

# **A Comparison Between Two Studies Shows that Large, Web-Based Studies Have Benefits that Outweigh Their Potential Costs**

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# **A Comparison Between Two Studies Shows that Large, Web-Based Studies Have Benefits that Outweigh Their Potential Costs**

## **Abstract**

A lab study ( $N = 180$ ), in which participants were supervised by an experimenter, showed that both the frighteningness and disgustingness of insects make people want to kill them, and that females wanted to kill the insects more than males did. There were also some interesting patterns of interaction with gender, but they were not statistically significant. However, an unsupervised, web-based study ( $N = 1301$ ) produced the same significant main effects as the lab study. Furthermore, the same patterns of interaction occurred in the web-based study that had occurred in the lab study, but in the web-based study they were statistically significant. These results suggest that whatever risks web-based studies may incur by being unsupervised, such as some contamination of the data by participants who are not genuinely motivated to follow the instructions correctly, are compensated for by the much larger sample size afforded by the web-based approach.

As the use of technology increases a large number of psychologists are exploring the idea of using the internet as a method for conducting research. This expansion into the relatively new area of web-based research has many experimenters questioning the validity of this method (Hewson, 2003). Up to this point, many advantages and disadvantages of internet research have been delineated.

Many studies have found a variety of advantages associated with internet based research, the most prominent of which include efficiency, diverse and large samples, and relatively low cost (see Hewson, 2003; Skitka & Sargis, 2006; Birnbaum, 2004). Other experiments have focused on the lack of experimenter presence, and have found it to have positive effects in two

ways. First, participants are more apt to be frank in their responses because of a decrease in anxiety over the social consequences (Hewson, 2003). Second, because the procedure can be replicated exactly for each subject there is no possibility of experimenter bias (Birnbaum, 2004). Pettit (2002) pointed out that errors in data entry are eradicated when studies are conducted over the internet. Also, another advantage of web research over traditional lab research is that the experimenter has easier access to specialized or underrepresented samples ( Skitka & Sargis, 2006; Birnbaum, 2004).

While these advantages seem appealing, there are a variety of disadvantages associated with internet research that warrant caution. According to Hewson (2003), the lack of researcher control poses huge problems. It is impossible to know if instructions are followed correctly, the state the subject was in at the time of their participation, or whether they took the study seriously, to name a few. Also, Birnbaum (2004) found that there was an increased dropout rate in web-based rather than lab studies. Another major disadvantage discussed in both Hewson (2003) and Skitka and Sargis (2006) are the ethical issues raised in the utilization of internet research. These studies have found problems with the delivery of informed consent and debriefing forms, and with the concern of confidentiality in the experiments.

However, most of the literature that we found, discussed studies that were not experimental in nature. They obtained data using questionnaire or survey methods (Lewis, Watson & White, 2009; Gosling, Vazire, Srivastava & John, 2004), and conclude the aforementioned advantages and disadvantages based on that information. In order to improve upon these findings, our study attempted to extend these results to experimental methods. Our purpose was to determine whether the pros and cons still applied when experimental lab research and experimental web research are compared.

Another focus of our study was to expand upon the idea that the results obtained in traditional lab research versus internet research are simply equivalent. Studies have shown that data acquired through the internet are of equal quality as data from lab studies (Lewis et al, 2009). The present study will seek to at least replicate this result of equivalence, and then determine if the results from internet research are actually superior to those from lab research in any way. Perhaps benefits from larger sample sizes which yield greater power outweigh the detriment of not having any supervision.

## **Experiment 1**

Experiment 1 was conducted in a laboratory under the supervision of an experimenter.









### **Method**

#### *Participants*

Our participants consisted of 180 university students, all of whom participated in our study in order to receive credit for their introductory psychology course.

*Materials*

We had obtained frighteningness and disgustingness ratings of 43 different insects from college students in a previous study. These ratings were used to select eight insects, two of which were in each of the four categories resulting from crossing high and low frighteningness with high and low disgustingness. The insects selected for the four categories are shown below.

