


2015

A cruel angel's thesis: a quantitative study of online privacy values dependent on social factors

Arielle Elyse Czalbowski
Iowa State University

Follow this and additional works at: <https://lib.dr.iastate.edu/etd>

 Part of the [Computer Engineering Commons](#), and the [Databases and Information Systems Commons](#)

Recommended Citation

Czalbowski, Arielle Elyse, "A cruel angel's thesis: a quantitative study of online privacy values dependent on social factors" (2015).
Graduate Theses and Dissertations. 14758.
<https://lib.dr.iastate.edu/etd/14758>

This Thesis is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

**A cruel angel's thesis: A quantitative study of online privacy values
dependent on social factors**

by

Arielle Elyse Czalbowski

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE

Major: Computer Engineering

Program of Study Committee:
Doug Jacobson, Major Professor
Joseph Zambreno
Tien Nguyen

Iowa State University

Ames, Iowa

2015

Copyright © Arielle Elyse Czalbowski, 2015. All rights reserved.

DEDICATION

I would like to dedicate this paper to my mother, Jeanette, and my father, Ron, for encouraging me throughout my college career and being there for me whenever I needed. Without their support in the way of encouragement, financial assistance, and advice, I would have had a much more difficult time making it through college. I'd like to give special thanks to my mother for taking enormous amounts of time out of her day to look over my thesis and give me feedback.

I would also like to dedicate this paper to my friends for supporting me throughout difficult times in graduate school. There are too many people to name, but I'd like to give special thanks to Meg Huss and Margaret Julien for taking care of me at their own expense when I really needed a shoulder to lean on. I'll love you both until the earth shrivels up, and then I will continue to bother each of you in the afterlife.

TABLE OF CONTENTS

	Page
DEDICATION	ii
ACKNOWLEDGEMENTS	iv
ABSTRACT	v
CHAPTER 1. INTRODUCTION	1
Computer and Internet Privacy	1
Social Factors	4
CHAPTER 2. RESEARCH METHODOLOGY	6
Gathering of Survey Responses	6
Survey Distribution	7
Result Aggregation	8
CHAPTER 3. RESEARCH RESULTS	10
Introduction	10
Number of Participants per Group	10
Correlation Graphs	22
CHAPTER 4. CONCLUSIONS	56
General Conclusions	56
Future Considerations	58
REFERENCES	60
APPENDIX A: SURVEY RESULTS	61
APPENDIX B: INSTITUTIONAL REVIEW BOARD APPROVAL	62

ACKNOWLEDGEMENTS

This thesis would not have been possible without the help of a number of people.

I would like to thank my committee for giving me guidance in writing my thesis and always lending support when I needed it. Without Dr. Jacobson, Dr. Zambreno, and Dr. Nguyen, I wouldn't have had any idea how to conduct my research, structure my thesis, or aggregate my data. This never would have been possible without the talented professors on my committee.

I would also like to thank everybody who shared and promoted my thesis to their friends, family, and strangers so that I could gather the much-needed data. Whenever I requested that people take and share the survey, they were always so receptive to my cause and helped me to the best of their ability, both across various social media and by word of mouth. I never could have possibly gotten the number and variety of results that I've gotten without everyone's help.

Next, I would like to thank my parents, Jeanette and Ron, for giving me a quiet place to work on my thesis and supporting me through graduate school. It would have been much harder for me to get through graduate school without their love and support, and I never could have gotten my thesis started if I hadn't had a quiet place in their house to start my work.

Finally, I would like to thank my dog Ursa and my cat Scheherazade for repeatedly attempting to erase my data on my whiteboard. I never would have had the joy of rewriting my data over and over without them.

ABSTRACT

Online privacy is an idea that is difficult to quantify, and simply asking people how they feel about their privacy often yields answers that are vague at best and do not give an overall look into how people view their own privacy or security online, much less a way to quantify it. The purpose of this study was to find a way to quantify how different societal factors may have an effect on computer and internet privacy. Five social factors were compared against seven privacy factors in order to determine if there was any correlation between them.

To meet this requirement, a survey was created and sent out to individuals who were also asked to share the survey. The survey stayed open for approximately six months before it was closed and the results were aggregated, and then graphs were created in order to examine the results of the survey.

There were a total of 464 active participants, and their responses were aggregated into graphs. After examination of the graphs, it would appear that while there is not a correlation between every social factor and privacy aspect, there are some aspects that have a definite correlation. In addition, there were some social factors that had larger tendencies to produce strong correlations than others. Likewise, there were some privacy factors that tended to produce stronger correlations than others.

Overall, future research considerations could include finding the mean and median of how people view privacy, looking into specific social media items, and finally, determining whether any of the correlations that were found have causations behind them.

CHAPTER 1. INTRODUCTION

Before beginning this paper, the author would like to note that the formation of data, all studies, and all work was done independently without referencing past work. However, some related work has been done in the past, and references to these papers may be found in the References section.

Computer and Internet Privacy

It may be fair to say that most people in this day and age who have access to an Internet-compatible device have also accessed the Internet, and this gigantic network has provided these people with more information than could ever be consumed in a lifetime, products that can be shipped around the world, and places to express personal thoughts and feelings. However, given the number of people on the Internet, not everybody is out for goodwill.

There are a number of people who wish ill will on others, either for personal gain or just for fun. Some of these attacks, such as viruses, can be stopped by computer software such as an antivirus program. Others, however, require knowledge of what one is looking at. An example of this is a phishing attack, wherein an attacker masquerades as a trustworthy website (for example, a bank or a popular social media website) and tricks the user into giving out sensitive information in order to access their accounts.

Some of these attacks certainly invade a user's privacy by stealing information such as credit card numbers. There are even innocuous games that float around the

social media networking website Facebook that tell a user to enter his/her birthday and mother's maiden name to find out the name of their band! However, something equally seemingly innocuous at first can easily be used to answer password reset questions and enter into an account.

Of course, there are also invasions of privacy that have nothing to do with stealing a user's personal data. There are dating websites and hookup websites that encourage users to meet each other offline, and there are those who find others on unrelated websites, such as forums and strangers on Facebook, wherein people decide to meet up with each other online. Of course, it would seem that at least one user would be comfortable with meeting up, and there are a number of people who have success stories with people that they met online first, and then in the real world, and formed true, genuine bonds.

However, there are also horror stories of people meeting others who are not who they claimed to be. With the best-case scenario being disappointment and the worst-case scenarios ranging from being robbed to being murdered, news outlets and other websites have run multiple news stories in the past warning against the dangers of meeting up with people whom they'd met online. It would seem that no matter how many phone calls, face-to-face video chats, and years people have known each other, one can never truly know another's intentions.

Security in itself is a very esoteric concept in everyday vernacular; generally, when one is asked about their security, it is difficult to quantify. It is not uncommon to list of the number of programs that the user runs to protect their system, which operating system they are using, the level of protection they tend to use to protect their

passwords, or the types of information that they would 'never give out'. This makes it very difficult to quantify how security is viewed. Security cannot necessarily be given a value by how many programs a person runs, and while passwords follow some general guidelines as to types that are stronger and types that are weaker, in some cases it is even left up to debate whether a password is strong or not.

Part of this study intends to quantify security values by asking people surveyed on a value that can be put into words (for example, not very likely, to extremely likely), or that can correspond to numbers (such as one to five); then a measure of quantification can be put to security. In order to help quantify security, users were asked the following questions with the following possible responses in parentheses, which are separated by commas. The answers are ordered from the values that would be considered the most (could be considered 5/5) to the least (could be considered 1/5):

- I. What do you consider your proficiency with computers to be? (Far above average, above average, average, below average, far below average)
- II. How much do you value your privacy? (Utmost importance, a lot, somewhat, a little bit, not at all)
- III. Have you ever lied about your age online to protect your privacy? (Did not share to protect privacy, yes, no)
- IV. Have you ever lied about your gender online to protect your privacy? (Did not share to protect privacy, yes no)

There were other questions asked that, while not directly addressing privacy, fell into this category due to potential ties between social factors and privacy. These questions are as follows, with potential answers formatted the same as above:

- V. How much time do you spend with people offline [The question was clarified in subheader that this time was time spent recreationally, and not time required to be offline, such as time spent at work or for projects]?
(More than 15 hours per week, 12-15 hours per week, 9-12 hours per week, 6-9 hours per week, 3-6 hours per week, less than 3 hours per week)
- VI. To what extent are you more open to people online than offline? (A lot, somewhat, a little bit, the same, not at all)
- VII. Do you use services to interact with other people online? (Yes, no)

Social Factors

There are a number of societal factors which may impact a person's privacy online, and these factors were a large part of the study when considering whether a person may or may not be willing to share more information online. For the purpose of this study, societal factors are considered to be specific aspects that make up a person or that a person might possess. Examples include things that cannot be changed, such as age, and things that can be changed, such as relationship status.

The purpose of including these in the study stems from the fact that not everybody in society is equal, and everyone may come from a different background, and these different backgrounds may have an influence on how people feel about privacy and how they implement it in their day-to-day lives.

There are an extraordinary amount of different societal factors that make up the whole of a person, and considering every single possible factor, even if each could be determined, would be a colossal task. Therefore, in this study, five questions were

asked that fell into the realm of societal factors. These societal factors were not quantified, but instead represented various categories of people who were taking the survey. The main purpose of this category was to serve as a factor with which to compare against other items and determine whether or not a correlation could be reached. The questions are listed below with possible answers in parentheses. Each answer listed in the order that it appeared on the survey:

- I. What is your age range? (18-24, 25-30, 31-35, 35-40, 41-50, over 50)
- II. What is your gender? (Male, female, transgender, other, prefer not to say)
- III. What is your relationship status? (Single, in a relationship, engaged, married / in a domestic partnership, divorced, widowed)
- IV. What is the highest level of education you have received? (Below high school, high school, attending college / trade school, finished college / trade school, Master's degree, Ph.D.)
- V. To what extent do you consider yourself to be an introvert or an extrovert? (Mostly introverted, somewhat introverted, somewhere in-between, somewhat extroverted, mostly extroverted)

CHAPTER 2. RESEARCH METHODOLOGY

Gathering of Survey Responses

In order to begin performing my research, I had to come up with a number of questions that would ensure some sort of quantification against different responses about privacy that an individual might have. Since quantification was the main purpose, being able to scale the data was a necessity. Although social data did not seem as though it would be easily translatable into numbers, it did seem easy to quantify different aspects of privacy. Therefore, questions concerning computer privacy were placed on a scale that allowed numerical data to be drawn from them.

An example of this data concerns the question of how open people are online. The question asked participants whether they are more open online than offline, and allowed users to choose a response of: A lot, Somewhat, A little bit, The same, or Not at all. The purpose of this was that, in chronological order, each response could be numbered from five to one, indicating that the greater the number, the more likely the user is to share information with people online, versus whether they were more protective of their data. Combining this with, for example, an age range, would allow for simple calculation of the mean and median of the feelings of certain age groups for a security question.

There was an addition component to the survey that can be seen in Appendix A in which users were asked whether they used common social media, also referred to in this thesis as interactive online media, and how they felt about giving out their information on the media as well as offline. This data was not used for this thesis, but could provide

the grounds for future research on how different groups of people value their privacy across various social media and to what extent individuals possessing certain societal factors act differently online versus offline.

As it stands, research was gathered and aggregated onto a percentage value graph to show the percentage of the surveyed population that felt a certain way about their privacy online. The resulting graphs and possible conclusions about them can be seen in Section 3 of this paper.

