.08$ , (Figure 4D) however this correlation is most likely the effect of outliers pulling the data towards a negative trend. It is interesting to note the relationship of eye movements on liking ratings, liking ratings' strong

correlations with attractiveness,  $r(718)=.40$ , (Figure 4E) and attractiveness' strong correlation with persuasion,  $r(718)=.67$ , (Figure 3A). Though this series of correlations does not show that persuasion itself is strongly correlated with eye movement, it highlights how other variables that are predictive of persuasion may be related to attentional processes.

In order to determine the unique variance explained by dwell time on text, a stepwise regression was performed with the predictors of persuasion (text dwell data, attractiveness ratings, identify ratings and liking ratings). Attractiveness was the best predictor of persuasion ( $R^2=.45$ ), adding identify ratings increased  $R^2$  to .47 and adding dwell time on text increased the variance accounted for just one hundredth of a point to .48. Liking ratings were removed from the regression analysis as they did not explain any unique variance. These results suggest that time spent reading texts does not add substantial power to predicting persuasiveness ratings.

### **Discussion**

Data from this study revealed that author attractiveness is the single best predictor of persuasiveness. It was hypothesized that study participants would base persuasiveness judgments on feelings of similarity to argument authors and that specified eye movement patterns would accompany any variations in persuasion and thus reveal the cognitive mechanisms behind the in-group bias. This hypothesis was unable to be reliably evaluated, however, as subjects did not clearly identify with one group of authors more than the other. Though support for the original hypothesis was unable to be tested, results suggest that persuasive judgments made through peripheral processing are based on visceral feelings rather than cognitive effort.

Though persuasion ratings did not differ by match and mismatch conditions, it is interesting to note that persuasion and attractiveness ratings were highly correlated. This relationship suggests that authors who are considered more attractive can positively influence

persuasion. The Elaboration Likelihood Model's, (Petty and Cacioppo, 1986), theory of peripheral processing offers an explanation of how author attractiveness may influence persuasion. The peripheral processing theory claims that individuals use heuristic clues about a author to determine argument persuasiveness. It is possible that subjects in the current study found attractiveness to be the most salient heuristic clue, and thus, persuasiveness judgments were based mainly on this attribute.

The best predictors of persuasion in this study were ratings of identification with an author, likeability of an author and author attractiveness. Two of these three factors correlated with eye movements, though persuasiveness ratings were curiously only very slightly correlated with eye movement data. It is interesting that there would be a lack of eye movement predictors for persuasion in the presence of such predictors for factors that seem to underlie persuasive judgments. The absence of a correlation between eye movements and persuasion is stranger still when one considers that eye movements are generally highly linked with cognitive processing.

One possible argument for the absence of strongly predictive eye movements for persuasion is that the range of variation in persuasion was too small to show effects of eye movements over processing of persuasive arguments; however, Figure 3A clearly shows that persuasiveness ratings spanned the entire range of values. Another possible explanation is that consideration of persuasiveness (and thus eye movements associated with this cognitive process) occurred only when subjects gave their response on narrative persuasiveness. Subjects' eye movements were not tracked as they read and answered post-narrative questions so this argument cannot be confirmed or denied with this data set. It is unlikely, however that subjects did not consider narrative persuasiveness during reading as they were aware that they would be required to rate the text's persuasiveness.



Overall, results from this study suggest that predictive eye movements for persuasion are not manifested during peripheral argument processing. The absence of predictive eye movements signifies a lack of concentrated cognitive processing, which in turn suggests that persuasiveness judgments during peripheral processing are based on more visceral feelings (i.e. attractiveness of an author) as opposed to any thoughtful consideration. These conclusions add empirical evidence on cognitive activity to support the claims outlined in the Elaboration Likelihood Model's theory of peripheral processing.

Future research into eye movements and persuasiveness should focus on cognitive processes during analysis of strong and weak arguments. It is possible that eye movements associated with perceived persuasiveness will become salient when arguments create differences in cognitive demand.

The current study's main weakness was the failure to create a clear in-group argument bias. Analysis suggests that the intended in-groups (matched gender) and out-groups (mismatched gender) were not salient to subjects. Though feelings of identification with an author and narrative persuasiveness were correlated, there was no effect of match condition on ratings of identification or persuasion. The absence of an in-group argument bias limits the study in that conclusions on the cognitive processes behind the bias cannot be evaluated. Further research into the processes underlying in-group biases should focus on creating reliable in-groups and out-groups.