			
			
<p>Low Disgusting &amp; Low Frightening</p>	<p>Low Disgusting &amp; High Frightening</p>	<p>High Disgusting &amp; Low Frightening</p>	<p>High Disgusting &amp; High Frightening</p>

*Procedure*

When the subjects arrived at the laboratory, the experimenter recorded their gender. The experimenter then told them they would see a series of pictures of insects and would then have to rate their hostility towards them. The rating was the extent to which they either wanted to kill or at least in some way get rid of that particular insect. The option of just getting rid of the insect was specified, for two reasons. First, some people may be morally opposed to killing. Second, the disgustingness factor may have prevented some individuals from wanting to kill the insects because they would not want to touch them. The instructions then went on to explain how to rate the insects. The hostility rating scale was from 0 to 10. A rating of 0 meant they would not want to kill the insect at all. A rating of 10 meant they had the greatest possible desire to kill the insect. Before the rating task, we presented all of the insects together to enable the participants to compare them. Then we presented them one at a time for the participant to rate them.

## Results

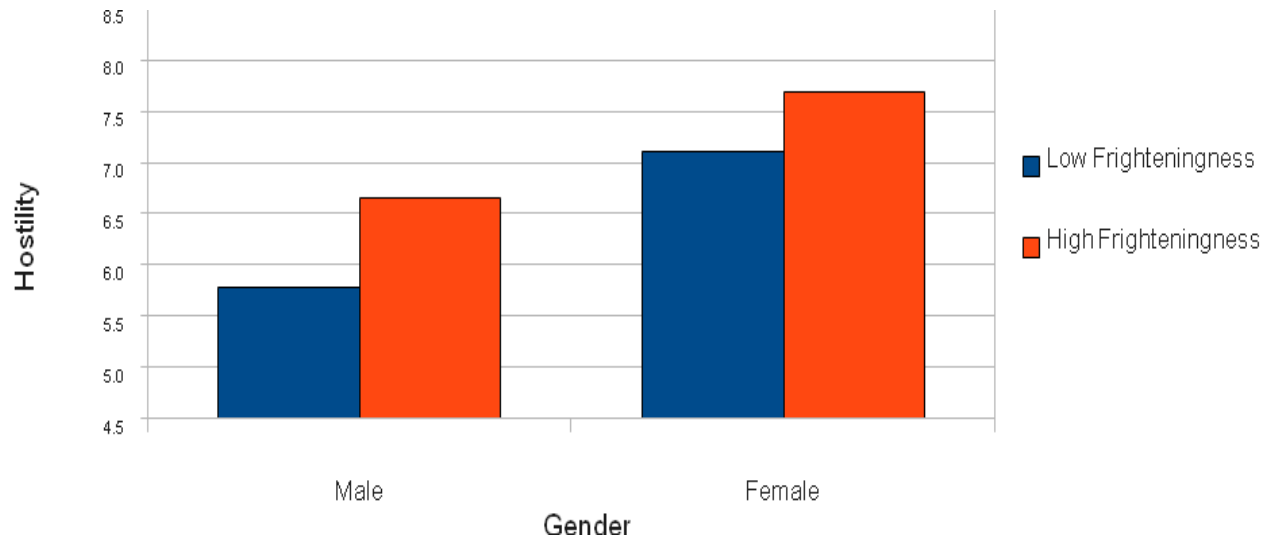
For Experiment 1 a three factor ANOVA was used to analyze the responses with gender as a between subjects factor and both disgustingness and frighteningness as within subjects factors. The results of the ANOVA are shown in Table 1.