Survey Distribution

After the initial questions were written and the survey approved by Iowa State University's Institutional Review Board under ID #15-255 (Appendix B), the survey was made digital via Google Forms provided by Iowa State University. The survey was purely digital, and no paper copies were distributed.

The main methods that the author herself used to spread the survey was through Facebook, a popular social media website used to connect with friends, and Tumblr, another popular social media website in which users can create posts and others can reblog these posts, meaning that they put the original post onto their own blog (sometimes with commentary). Much like the media site Twitter and its hashtags that allow users to find other users talking about the same thing, Tumblr offers tags that allow users to make their posts searchable by the specific tag. Posts can also be searched for by the text within them; however, the Tumblr community tends to rely highly on tags for a number of things, including searching for posts that they would find relevant.

The author posted the survey to her personal Facebook multiple times and had it shared to collect data, but it would seem that the majority of the data came from Tumblr. The author's post was reblogged hundreds of times, which got the survey out to numerous people. Reblogging a post, in addition to putting it on the user's blog, allows users who are following the blog to view it, since whenever a user follows a blog, all new posts from that blog appear on the user's home page. Therefore, the original post containing the survey link was able to get out to a massive audience. However, due to the sheer number of posts that likely came from Tumblr, there may be a slight bias in the survey.

Finally, some data was collected by sending the survey out to students in Computer Engineering via the Iowa State University mailing list. This allowed for students in the field to answer the survey and get information from the college of which this thesis is originating. This may have skewed the data somewhat since one would expect a student in the college of computer engineering to be at least somewhat proficient at privacy and computers, but on the other hand, it may have evened out the results from other mediums.

Result Aggregation

All told, there were 466 people who took the survey. However, two of these results had to be discarded. The very first question in the survey asked whether the user agreed to the survey or declined to take it, and if the user declined to take it, they were lead to the end of the survey and their response was still recorded, but without any

of the questions that were directly relevant to the research being answered. Therefore, these two results were deleted from the aggregation of the data.

The only questions that users were required to answer were whether they agreed to take the survey, whether they used social media and, if they answered yes to that, whether they'd used each social media represented in the survey. Therefore, this left some blanks in the survey where some users chose not to answer questions. These blanks were ultimately represented as N/A and were still considered while graphing the data and comparing it against either social factors or computer privacy questions. Although the numbers per graph where people did not answer were few, there were very few cases in which two blank answers were put together. Therefore, even though some information was missing, another aspect of the question was answered. While the numbers polled were too few to come to a probable correlation, the results could lead to possible postulation as to why the user chose not to answer that specific question. Unfortunately, whether or not a participant chose to answer a question, sometimes it was true that there was too little data to make a definitive conclusion of a correlation. However, enough people answered that some data could be gleaned from each graph.

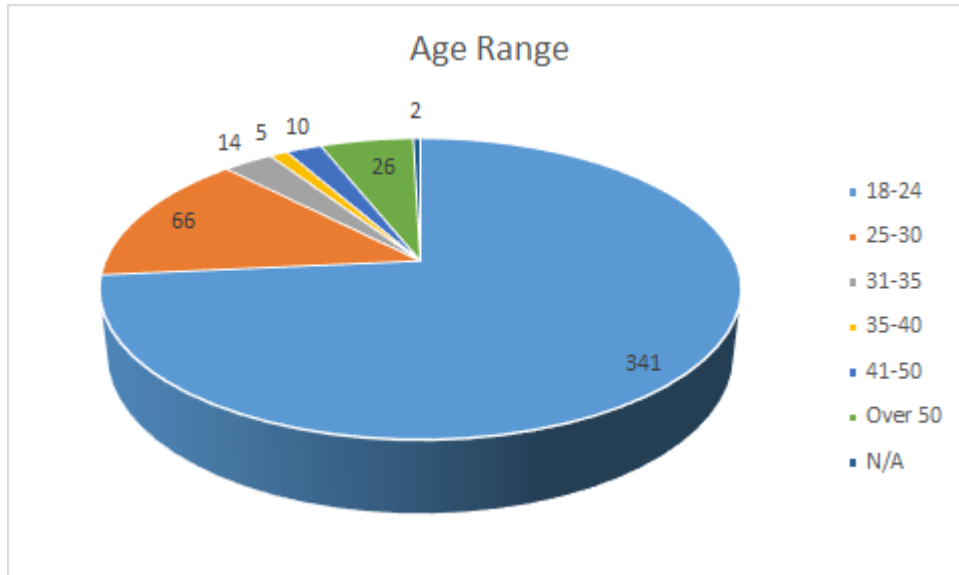
CHAPTER 3. RESEARCH RESULTS

Introduction

The results of the survey as well as postulations about the given results are henceforth detailed in this chapter. It is very important to note that these graphs only represent correlation, and it cannot be certain as to whether there is any causation between the two variables. It is possible that if this research is expanded upon, some causations may be found, but only possible reasons for correlation will be noted.

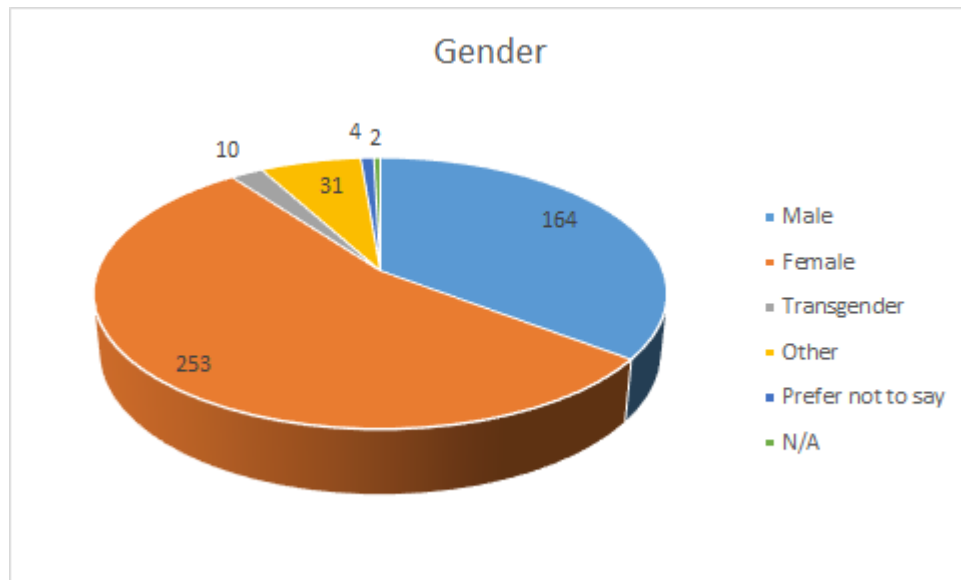
Number of Participants per Group

As previously stated, there were twelve items tested: five societal factors and seven computer security questions. The breakdown of each are as follows:



(Figure 1. A pie chart showing the age range of all respondents.)

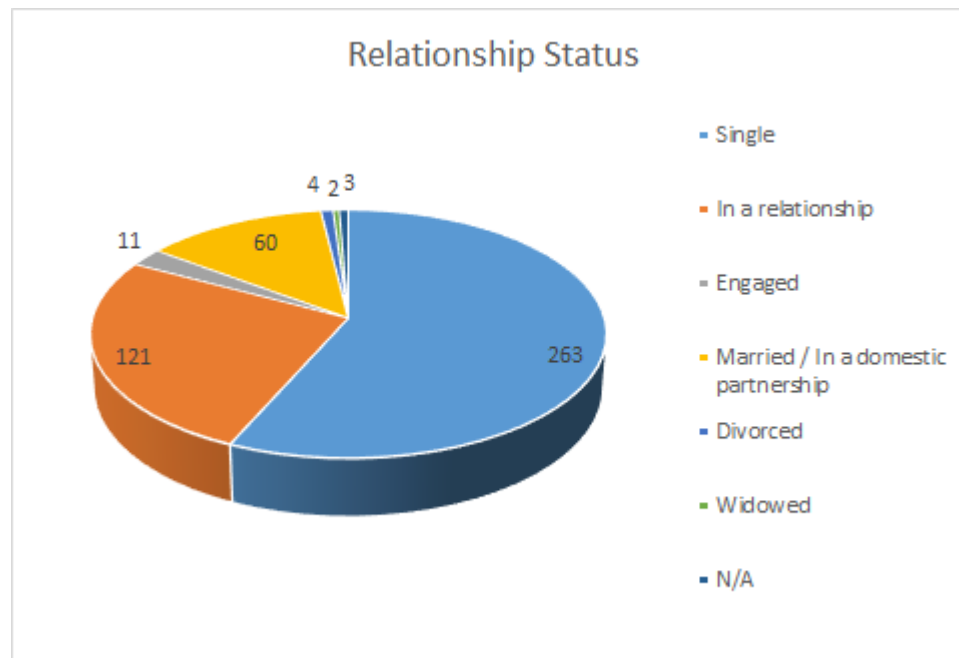
As can be seen by this graph, an overwhelming amount of the surveyed population was in the 18-24 age range, and this certainly skewed data somewhat to privacy trends toward this age group as opposed to any other. Besides those who didn't answer, the smallest age respondent group was in the 35-40 range with only five respondents, and this study may not be considered a plausible indication of the habits of this age group.



(Figure 2. A pie chart showing the genders of all respondents.)

Although there were approximately 1 1/2 times the number of female respondents as opposed to male respondents, those who considered themselves to be male and female made up the majority of those surveyed. Beyond those who preferred not to say and did not answer, the smallest number here were individuals who identified as transgender, and this study may not be considered a plausible indication of the habits of

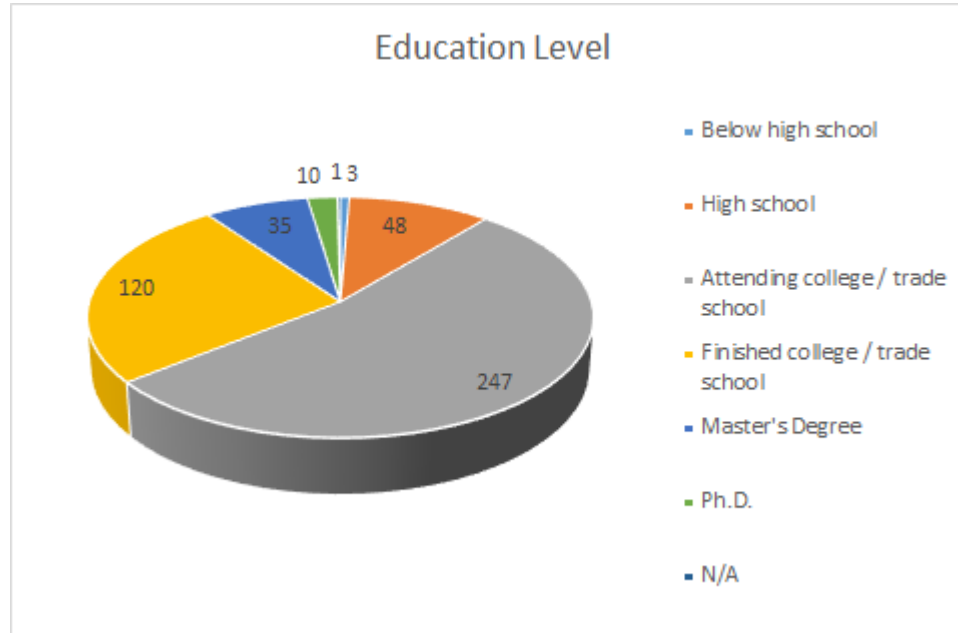
this group. Interestingly, almost 7% of respondents identified in the other category, meaning that 31 of the people who took the survey identified as a gender not listed, such as agender, genderfluid, or any one of the numerous genders that exist. While this provides interesting data for those with marginalized genders, there are countless possible genders that could fall under this answer, and the correlations given do not represent one single gender. Unfortunately, this provides some difficulty in coming to distinct conclusions about this group.