Though results from this study did not provide insight into the cognitive processes behind the in-group argument bias, data did provide insights into creating more efficacious health promotional initiatives. Evidence from the current study may be used in instances where tailoring narratives to a specific audience is not possible. Results suggest that health promotional materials

should be accompanied by authors that meet high standards for the three factors of attractiveness, likeability and similarity to the reader in order to achieve maximum efficacy.

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Table 1.

*Eye Movement Data by Match Condition and Gender*

	Match				Mismatch			
	Female		Male		Female		Male	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Saccades	1.73	0.53	1.73	0.62	1.69	0.49	1.78	.75
Pupil Diameter (mm)	1897.06	475.80	2073.33	791.80	1905.72	494.71	2110.95	857.14

Table 2.

*Rating and Eye Movement Data Correlations*


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	Persuasion	Liking	Attractiveness	Identify	Dwell Time on Text	Dwell Time on Image	Dwell Time on Last Paragraph	Pupil Diameter on Image	Saccades
Persuasion	1	.28**	.67**	.47**	-.08*	.05	-.04	-.02	.05
Liking	.28**	1	.40**	.20**	.17**	.20**	.09*	-.03	.04
Attractiveness	.67**	.40**	1	.53**	.04	.11**	.01	.01	.08*
Identify	.47**	.20**	.53**	1	-.02	-.04	-.08*	-.06	-.00
Dwell Time on Text	-.08*	.17**	.04	-.02	1	.21**	.56**	-.07	.14**
Dwell Time on Image	.05	.20**	.11**	-.04	.21**	1	.18**	-.11**	.38**
Dwell Time on Last Paragraph	-.04	.09*	.01	-.08*	.56**	.18**	1	.02	.09*
Pupil Diameter on Image	-.02	-.04	.01	-.06	-.07	-.11**	.02	1	.05
Saccades	.05	.04	.08*	-.00	.14**	.38**	.09*	.05	1

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*Note.* \*Correlation is significant at the 0.05 level (2-tailed). \*\*Correlation is significant at the 0.01 level (2-tailed).

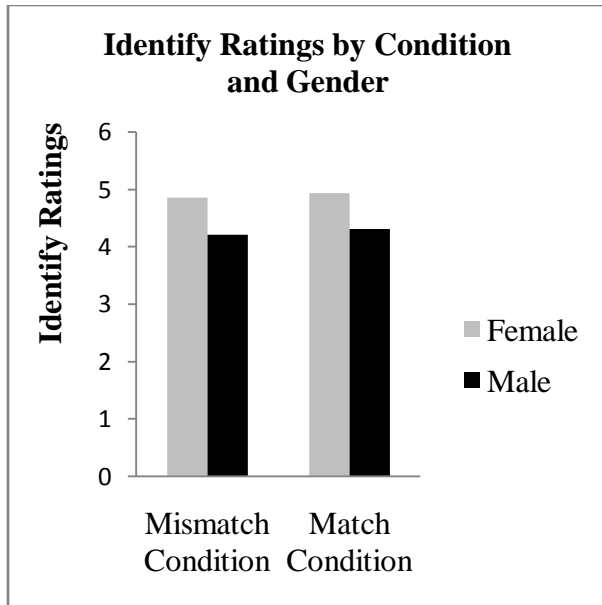


Figure 1A. Average identification rating with narrative authors by participant gender and match condition.

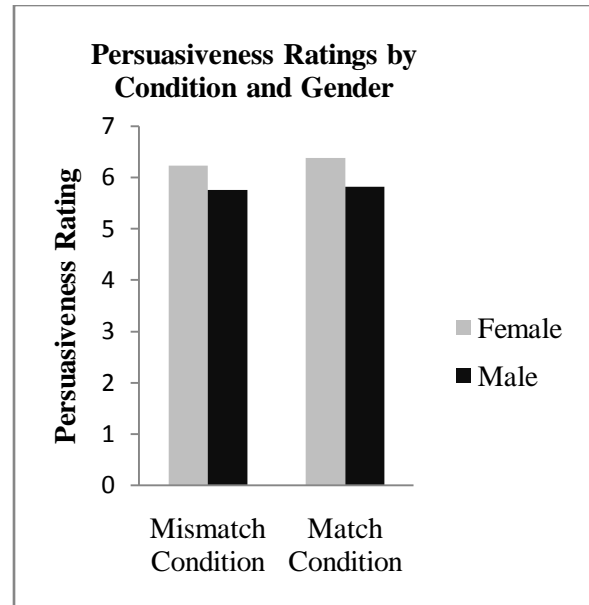


Figure 1C. Average persuasiveness ratings of narratives by participant gender and match condition.