**Table 1**

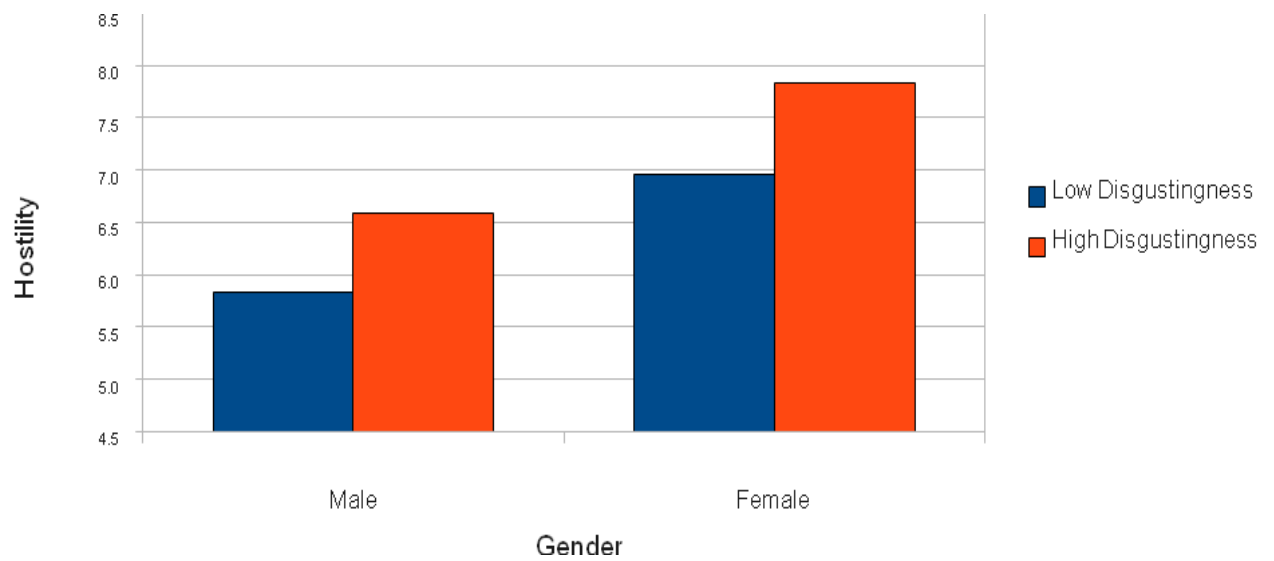
Source	SS	df	MS	<i>F</i>	<i>p</i>
Gender	168	1	167.6	10.31	.002
Error (Gender)	2893	178	16.3		
Frighteningness	63	1	62.9	7.65	.006
Fright'ness*Gender	3	1	2.7	.33	.566
Error (Frighteningness)	1465	178	8.2		
Disgustingness	80	1	79.6	11.73	.001
Disgustingness * Gender	.4	1	.4	.06	.807
Error (Disgustingness)	1209	178	6.8		
Fright'ness * Disgust'ness	2	1	2.4	.36	.547
Fright'ness * Disgust'ness * Gender	.2	1	.2	.03	.857
Error (Fear * Disgust)	1166	178	6.6		

There were main effects of gender, frighteningness and disgustingness. The females gave higher hostility ratings ( $M=7.40$ ,  $S.E.=.169$ ) than the males ( $M=6.21$ ,  $S.E.=.327$ ). The high frightening insects received higher hostility ratings ( $M=7.17$ ,  $S.E.=.186$ ) than the low frightening insects ( $M=6.44$ ,  $S.E.=.259$ ). The high disgusting insects received higher hostility ratings ( $M=7.21$ ,  $S.E.=.182$ ) than the low disgusting insects ( $M=6.40$ ,  $S.E.=.251$ ). Gender had a tendency toward an interaction with frighteningness, with disgustingness and with frighteningness by disgustingness. As shown in Figure 1 the effect of frighteningness was numerically greater for males than females. As shown in Figure 2 the effect of disgustingness was numerically greater for females than males. As shown in Figure 3 for the low disgusting insects the effect of frighteningness was numerically greater for males than females. However, there was no such tendency toward an interaction for the high disgusting insects.