(Figure 3. A pie chart showing the relationship status of all respondents.)

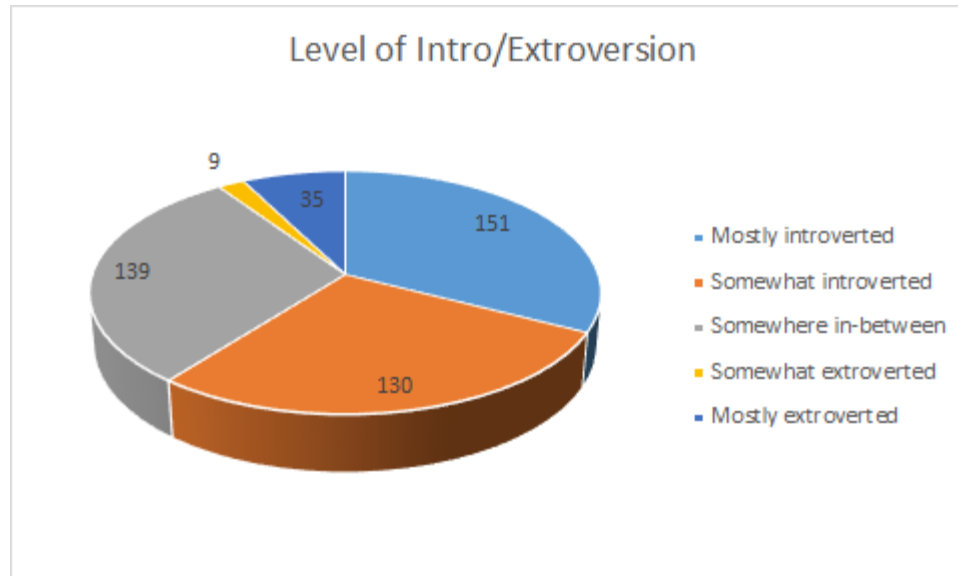
Of those who took this survey, the relationship status of the participants was overwhelmingly single, with a large follow-up by those who are in a relationship. Beyond those who didn't answer, a very small population of those

engaged, divorced, and widowed was collected, and therefore data presented on this group may not represent the entire population.



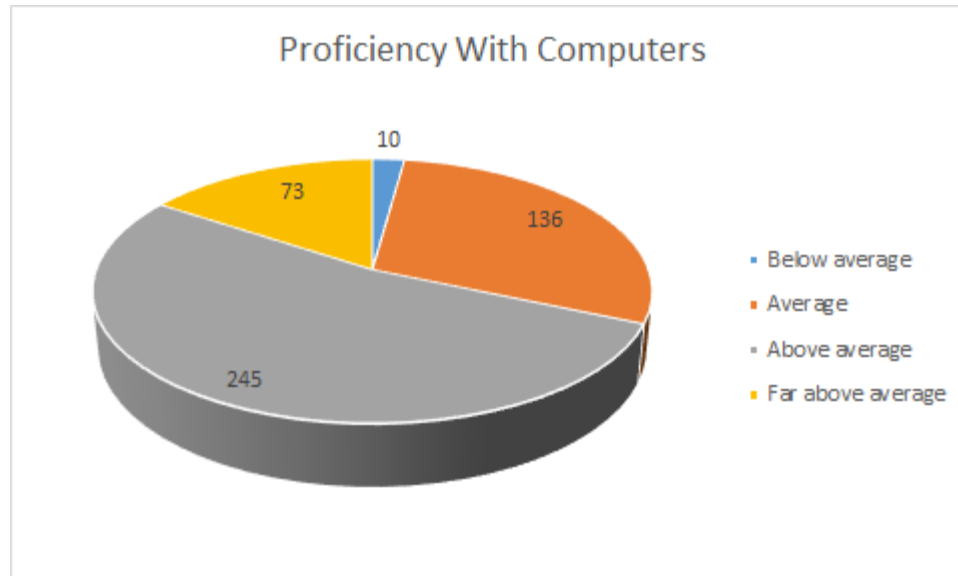
(Figure 4. A pie chart showing the education level of all respondents.)

Approximately half of the respondents of the survey are either attending college or trade school, and another large portion have finished. This, of course, aligns with the age group collected. The smallest group collected was for those who have finished below high school, which comprises of only one person, and certainly cannot be considered a representative opinion of the group. Similar sentiments can be expressed for those with a Ph.D. and a Master's degree, although their responses were a bit higher.



(Figure 5. A pie chart showing the levels of introversion and extroversion of all respondents.)

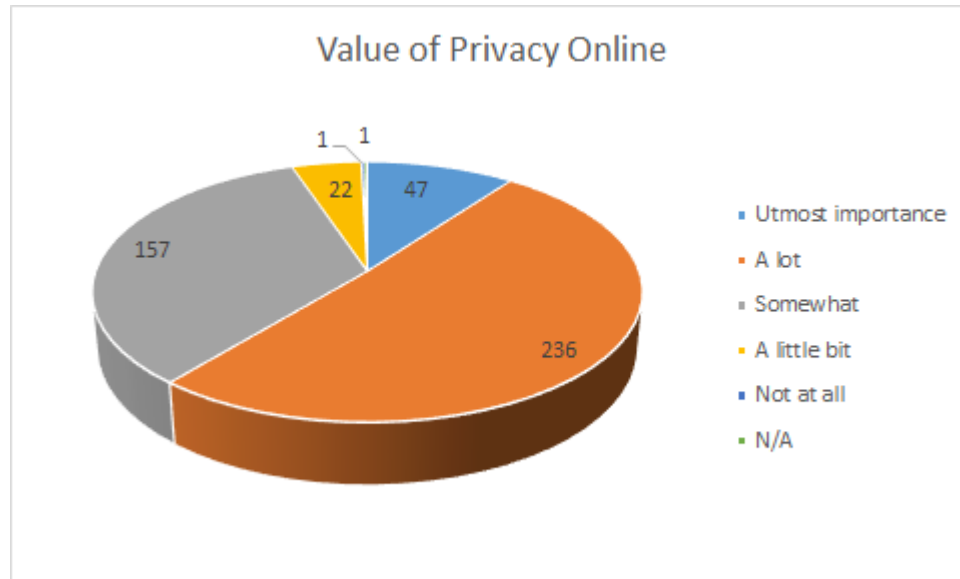
Interestingly enough, the survey is split fairly evenly among those ranging from the very introverted to those who feel they are a balance of introvert and extrovert. Additionally, those who were mostly extroverted provided a higher number than those who were somewhat extroverted by almost four times. Since only nine respondents answered to being somewhat extroverted, correlations from this group may not be considered a population representative.



(Figure 6. A pie chart showing the perceived proficiency with computers of all respondents.)

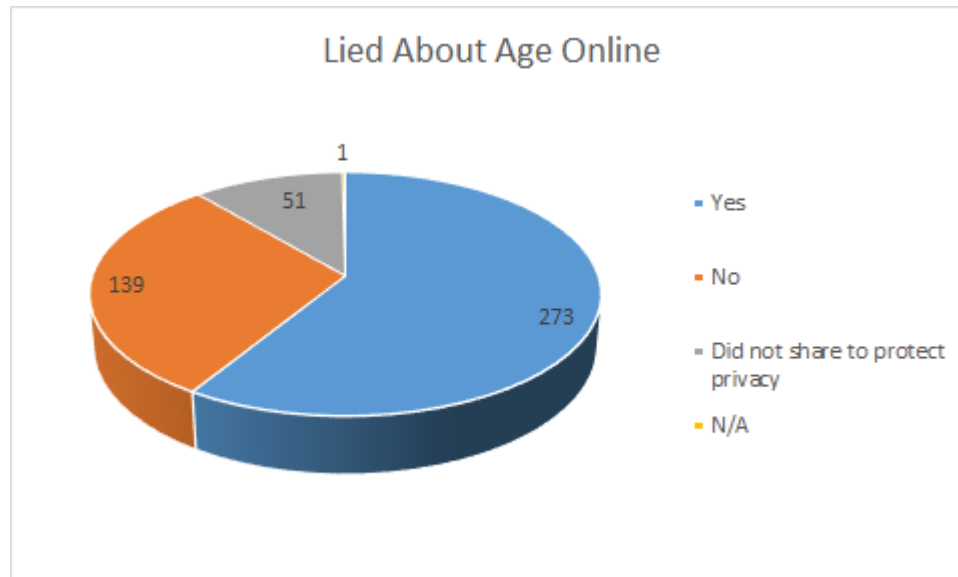
The graph that asks addresses proficiency with computers is very interesting. Although a fair number considered themselves far above average and a sizeable portion considered themselves average, over half of the respondents considered themselves above average. Of course, half of a population cannot be above average, which leads to a number of possible explanations as to why this is so. One may be that proficiency at computers is relative, and with no set standard for proficiency, these users may in fact be above average compared to those around them, yet more average on the whole. On the other hand, since the survey was only on the computer, it took some level of proficiency to access and complete it, which means that only those who had some proficiency with computers had access to it. While ten people admitted to being below average (and this small number cannot be considered a population representative), there was a fifth option that nobody picked, which was far below

average. Possible reasons why nobody picked this are the same as the possible reasons that over half of the population considers themselves above average at computers, as stated above.



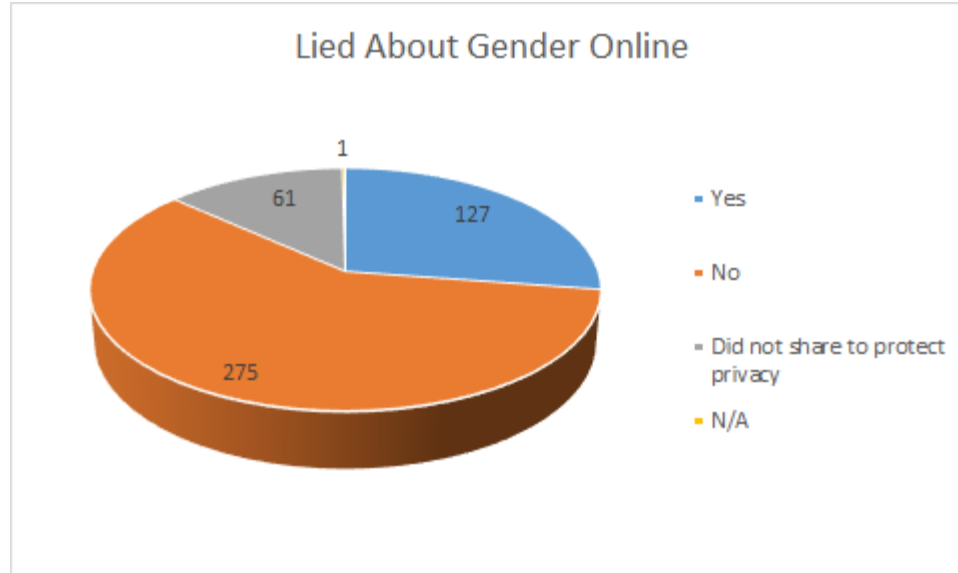
(Figure 7. A pie chart showing the perceived personal value of privacy online of all respondents.)

The graph of the value of privacy online is similar to the above graph of proficiency with computer. Over half of the respondents reported that they valued their privacy a lot, which is above the average answer of somewhat. As previously stated, this could be due to the audience to which the survey was released, or it could be attributed to various definitions of privacy online. In this case, only one person responded that he/she does not at all value his/her privacy, and one person cannot be representative of a population.