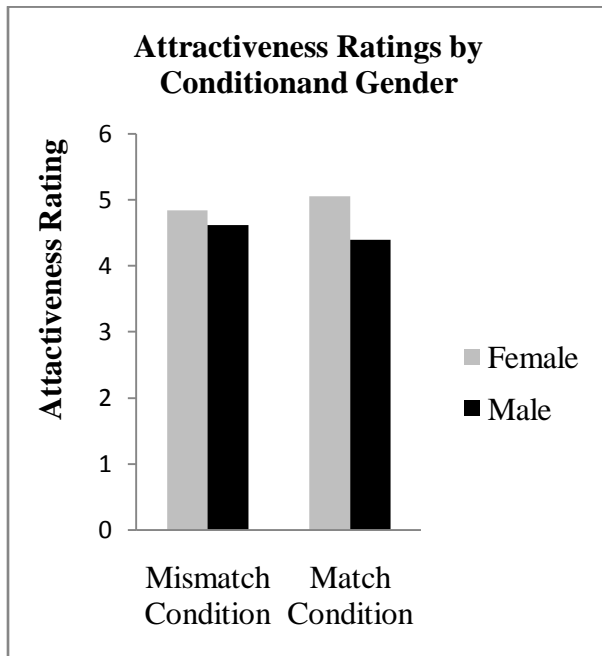


Figure 1B. Average attractiveness ratings of narrative authors by participant gender and match condition.

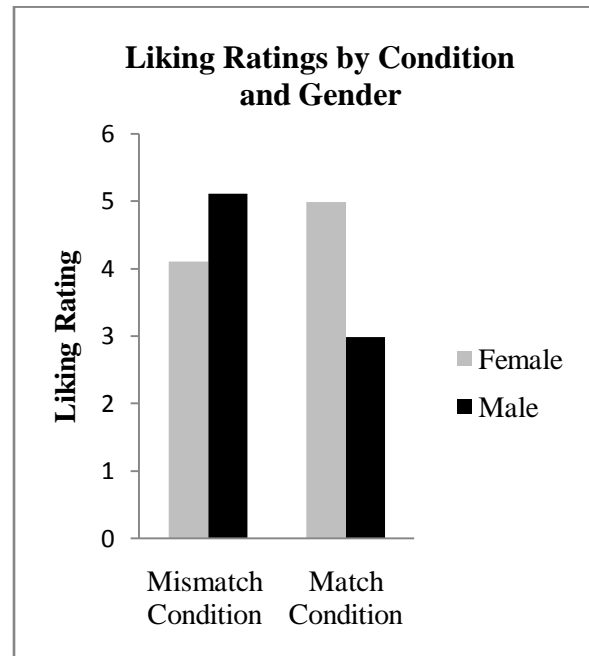


Figure 1D. Average liking ratings of narrative authors by participant gender and match condition.



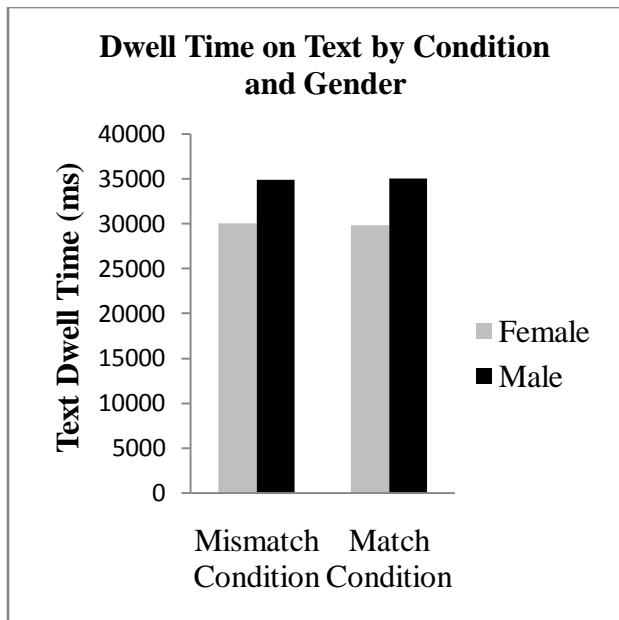


Figure 2A. Average dwell time on narrative text by participant gender and match condition.