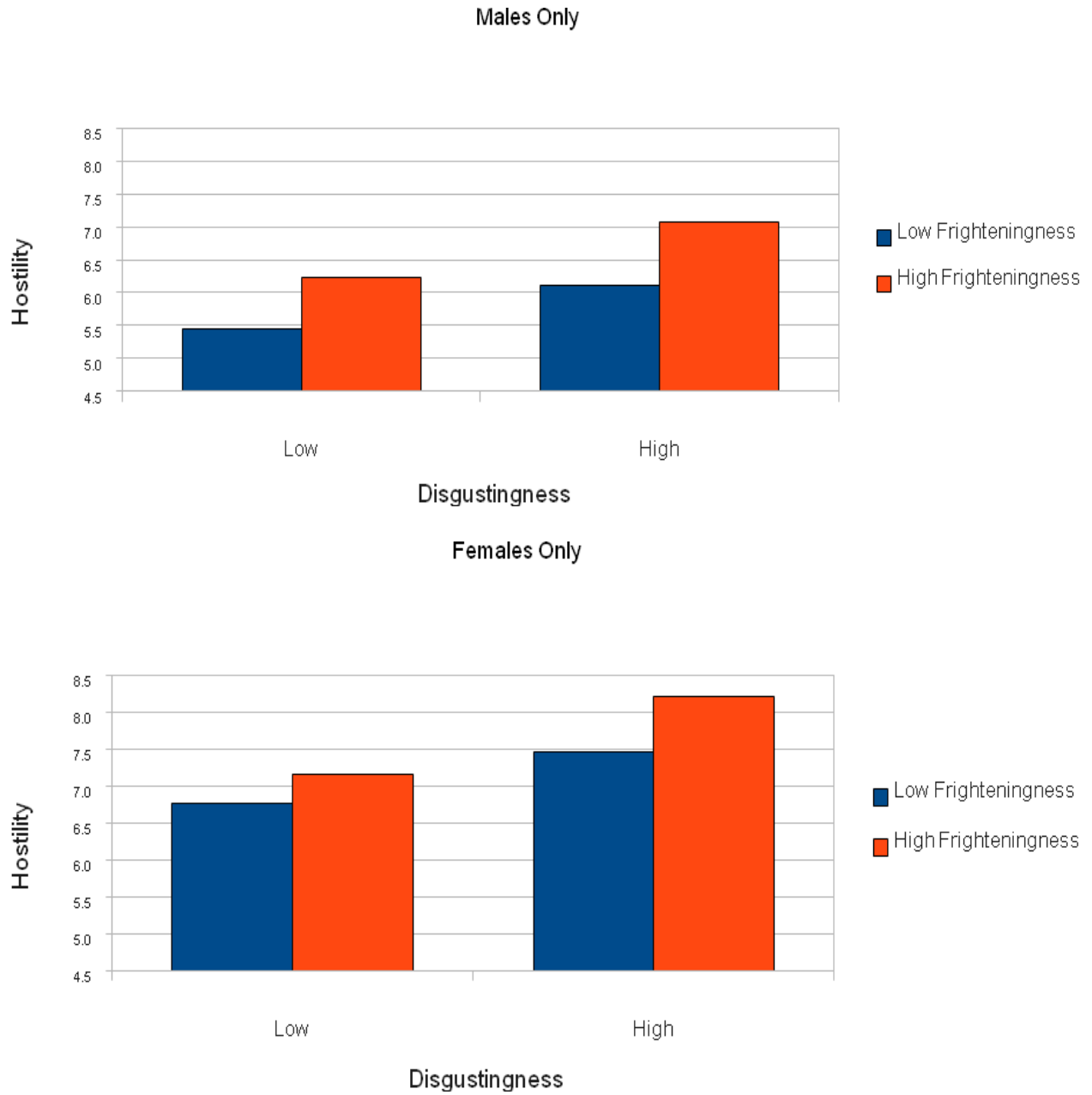
**Figure 1** Mean hostility as a function of frighteningness and gender for Experiment 1



**Figure 2** Mean hostility as a function of disgustingness and gender for Experiment 1



**Figure 3** Mean hostility as a function of gender, frighteningness and disgustingness for Experiment 1



## Experiment 2

Experiment 2 was identical to Experiment 1 except there was no supervision of the participants by an experimenter, because the directions were written on web pages that were found on the public internet. The study was originally posted on a website maintained by Hanover College (<http://psych.hanover.edu/research/exponnet.html>). The actual study can now be found at <http://ryanlab.netfirms.com>.

### Method

#### *Participants*

Our participants consisted of 1,351 respondents from a web-based study. Participants came from all over the world, however most of them came from North America. Due to some missing data, 1301 respondents' data were included in the analysis.

#### *Materials*

The materials were exactly the same as Experiment 1 except that they were presented on web pages.

#### *Procedure*

The procedure was exactly the same as Experiment 1 except the instructions were written on the pages rather than given by an experimenter. Thus, there was no guarantee that the participants were following the instructions.

### Results

The data set was cleaned by removing responses that contained no ratings, and those that were obvious duplications. A response was considered a duplication if it came from the same IP address only a few seconds after the previous response and contained exactly the same demographic data and ratings. A three factor ANOVA was used to analyze the hostility ratings in the same way as in Experiment 1. The results of the ANOVA are shown in Table 2.