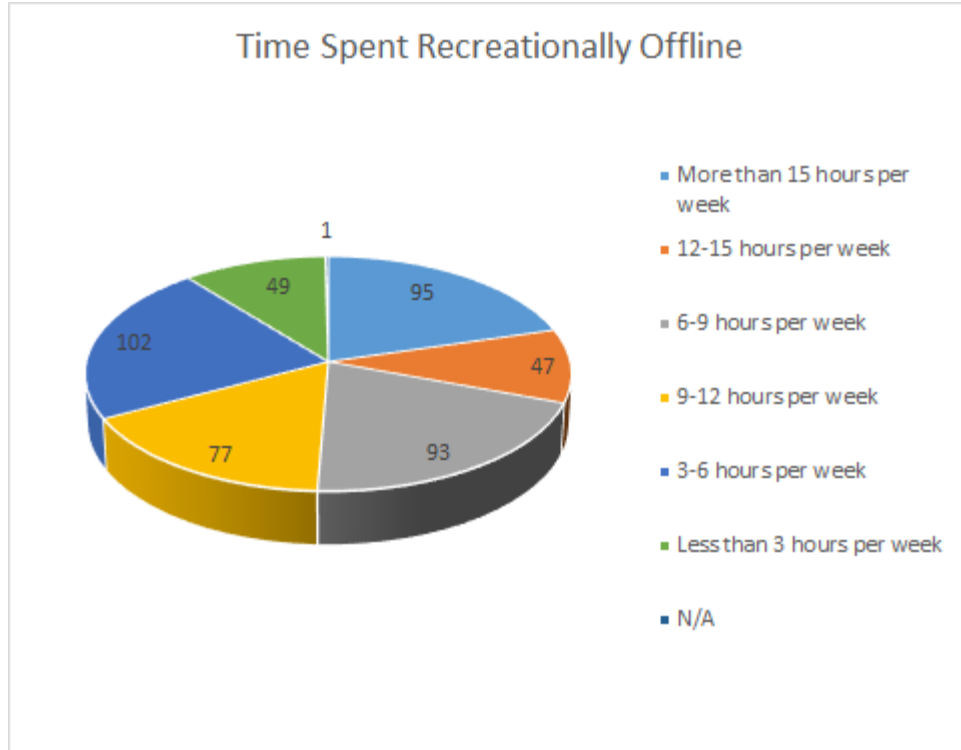
(Figure 8. A pie chart showing the number of people who have lied about their ages online of all respondents.)

Acknowledging just one blank answer, each result on this pie chart had a solid representation of each answer. It is revealed that over half of respondents have lied about their age online at some point and, in addition, approximately 11% refused to share their age online at all in order to protect their privacy. However, a greater percentage shows a population that has not lied about their age.



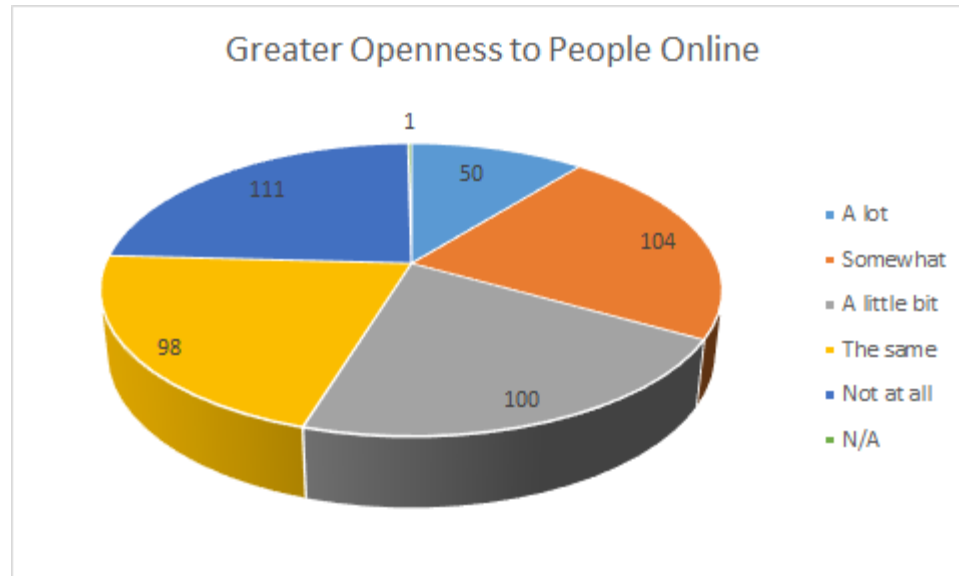
(Figure 9. A pie chart showing the number of people who have lied about their genders online of all respondents.)

With a very similar breakdown to the graph above, aside from the person who did not provide an answer, this chart shows a visible population for each group. While over half of respondents have not lied about their gender online, there are still a sizeable portion who have and, although smaller, approximately 13% have chosen not to share their gender in the first place in order to protect their privacy. While the majority of the chart did not lie, the other two pieces put together indicate that lying about gender online is still a major trend.



(Figure 10. A pie chart showing the estimated amount of time spent offline of all respondents.)

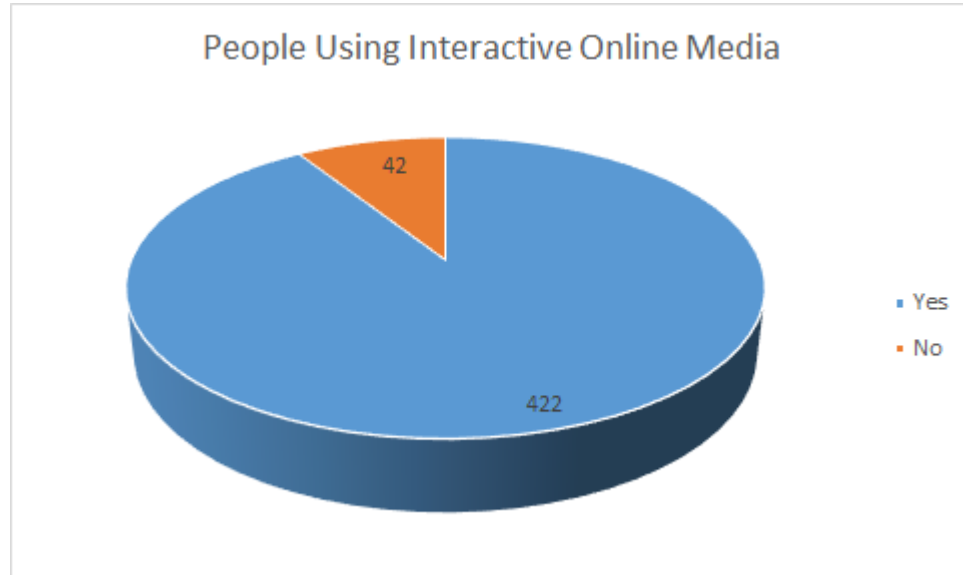
In regards to time spent recreationally offline, this chart shows a fairly even breakdown between all categories except for the one non-respondent. Of course, some categories in the chart are larger than others. For instance, the majority of respondents spend more than 15 hours per week offline recreationally. The second lowest response by a little more than half belongs to those who spend less than three hours per week offline recreationally, which then discounts the non-answer. Regardless, it seems that time spent recreationally offline is split more evenly than other charts representing other aspects studied.



(Figure 11. A pie chart showing perceived level to which one is more open to people online than offline of all respondents.)

The chart that studies whether others are more open to people online has revealed some interesting results. Disregarding the missing answer, four of the five possible answers had approximately 100 people respond to them. In spite of small numerical disparities, these can be considered more or less even. However, the population that considered themselves a lot more open to people online than offline was approximately half of the rest of the possible answers. It is interesting to think why this could be; perhaps there are different definitions of openness, and people did not consider themselves on the extreme end of sharing information with those they have only met online. On the other hand, perhaps those taking this survey guarded their privacy such as to not open themselves up too much to strangers. Yet another possibility lies in all the warnings given about being too open online, and there is not a

large population who would consider themselves to completely ignore that warning and completely open themselves up.

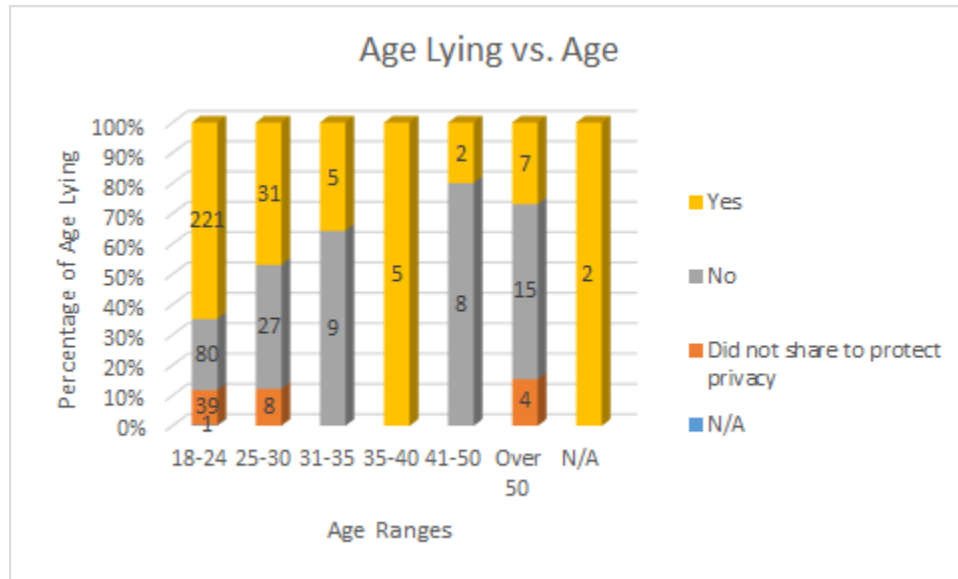


(Figure 12. A pie chart showing the reported level of people who use interactive online media (a.k.a. social media) of all respondents.)

As this graph clearly shows, the large majority of respondents do use some form of interactive media, whether it be e-mail, forums, chat rooms, or famous social media websites such as Twitter, Pinterest, Facebook, or others. A much smaller percentage claimed that they did not use any form of social media. While it might be hard to imagine how those who answered ‘no’ had access to the survey, there are a number of ways that people can take the survey (on another’s computer, for example) without using social media themselves. However, there is also a possibility that this question was misunderstood in some way, due to the prevalence of interactive media in

contemporary society. For example, E-mail addresses are so prevalent that it is hard to imagine that approximately 9% of the people who took the survey do not use e-mail to communicate with others.

Correlation Graphs



(Figure 13. A 100% stacked column depicting the percentage of people who have lied online versus the age range of all respondents.)