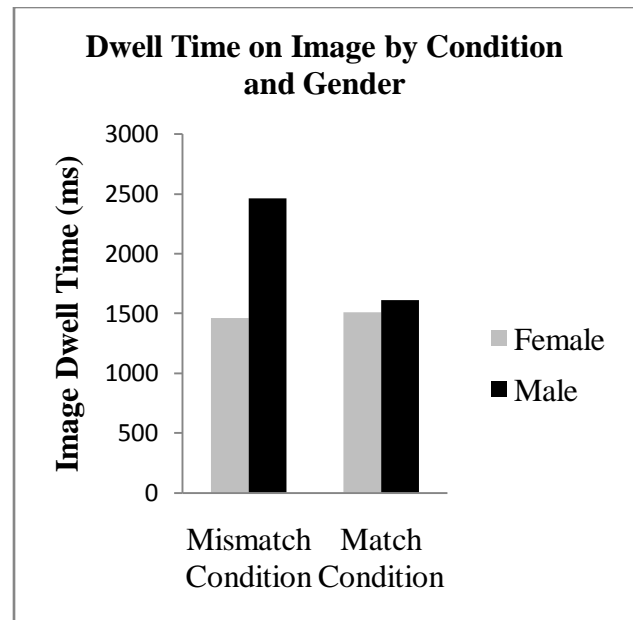


Figure 2C. Average dwell time on image of narrative author by participant gender and match condition.

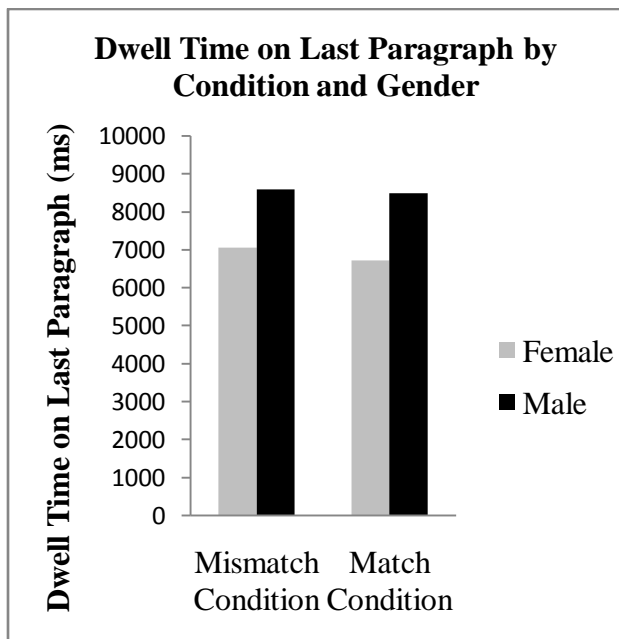


Figure 2B. Average dwell time on the last paragraph of narrative text by participant gender and match condition.

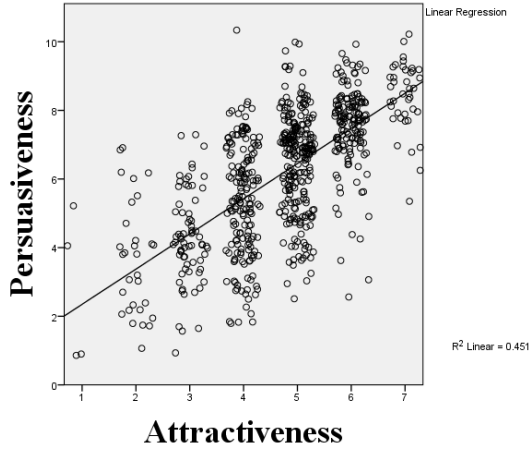


Figure 3A. Scatter plot showing correlation between ratings of narrative author attractiveness and ratings of narrative persuasiveness.