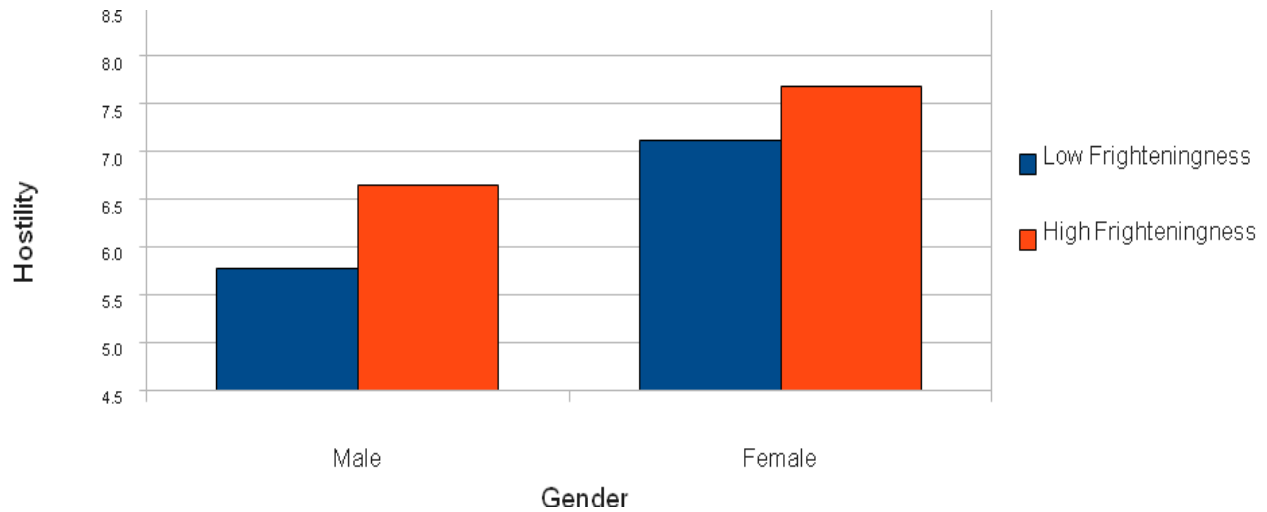
Table 2

Source	SS	df	MS	F	p
Gender	211	1	211.0	10.90	.001
Error (Gender)	25012	1293	19.3		
Frighteningness	256	1	256.0	48.92	<.001
Frighteningness * Gender	60	1	60.0	11.43	.001
Error (Frighteningness)	6757	1293	5.2		
Disgustingness	1401	1	1401.0	308.60	<.001
Disgustingness * Gender	55	1	55.2	12.16	.001
Error (Disgustingness)	5872	1293	4.5		
Fright'ness * Disgust'ness	410	1	410.0	100.57	<.001
Fright'ness* Disgust'ness * Gender	18	1	18.0	4.31	.038
Error (Fright'ness * Disgust'ness)	5265	1293	4.1		