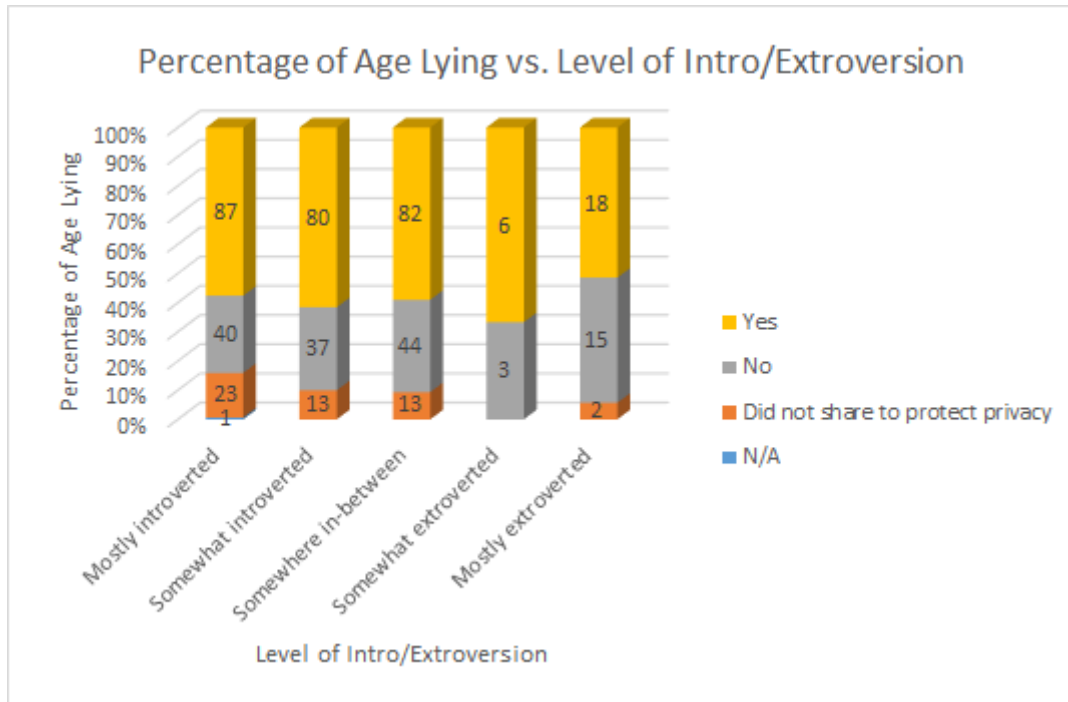
In this graph, there appears to be a correlation between the percentage of people who lie about their age online and the age group that does this. Disregarding the 35-40 age category and its small number of respondents, the graph shows a trend that reveals that the older the age group a person is in, the less likely they are to have lied about their age on the Internet. Additionally, the graph shows that approximately the same

percentage of those in the 18-24, 25-30, and over 50 age groups have not shared their ages in order to protect their privacy.

The reasons for this trend may be numerous. It is possible that those who are younger had lied about their age online when they were under 18 in order to access certain Internet services. Of course, users can lie about being older or being younger. In the case of claiming that one's age is greater than it actually is, as an example, COPPA law requires that individuals be at least 13 years of age to post in an online forum. Those in the younger generation who were affected by COPPA law may have lied about their ages in order to join a forum that they liked. If someone were to lie and claim that they were younger, it could potentially be to fit in socially with a group (for example, a 60-year-old saying that they are 20 to fit in). However, considering the trend that those who have not lied increases as the age group increases, it seems more likely that people who have lied would have done so by claiming to be older than they actually were.

Additionally, there is the case of those who have not shared their age at all. In the case of the younger age groups of 18-24 and 25-30, not sharing one's age could have the benefit of warding off unwanted company. If someone perceived that their younger age could attract a potential predator, not sharing it would be a countermeasure. In regards to the over 50 group admitting to not sharing their age in order to protect their privacy, it could also be to ward off unwanted company (such as those who would target older people with the idea that they are more susceptible to scams). However, each individual has a reason for not sharing their age to protect their privacy, and there could

be more personal reasons why others chose to keep their age a secret in order to protect themselves.

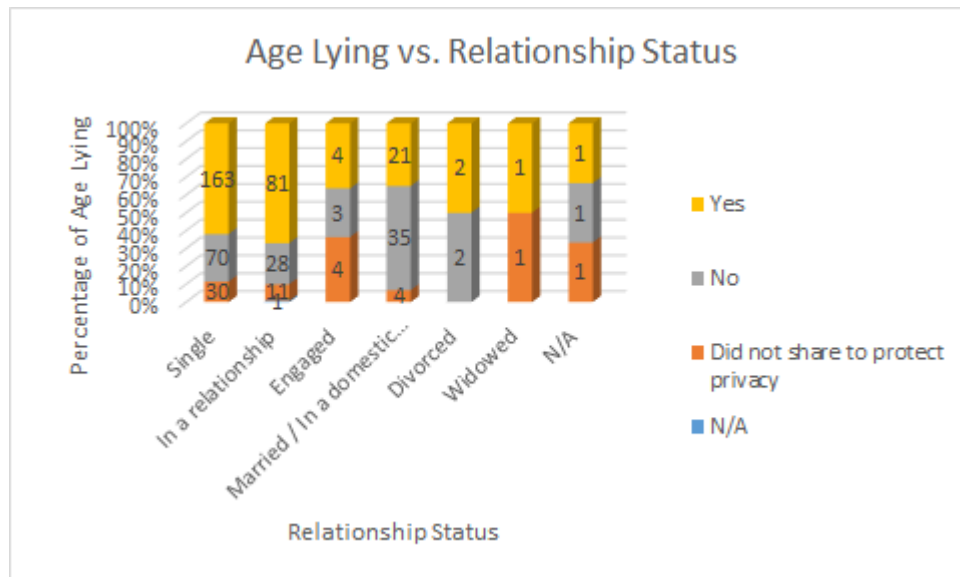


(Figure 14. A 100% stacked column depicting the percentage of people who have lied about their age online versus the level of introversion and extroversion of all respondents.)

As this graph shows, there does not appear to be a strong correlation between introversion and extroversion and whether an individual has lied about their age. There is a slight decrease in lying about age for those who are mostly extroverted, but otherwise, the percentages show a weak correlation in that, regardless of whether

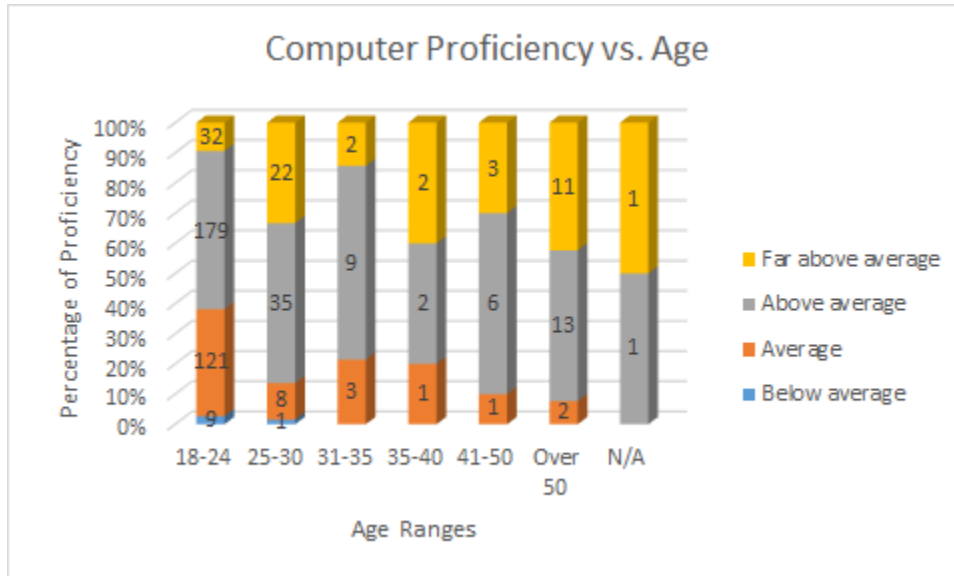
individuals are more or less extroverted, it barely changes whether they have lied or not, with most people responding that they have lied about their age.

There is, however, a slight correlation between those who have not shared their age to protect privacy and due to introversion. Those who are mostly introverted have the highest percentage of not sharing their age to protect their privacy, and this generally slowly decreases as one becomes more and more extroverted. A plausible reason for this is that introverts tend to be more closed off from others, and would therefore be more hesitant to share their age with others, whereas extroverts by definition are more open and may not see as much of a need to protect their age.



(Figure 15. A 100% stacked column depicting the percentage of people who have lied about their age online versus the relationship status of all respondents.)

Interestingly, in this graph, the statistics show that those who are in a relationship are slightly more likely to lie about their age than those who are single, as approximately 62% of those who are single have lied about their age, and approximately 67% of those who are in a relationship have lied about their age. However, this is a weak correlation and, in spite of a sufficient number of respondents in both categories, may change if more data were to be collected. It is difficult to imagine why this is so – perhaps those in a relationship believe that lying about one’s age may ward off any unwanted attention and prevent being propositioned by other interested parties. Additionally, while there is a large amount of people who are single and have lied about their age, the group least likely to lie about their age are those who are married or in a domestic partnership. This points to the possibility that people who are married either correlate with those who are older, as in the graph above, or perhaps because they feel that there is no need to lie to impress or ward off a potential partner. While there is some data for those who are engaged, widowed, and divorced, the numbers are so small and unrepresentative of that particular population of people that it would seem unfair to attempt to draw any sort of conclusion based on current data.



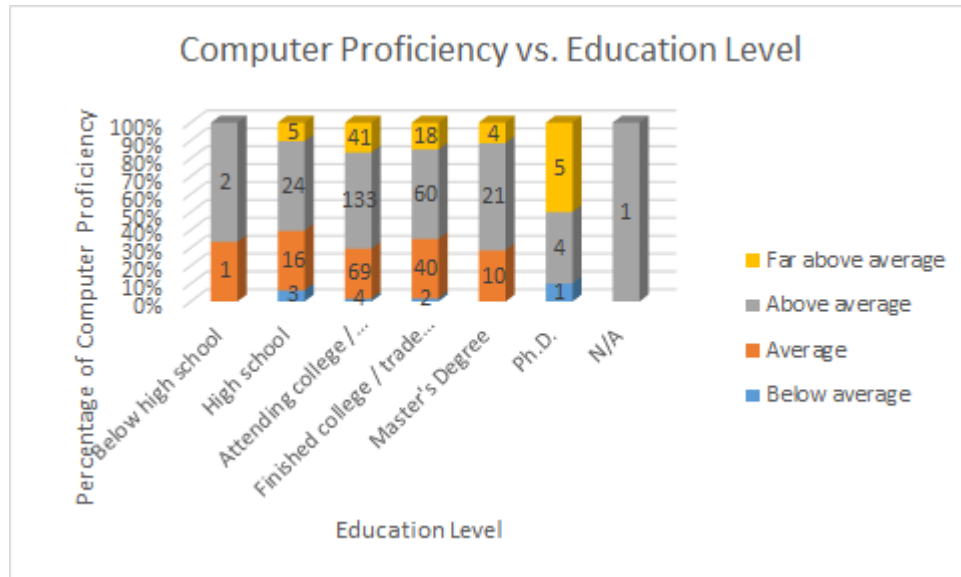
(Figure 16. A 100% stacked column depicting the percentage of reported computer proficiency versus the age range of all respondents.)

This graph is somewhat difficult to interpret. On the one hand, there does not seem to be any correlation between age and those who consider themselves to be far above average or above average with computers. On the other hand, the sample sizes for the older ages are significantly smaller than the younger ages, so there is insufficient data to form a conclusion.

However, there does seem to be a slight correlation between age and those who consider themselves average at computers, in that as age number decreases, it seems that less and less people consider themselves average. On a similar note, there is a slight correlation between age and those who consider themselves below average, as the percentage of people who consider themselves below average decreases as age

increases. This could possibly be because the older people get, the more practice they have had with computers.

Regardless of the slight correlations found, in order to find out if a true correlation exists, much more data for the later age groups would need to be gathered.