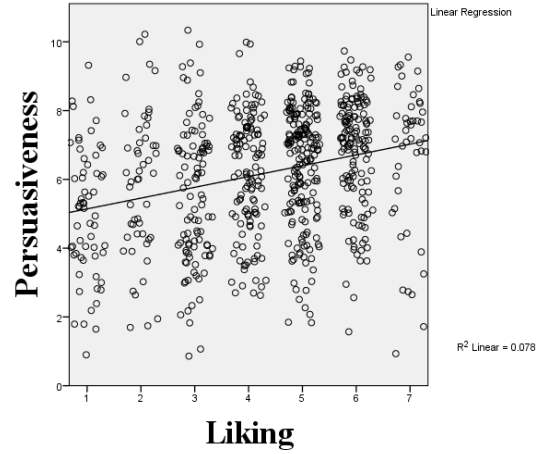


Figure 3C. Scatter plot showing correlation between ratings of liking a narrative author and ratings of narrative persuasiveness

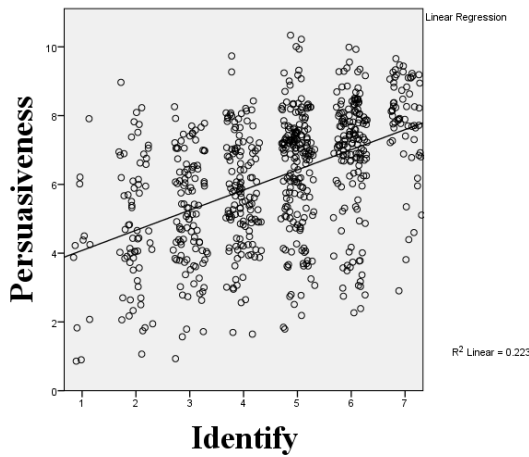


Figure 3B. Scatter plot showing correlation between ratings of identifying with narrative authors and ratings of narrative persuasiveness.

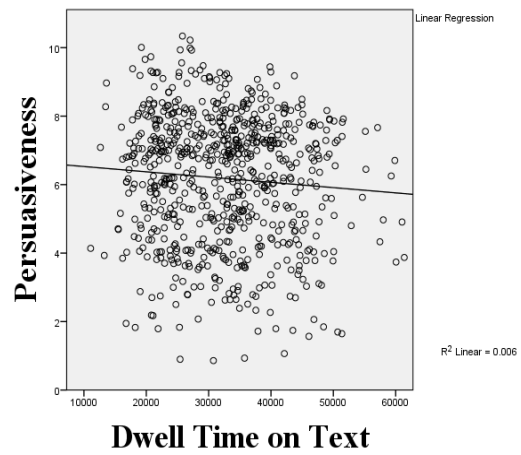


Figure 3D. Scatter plot showing correlation between dwell time on narrative text and ratings of narrative persuasiveness.

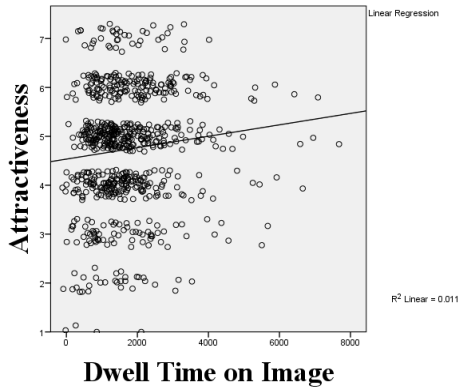


Figure 4A. Scatter plot showing correlation between dwell time on narrative text and ratings of narrative author attractiveness.

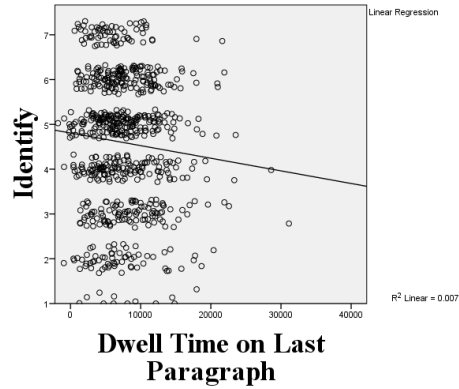


Figure 4D. Scatter plot showing correlation between dwell time on the last paragraph of narrative text and ratings of identifying with a narrative author.