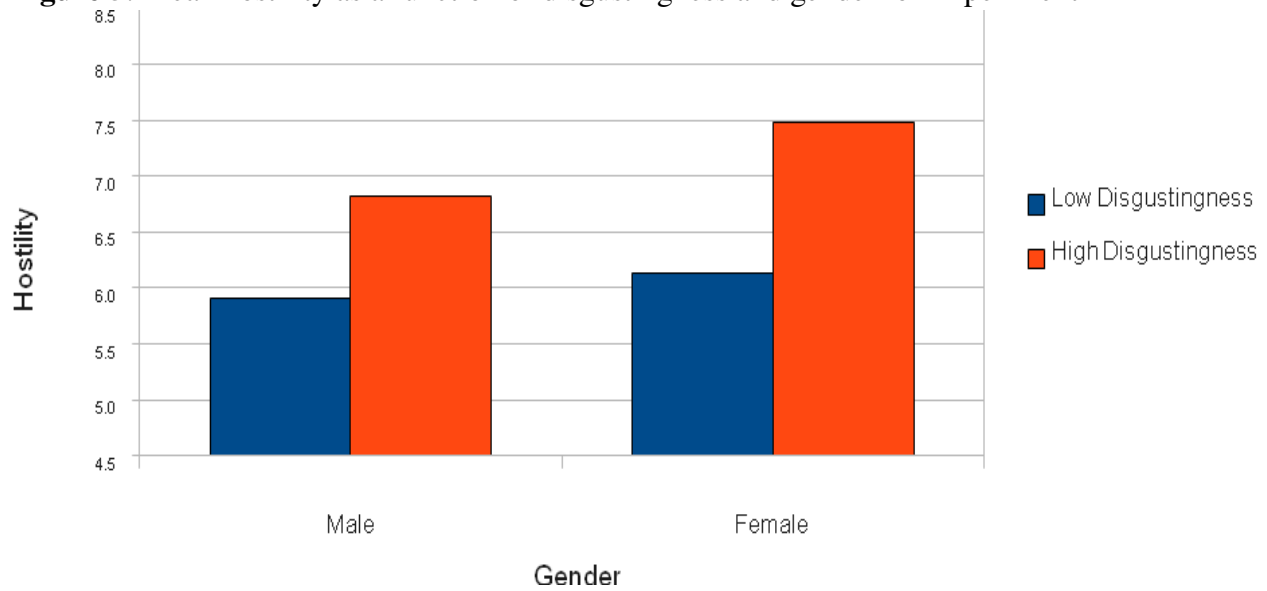


As in Experiment 1 there were main effects of frighteningness, disgustingness and gender. The females gave higher hostility ratings ( $M= 6.80$ ,  $S.E.= .073$ ) than the males ( $M=6.37$ ,  $S.E.=.110$ ). The high frightening insects received higher hostility ratings ( $M=6.83$ ,  $S.E.= .076$ ) than the low frightening insects ( $M=6.34$ ,  $S.E.= .073$ ). The high disgusting insects received higher hostility ratings ( $M=7.15$ ,  $S.E.= .070$ ) than the low disgusting insects ( $M=6.02$ ,  $S.E.= .077$ ). Gender interacted with frighteningness, with disgustingness and with frighteningness by disgustingness. As shown in figures 4, 5 and 6, the patterns of these interactions in Experiment 2 were the same as in Experiment 1, but they were all statistically significant.

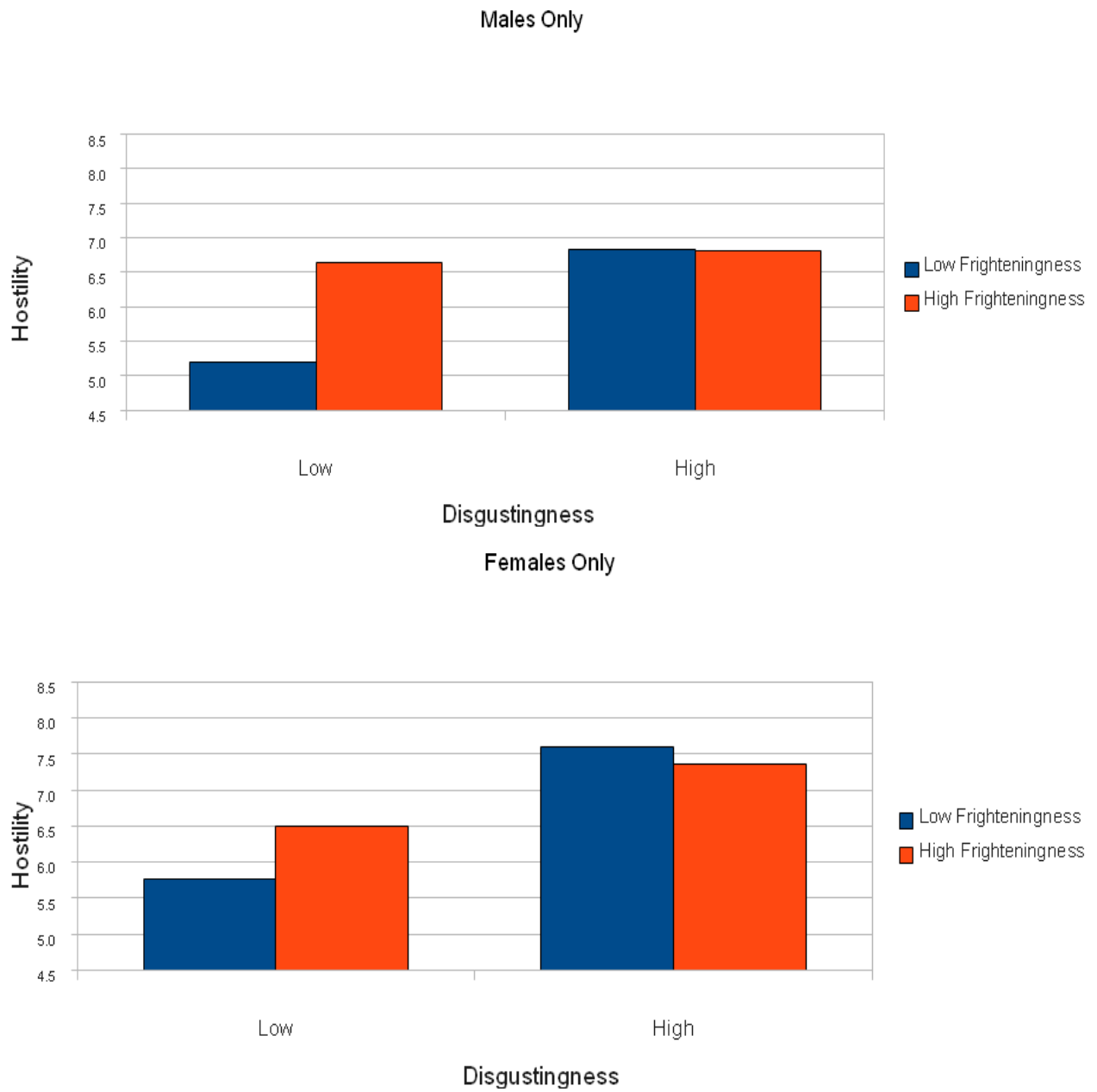
**Figure 4:** Mean hostility as a function of frighteningness and gender for Experiment 2