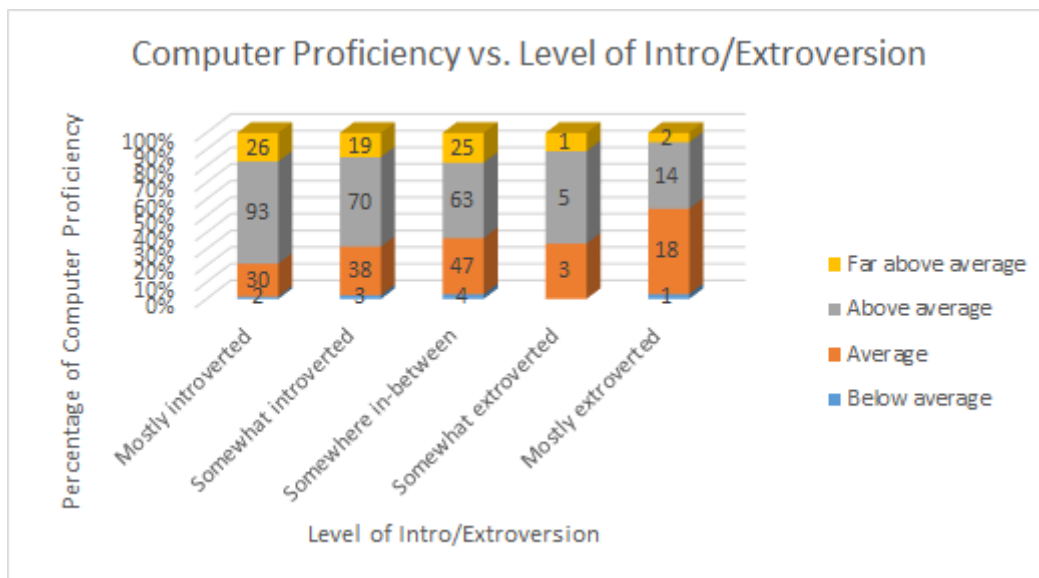


(Figure 17. A 100% stacked column depicting the percentage of reported computer proficiency versus the education level of all respondents.)

Unfortunately, with this graph, there is not enough data from the population who have not completed high school or who have a Ph.D. in order to form proper analysis of those subjects. Nevertheless, there appears to be a correlation between higher education and users considering themselves far above average in terms of their proficiency with computers. There is also a decrease in the number of those who consider themselves below average as formal education increases. However, the

percentage of those who consider themselves to be above average and those who consider themselves to be average appear to remain the same.

This could be because as education level increases, users who are below average might become average, and users who are average may become above average, and so forth up the metaphorical chain of computer knowledge. Therefore, those who lie in the given extremities of far above average and below average change, while the number of average and above average remain approximately the same. It is worth noting again, however, that the fifth option on the survey, far below average, was never picked. Surveying a higher population from outlying groups may add some of this to the data and help create a more complete aggregate of computer proficiency.

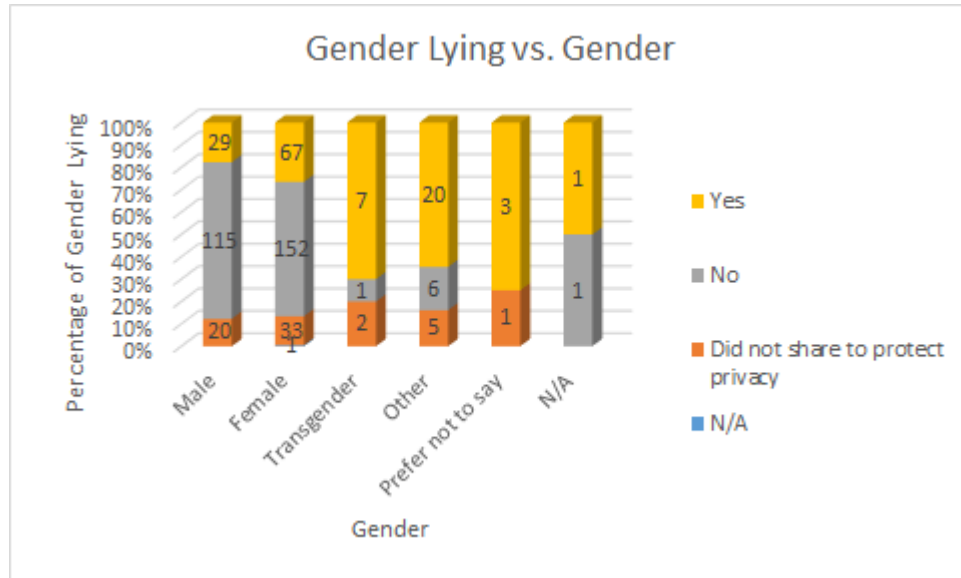


(Figure 18. A 100% stacked column depicting the percentage of reported computer proficiency versus the level of introversion and extroversion of all respondents.)

This graph appears to show a very slight constant correlation between computer proficiency and whether an individual is an introvert or an extrovert. It appears that the more introverted a person is, the more they consider themselves far above average, and the more extroverted a person is, the more average they consider themselves. Although slight, and with insufficient participation from the somewhat extroverted group, this trend seems to apply to each category.

A possible explanation for this result might be that extroverts tend to enjoy talking to people, going out, and by definition, recharge their metaphorical batteries by being around other people. On the other hand, an introvert regains more energy by being alone and taking time to themselves. Although there can be social aspects, being on the computer is generally considered a solitary activity, and therefore one could conjecture that introverts spend more time on the computer than extroverts. Therefore, it is possible that if they spend more time using the computer, introverts will get better at using them than extroverts.

Another possible explanation for this result may be that those who are more introverted prefer solitary activities such as computers. Therefore, those who enjoy computers may go into computer engineering, and a number of people who took the participants were computer engineers. Therefore, those who enjoy a solitary activity would choose a solitary activity, and that would lead to a lifelong passion.

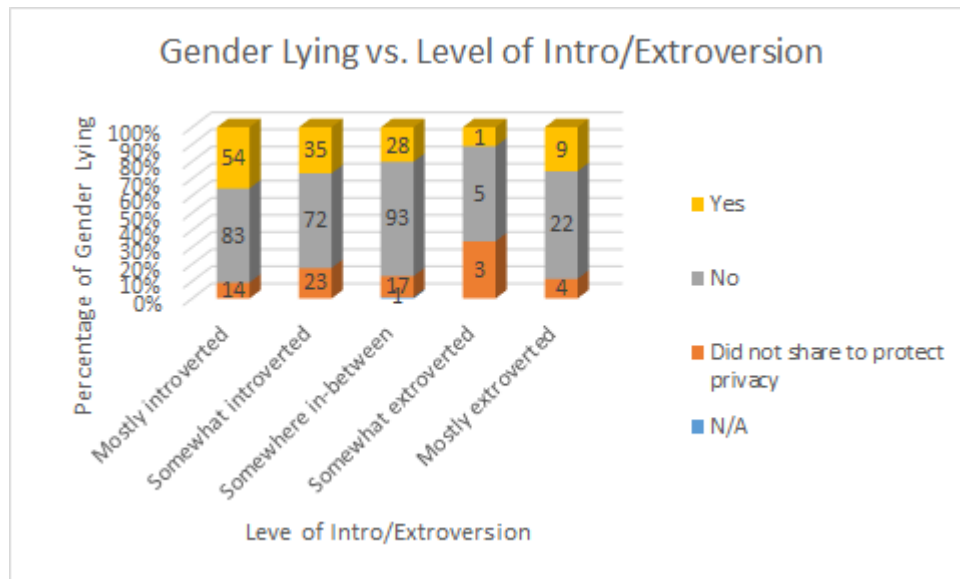


(Figure 19. A 100% stacked column depicting the percentage people who have lied about their gender online versus the genders of all respondents.)

In this graph, those who consider themselves male are shown to lie the least about their gender, while those who consider themselves female lie about their gender a bit more than males do. This could potentially be due to women in online communities not wanting to be harassed online. However, between those who consider themselves male and female, the percentage of those who did not share their gender to protect their privacy is approximately the same.

Even though there is a small amount of data for people who fall under the transgender category, there is an exponential jump of people who have lied about their gender when they fall into the transgender or other categories. This might be most likely because people who are transgender and people who consider themselves to be other genders besides the three provided are in marginalized gender groups, and being

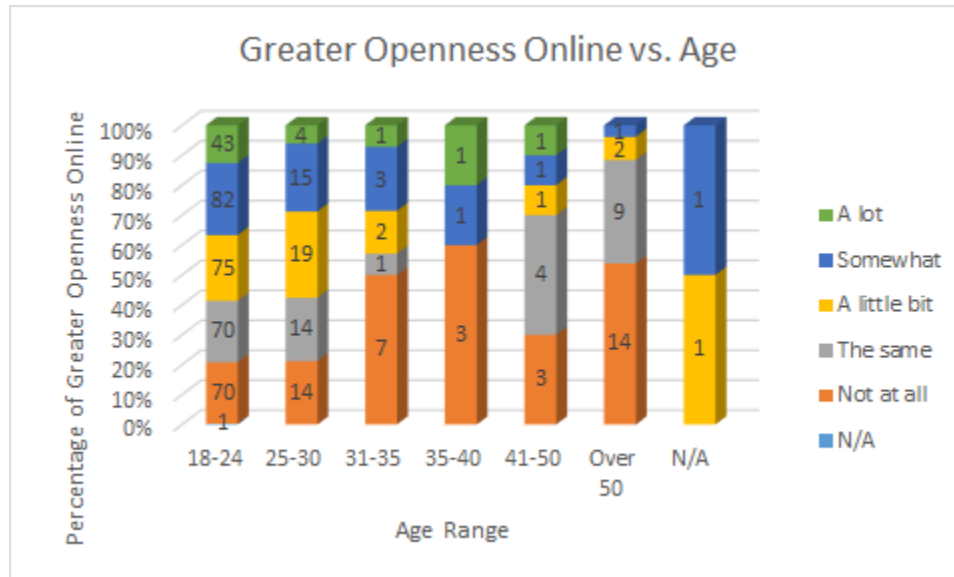
in such a marginalized group can often be met with hatred and misunderstanding. Therefore, it seems plausible that those who are part of marginalized groups would lie about their genders in order to protect both their physical, mental, and emotional safety.



(Figure 20. A 100% stacked column depicting the percentage of people who have lied about their gender online versus the level of introversion and extroversion of all respondents.)

This graph appears to show a correlation between whether someone has lied about their gender and their level of introversion and extroversion, as it seems that the more extroverted someone is, the less likely they are to lie about their gender (somewhat extroverted notwithstanding). This could be because those who are extroverted are more comfortable around others and do not feel a need to hide their gender. However,

it seems that whether an individual is an introvert or an extrovert does not affect whether they are inclined to not share their gender in order to protect their own privacy.