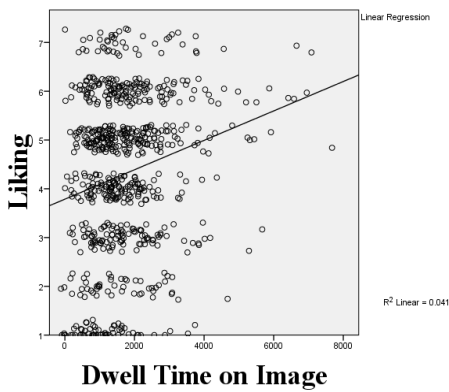


Figure 4B. Scatter plot showing correlation between dwell time on author image and ratings of liking a narrative author.

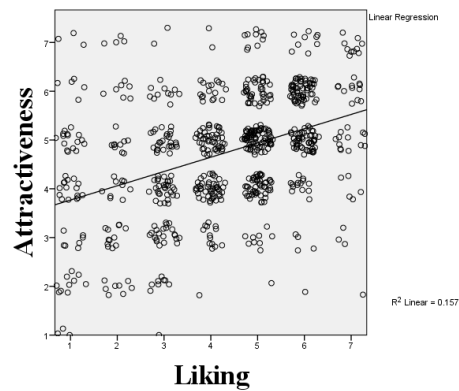


Figure 4E. Scatter plot showing correlation between ratings of liking a narrative author and ratings of narrative author attractiveness.

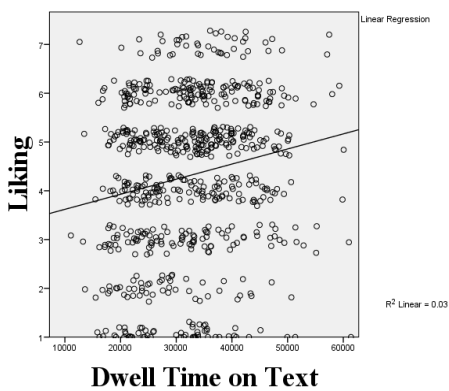


Figure 4C. Scatter plot showing correlation between dwell time on narrative text and ratings of liking a narrative author.

Appendix A

Photographs



## Appendix B

## Narratives

**1.** I had never seriously thought about my diet before my annual check-up. At the appointment, my doctor told me that my family has a history of heart disease and I could be at risk too.

I'm busy and it's often hard to eat right all the time, but I still try to be healthy. Even though I've made efforts to better my health in the past, I just wasn't motivated to stick to a plan. My doctor suggested making small changes in my diet instead of drastically changing my lifestyle. She said an easy way to cut down on calories and to be healthy at the same time is to add more fruits and vegetables to my meals and snacks.

At first, I was ambivalent about her advice because I've never really enjoyed vegetables or fruit. It turned out to be easier than I had thought. First, I started chopping fruit to put on cereal in the mornings and bringing an apple in my lunch. I used frozen vegetables steamed in the microwave for quick side dishes and added fresh vegetables to pizza and sandwiches. I dreaded making the changes, but it turned out to be so easy!

**2.** I pride myself in taking good care of my body; I eat low calorie foods and work out at least three times a week. To me, my eating style seemed healthy, but I recently changed my diet when I discovered that I wasn't eating enough carbohydrates.

At my annual physical I told my doctor how my diet included a minimum amount of carbs, because I've heard it's easier to lose weight on a high protein-low carb diet. My doctor told me that carbohydrates are actually good for you and an essential part of a healthy diet and body. Because of the care I invest in myself, I wanted to change my diet to include more carbohydrates so I can be even healthier.

I didn't want to load up on cake and ice cream though, because I knew those foods contain a lot of sugar and fat. Instead, I chose to add fruits and vegetables to things I already love to eat. This way I was able incorporate healthy carbohydrates into my high-protein meals. I still eat healthy and still look great, but now I know I'm giving my body the healthy balance it needs.

**3.** I love to eat good food, and before I changed my eating habits I often found myself still feeling hungry after meals. When I noticed I had gained some weight, I wanted to take it off but didn't want to go hungry. I was able to achieve my weight loss goal simply by substituting fruits and vegetables for higher calorie dishes.