**Figure 5:** Mean hostility as a function of disgustingness and gender for Experiment 2



**Figure 6:** Mean hostility as a function of gender, frighteningness and disgustingness for Experiment 2



## Discussion

The comparison of the results from our lab and web experiments confirmed our hypotheses about web versus lab research. Our comparison of experimental studies mirrored the comparisons of the many studies that were not experimental (see Lewis et al, 2009; Gosling et al, 2004). Despite the stricter controls required of research that is experimental in nature, we still found an unsupervised web-based study to produce results similar to those from a supervised lab study.

We do acknowledge, however, that many of the disadvantages of web research were not applicable to our study and therefore did not pose any problem for our comparison. For example, the problem of increased dropout rate proposed by Birnbaum (2004) was avoided in our study. In order for dropout to be a problem, the study must be composed of at least two separate parts, between which the participants have the opportunity to dropout. Our study, however, consisted of only one part, and, as long as the participant completed the study, dropout was impossible. Another potential disadvantage of web research could be ethical issues (Hewson, 2003; Skitka & Sargis, 2006). Again, however, informed consent was not a problem in our study because the first page of the website was the informed consent. By clicking submit, the participant was agreeing to the terms of the experiment and “signing” the informed consent. Our Institutional Review Board approved our obtaining informed consent in this way.

Another focus of our study was to explore the idea of whether data from traditional lab research and web research are only equivalent, or whether internet research can be superior. According to Lewis et al (2009) these two types of data are of equal quality, and our results supported this conclusion. In addition, however, our results show that data obtained from web research are not only equal to, but superior to those obtained from traditional lab studies. Despite the lack of experimenter control, our web study, with its greater power, showed significant interaction effects where the lab study only showed patterns that did not reach significance.

A possible limitation of our study could be that we obtained a sample that is not representative of the general population. Although our web based study had participant entries from all over the world, there is a societal difference between those who use the internet and those who do not; this problem is referred to as the digital divide (Lewis et al, 2009). An issue that is particularly pertinent to this study is the fact that our study consisted mainly of college students. Our web study was posted on the Hanover College website and it is likely that the vast majority of people who visited this site were university students. Although web-based studies are not entirely representative of the general population, they are still much more diverse than lab based studies (Lewis et al, 2009; McGraw, Tew & Williams, 2000).

Overall, we must conclude that this relatively new field of internet based research is a promising one. For the most part, any disadvantages can be kept to a minimum, and those that cannot are certainly outweighed by the potential advantages that this method can offer. The increased power of a web study enables researchers to provide evidence for subtle effects that are only suggested by trends in a smaller study, and the lack of supervision does not change the direction of effects or hide them with excess variability in the data.

## References

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