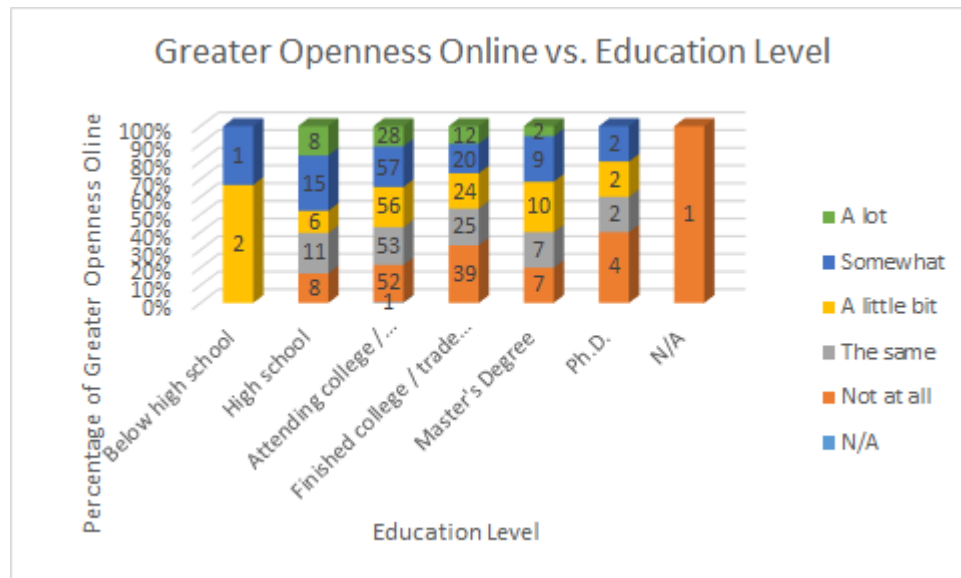


(Figure 21. A 100% stacked column depicting the percentage of the degree to which people are more open with others online versus the age ranges of all respondents.)

Despite the insufficient data for the 35-40 and 41-50 age groups, there appears to be a clear trend revealing that the older a person gets, the less likely they are to be open online. Those in the 18-24 age group were approximately evenly spread out as to how open they were online, whereas those who are over 50 largely treat people online either the same as or with more caution than those who they know offline.

Perhaps people who are younger have grown up with the Internet and are used to talking to people online, therefore show a fairly equal distribution of how much more they are willing to share with online acquaintances and friends. On the other hand,

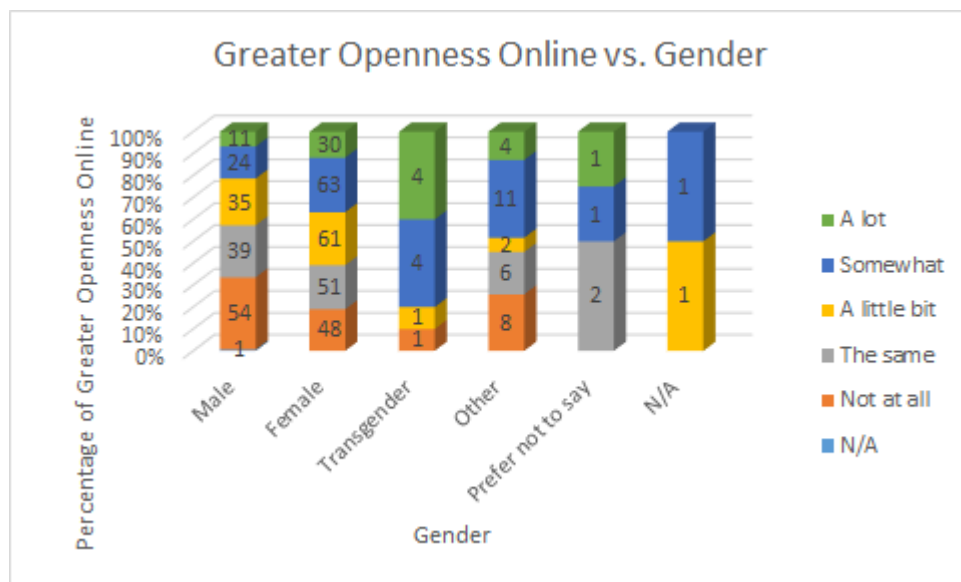
perhaps those who are over 50 are less familiar, and grew up largely in a world where meetings and interactions took place face-to-face, and the idea of talking to and sharing intimate details with people online seems strange.



(Figure 22. A 100% stacked column depicting the percentage of the degree to which people are more open with others online versus the education level of all respondents.)

Removing those who have not completed high school due to insufficient participation, there seems to be a trend that the higher education level that one receives, the less open they are online. With the exception of those with a Master's degree, who more closely match those attending college or trade school, those higher up the metaphorical educational ladder seem less and less likely to share a lot of information with their online acquaintances.

The reasoning for this could point to a correlation with the above age graph, as it is generally expected that the higher one's age, the more education they have completed. While high school typically takes four years, college and post-graduate education can take varying amounts of time, from those who graduate with a bachelor's degree after three years to those who labour for five or more years over their Ph.D.

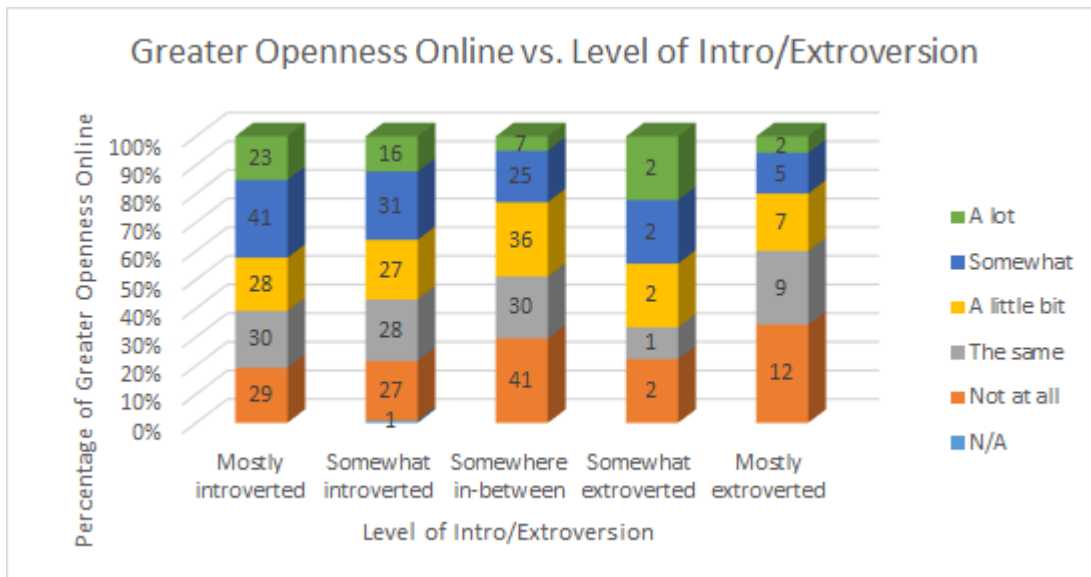


(Figure 23. A 100% stacked column depicting the percentage of the degree to which people are more open with others online versus the genders of all respondents.)

As this graph shows, it seems that those who identify as male and female are approximately equally distributed in terms of how open they are online, with women being slightly more open online than men. It seems though, that those who identify as transgender and other are generally at least somewhat more open online than

others. Although it is hard to draw definitive conclusions about those who identified as transgender due to the low number, the data that has been obtained still holds true.

It is possible that those who identified as transgender and other are a lot more open online due the aforementioned reasoning that those who are transgender and other genders are in a marginalized group, and it may be difficult for individuals in that category to easily communicate with the outside world and still be comfortable with themselves. Therefore, it is possible that this group may turn to people online to judge online interactions and determine whether they would feel safe, and conversely have a place where they do not have to feel judged themselves.

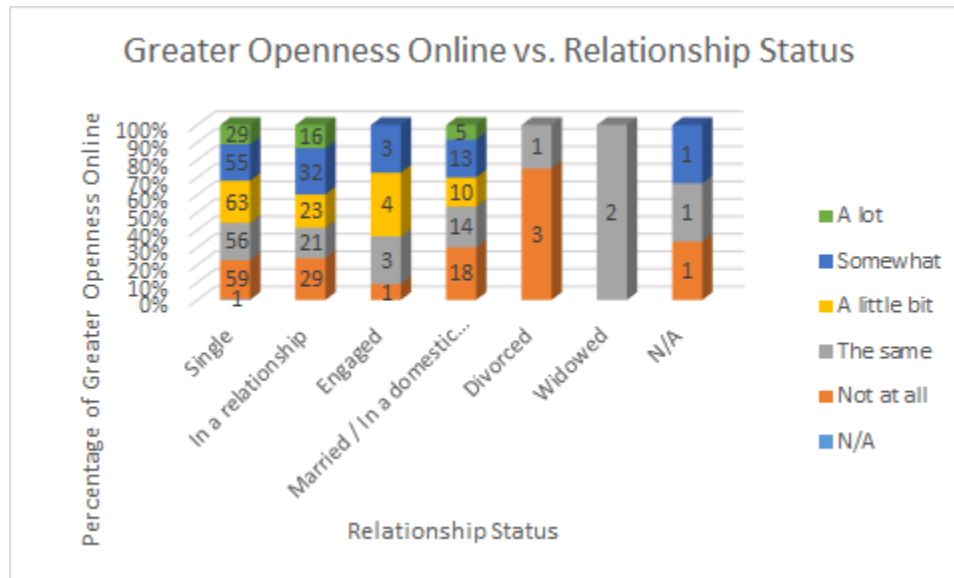


(Figure 24. A 100% stacked column depicting the percentage of the degree to which people are more open with others online versus the level of introversion and extroversion of all respondents.)

Although, as previously stated, the column showing the somewhat extroverted has insufficient data to determine a solid trend, there is a trend based on the rest of the graphs. It shows that the more introverted someone claims to be that the more open they are online; conversely, the more extroverted someone claims to be, the less open they tend to be online. This can be seen in that those who consider themselves mostly extroverted have the highest percentage of those not at all being open online, whereas those who are mostly introverted show the highest percentage of being a lot more open online.

This correlation may exist because those who are more extroverted tend to find the relationships that they want outside of the internet since they recharge by being around people, and therefore do not see a need to share extra information with people online. On the other hand, those who are introverted recharge from being alone, and social events can be overwhelming. Therefore, opening up to people online may be less stressful for introverts in forming friendships, and this may cause introverts to be much more open online.

This may also correlate to other trends, such as certain age groups, genders, and education levels preferring to speak with each other out of wont for a common interest. Those whose interests are solitary activities may find it easiest to network online, whereas those whose interests involve groups and are more extroverted may not feel the need to be more open online.

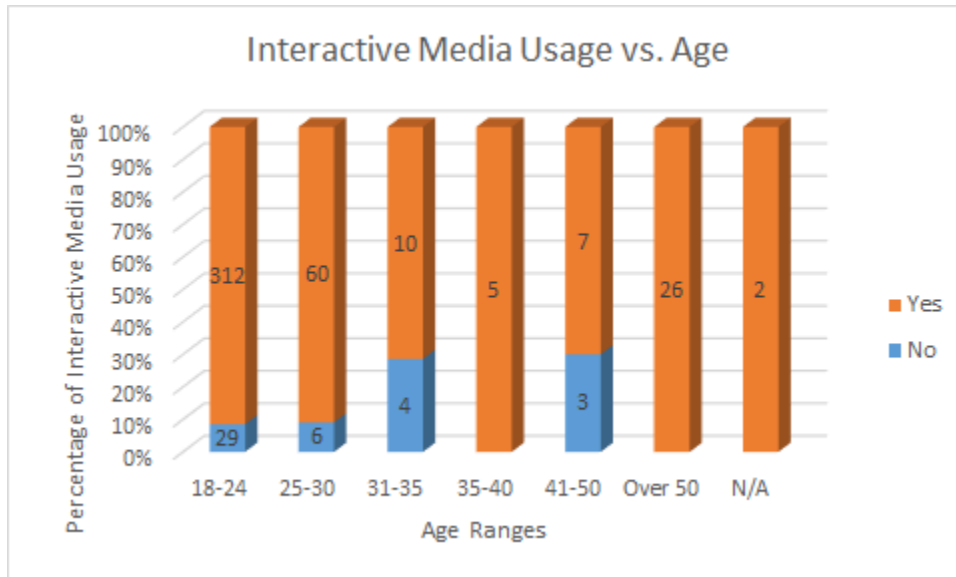


(Figure 25. A 100% stacked column depicting the percentage of the degree to which people are more open with others online versus the relationship status of all respondents.)