I had mentioned my weight gain to a friend and he said he'd had a similar experience. He suggested I try the solution that worked for him: filling up on fruits and vegetables instead of going back for seconds of dinner or dessert. This sounded like good advice, but I wasn't sure if it would work for me.

I half-heartedly began to add just a few tweaks to my regular eating habits. After a couple weeks, I was frustrated when I wasn't seeing the results I wanted. I began to realize that I needed

to commit to change if I wanted to see change. Instead of occasionally eating a piece of fruit instead of dessert, I began eating salad before dinner and supplementing my lunches with veggie sticks and fruit. After I truly committed myself, the switch seemed easy.

**4.** I've tried several different diets to myself keep in shape. They all end up the same way, though. I would lose some weight, but I couldn't keep it off for the long term. I'm more interested in staying healthy than losing a bunch of weight; I just need a plan that works.

I needed a way to cut down on the amount of calories I was eating, but in a way that wasn't harmful to my body. I'd read articles about how fruits and vegetables can help you eat less calories by making you feel more full before you eat other food. Making changes in my eating habits has always been difficult for me, but this change seemed different. Unlike other diets, this one seemed like a breeze. I didn't have to drastically change what I was eating, or cut out specific foods.

After a couple of weeks of eating more fruits and vegetables I could see a difference in the way I looked and even my mood improved. I feel I have more energy and am less tired throughout the day. Who knew such a simple change could make such a big difference?

**5.** Obesity runs in my family. I grew-up in a household that wasn't health conscious when it came to the foods we ate. I know the risks of being too heavy: heart disease, diabetes and even trouble walking, just to name a few. I wanted to break away from the habits I learned growing up and begin eating healthy so I wouldn't have to face those problems.

I had a hard time deciding exactly what foods comprised a balanced diet because I grew up in a house that didn't focus on balanced nutrition. I used the food pyramid as an initial step towards my new, healthy, lifestyle. It recommended eating plenty of greens like fruits and vegetables. These were two food groups I didn't see a lot of at home. I'm generally not a fan of "healthy food," but I knew I had to make a change in order to break away from my family's pattern.

I started to add fruits and vegetables to my diet and began to see results after just a short time. At first I thought it would be hard to keep up my new diet, but the progress I see is more than enough to keep me motivated.

**6.** I had been a healthy weight all my life. But now that I've been in college for a while, my weight and my body just aren't what they used to be. I'm too occupied with my job and classes to play sports, and I've definitely noticed a change in my diet now that I don't have my mom around to cook for me. I wanted to start eating better to get back to the way I was in high school.

I know people's bodies change as they get older, but I wasn't happy with the added weight. My schedule doesn't allow anytime for sports, and I don't like working out at the gym, so I decided the easiest thing to change was my diet. I did some research and found that my mom was right; I really should eat my veggies.

I've started eating more fruits and vegetables to help balance my otherwise "junk food"-heavy diet. I've found that eating a banana and orange juice in the morning is just as satisfying as

the sugary cereal I used to eat. By simply adding greens to my diet I've seen big results. I have more energy, I'm less tired, and I've noticed my old clothes fitting better too!

**7.** I've always thought that I don't need as much sleep as the experts recommend. I would get just a few hours of sleep a night and then have coffee multiple times during the day. That pattern worked for a while, but then I could tell that the coffee just wasn't enough.

I felt like a zombie in class. I felt I was only awake because of the caffeine in my system. I wasn't even paying attention in lecture either. I was so tired I couldn't concentrate on what my professors were saying or bother to write it down. I knew this couldn't go on forever, so I decided to change my sleeping habits.

It was hard to get enough sleep with all the school work I needed to do. I knew my grades would really suffer, though, if I was always asleep in lecture. I decided to make a rule that I had to be in bed at least eight hours before I had to wake-up. In just a couple of weeks I was really noticing the difference. Now I have energy enough to stay alert in lectures and I'm less irritable.

**8.** It used to be that when I woke up in the morning I wanted to sleep a lot longer. I had to wake up for class though. It wasn't so bad because about half way through the day I'd feel my energy level go up and if I just kept busy I didn't even notice how tired I was. I knew I couldn't keep this up very long though.

It was only when I would sit down to rest or read for class that I noticed just how sleepy I was. I told my mom how tired I was feeling and she seemed worried. Even though the main reason I wasn't sleeping was to keep up with school, my mom said that if I didn't get proper sleep my ability to learn and retain information would go downhill.

I listened to my mom and started getting 7 hours a night. It wasn't easy to cut out things I liked to do, like hanging out with friends late at night and watching movies on week days, but it paid off. It's a lot easier and faster to do work now that I'm not half asleep when I'm trying to do it.

**9.** At the beginning of my freshman year I only got a few hours of sleep at night, but I usually felt fine during the day. I needed to stay up late to finish homework because I like to use time during the day as free time to hang out with friends and do whatever I really want to do. I didn't want to give up anything just to sleep more. I figured if I felt fine, why should I bother going to bed earlier? I changed my mind after I saw a TV show about the importance of a good night's sleep.

I didn't realize how much sleep can affect you. The show talked about how sleep deprivation affects everything from mood, to job performance and memory. I was really surprised and decided that maybe I should try getting to bed a little earlier.

I tried going to bed earlier for a couple of weeks and I couldn't believe the difference it made. I was in a better mood and noticed an increase in my energy too. Of course I had to sacrifice some of my free time to doing homework, but I feel the results were worth it.

**10.** I was really stressed out last year, in a way I had never been before. I was taking a full course load and by the time I realized it was too much to handle, it was too late. I wanted a social life too, and so I ended up pulling multiple all-nighters to get class work finished. My grades

were hurting though. I knew this semester was going to make a dent in my grade point if I didn't figure out a better system.

I would have weeks when there wasn't anything due, and then times when every class had an exam or a paper. I tried to stay on top of the work by doing as much as I could during the weeks when less was due. But every time I sat down I wanted to fall asleep. My work was becoming sloppy and it was all I could do to study for a couple hours before exams. I finally decided that I'd have to cut back on going out with friends so I could catch-up on my sleep.

I noticed a difference almost immediately. Not only could I concentrate, but I didn't feel as stressed-out anymore. I had more energy and was in a better mood.

**11.** I figured everyone in college stayed up all night at least a couple times during the semester to finish a paper or study for an exam. I knew I was probably working later than most students, but I figured it was the norm for a college kid to be sleep deprived when trying to balance a life and school. But it was a struggle to wake up for class and pay attention in lecture and finally I decided I'd had enough of it.

Even if this was supposed to be the life of a college student I couldn't take it anymore. I felt groggy during the day and I had to force myself to get anything done. I knew something would have to change, either less work or less play. I decided to make a small change, nothing drastic, just to try it out.

I ended up adding just one more hour of sleep a night. I was kind of surprised to find that it really worked! After a couple of weeks my head seemed clearer and I wasn't dragging myself out of bed and feel like I can get more done. Adding that extra hour was definitely worth it.

**12.** I know my limits when it comes to not getting enough sleep. Lack of sleep makes me irritable and stressed out. It's hard to admit this to people, especially when everyone else seems to be able to handle going out multiple nights and finishing their class work. I figured that if other people could get by on a couple of hours of sleep a night, so could I. But I quickly noticed the usual symptoms of not enough sleep come creeping into my personality. It was obvious to me that what worked for everyone else was not going to cut it for me.

I felt pressured to do what everyone else was doing, but I just couldn't handle the sleep deprivation. Even though I wanted to have fun and get good grades, I knew my relationships and self-esteem would suffer I didn't start getting more sleep.

It was tough to turn down offers to have fun, but I knew it was worth the pay off. I still go out, don't get me wrong, but now I also make sure I get enough sleep on week nights so I can properly balance my social and academic life.



## Appendix C

## Sample Trial



I figured everyone in college stayed up all night at least a couple times during the semester to finish a paper or study for an exam. I knew I was probably working later than most students, but I figured it was the norm for a college kid to be sleep deprived when trying to balance a life and school. But it was a struggle to wake up for class and pay attention in lecture and finally I decided I'd had enough of it.

Even if this was supposed to be the life of a college student I couldn't take it anymore. I felt groggy during the day and I had to force myself to get anything done. I knew something would have to change, either less work or less play. I decided to make a small change, nothing drastic, just to try it out.

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