Due to the small populations of those who fall under engaged, divorced, and widowed, it is hard to come up for a trend with this graph. It seems that those who are married or in a domestic partnership are slightly less likely to be open online, but those who are single or in a relationship have approximately even distributions of their openness across the board.

This could be because those who are married may be older and fall into the latter categories of being more used to socializing off of the Internet, and those who are single and in relationships are open online not necessarily for dating, but also for friendship. Therefore, there may be an even split among them. Unfortunately, these

correlations are rather weak and it is difficult to say whether or this could lead to any probable causation without more data from underrepresented categories.

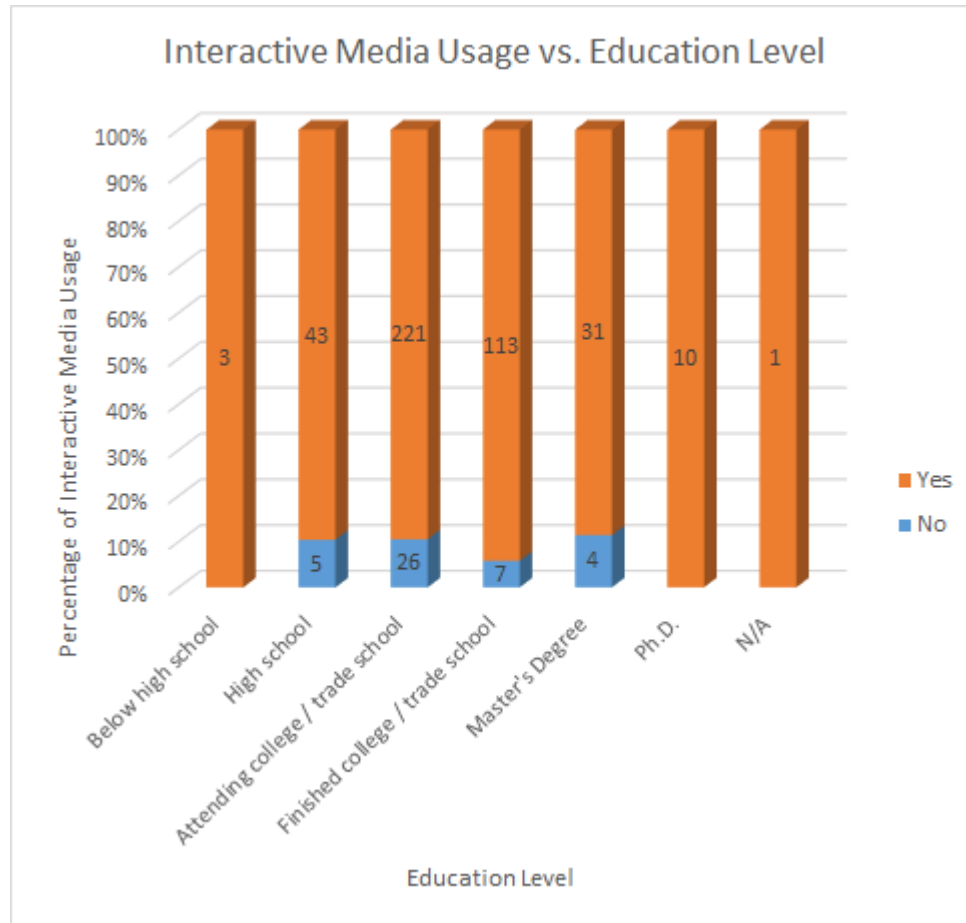


(Figure 26. A 100% stacked graph of the percentage of those who use interactive media versus the age ranges of all respondents.)

Unfortunately, this graph has a very weak correlation of those who use interactive media and their age representations. It would seem that those in younger age groups are more likely to use interactive media and that those in higher age groups are less likely to use interactive media, but there is insufficient data for a number of the groups. In addition, all of those who are over 50 claim to use interactive media.

It could be postulated that younger people use interactive media for a multitude of reasons, such as the sites being built for them or feeling more comfort sharing details, but it does not explain why the oldest age group does use interactive media. In order to

draw a true correlation, the surveyed age groups would need more respondents for the 31-35, 35-40, and 41-50 groups.

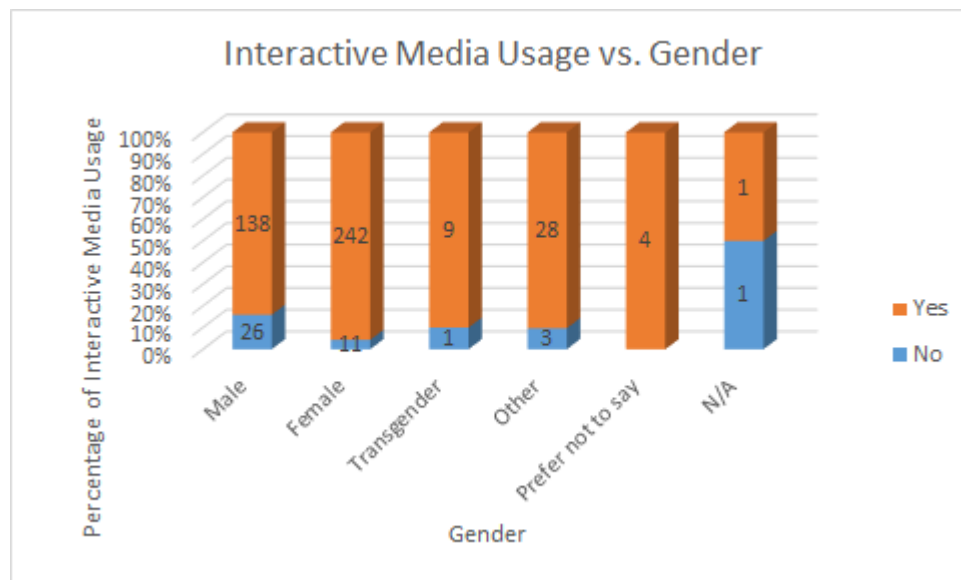


(Figure 27. A 100% stacked graph of the percentage of those who use interactive media versus the education level of all respondents.)

In this graph, it would seem that people are generally very likely to use interactive media regardless of their education level, although those who have finished college /

trade school use it slightly more than those who have finished high school, are attending college or trade school, or who have a Master's degree.

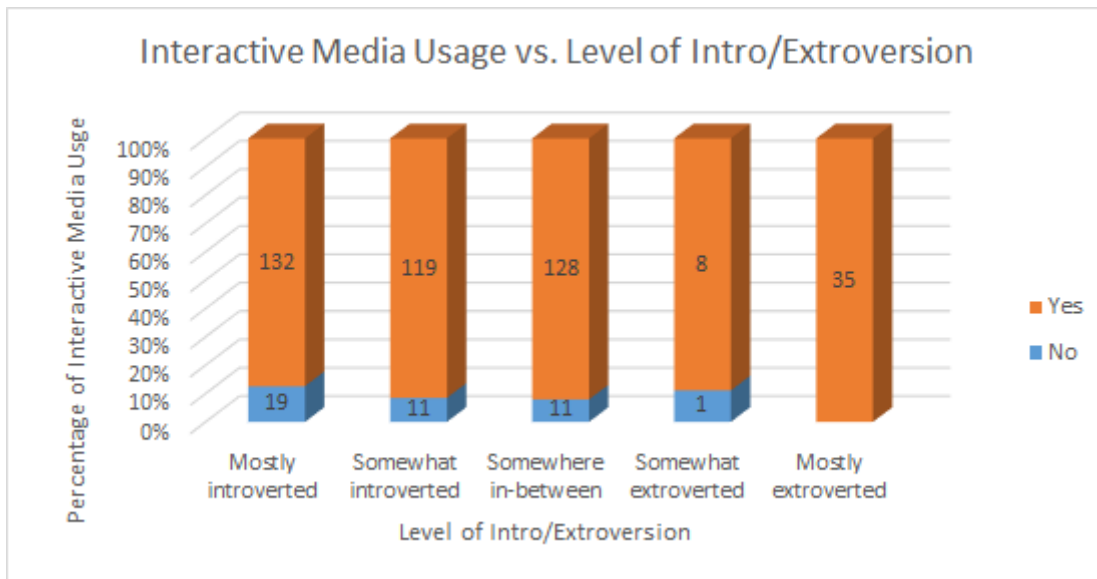
In regards as to why those who have finished college may use interactive media a bit more, it could be due to time freed up from not having homework or other educational obligations. However, it seems impossible to draw conclusions regarding those who have not finished high school or those who have a Ph.D. considering the low numbers; therefore, to see if the numbers are truly approximately even across the board, more data would be required.



(Figure 28. A 100% stacked graph of the percentage of those who use interactive media versus the genders of all respondents.)

According to this graph, men are the least likely out of any group to use interactive media, while women are the most likely, and those who are transgender or another gender are approximately even in whether or not they use social media.

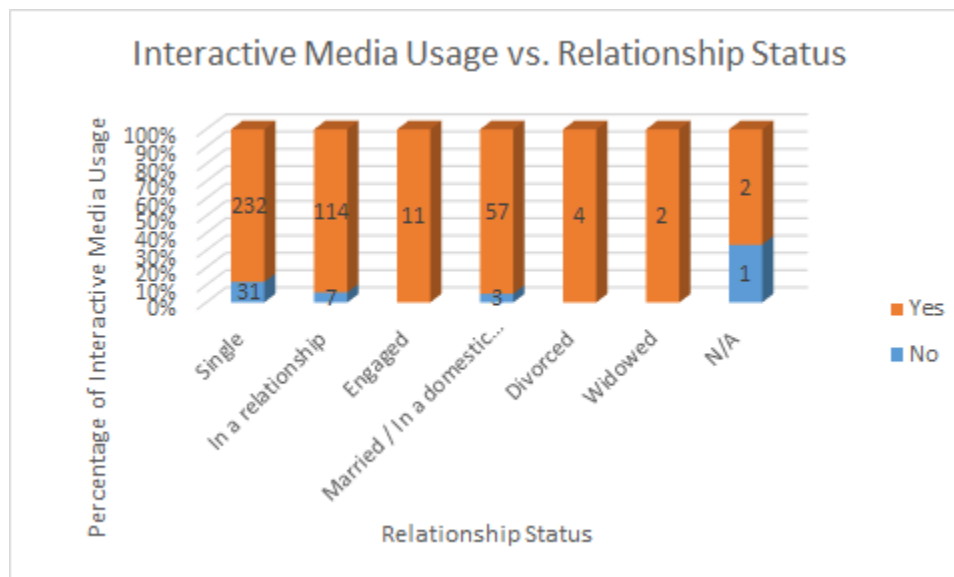
It is possible that between males and females there is a difference in preferred method of communication, and that may account for that discrepancy. In terms of transgender and others, as previously discussed, using social media may be one of the few ways to connect to others in which these individuals feel control over their safety. The problem is with the low number of transgender respondents, and more data would be needed to test if this were true. Otherwise, the main point that may be gleaned from this graph is that males are somewhat a less likely to use interactive media than females.



(Figure 29. A 100% stacked graph of the percentage of those who use interactive media versus the levels of introversion and extroversion of all respondents.)

In spite of the lack of respondents from those who are somewhat extroverted, it seems that across the board that besides those who are mostly extroverted, people who do and do not use interactive media have approximately the same percentage of usage. Therefore, there does not seem to be much of a correlation in this graph.

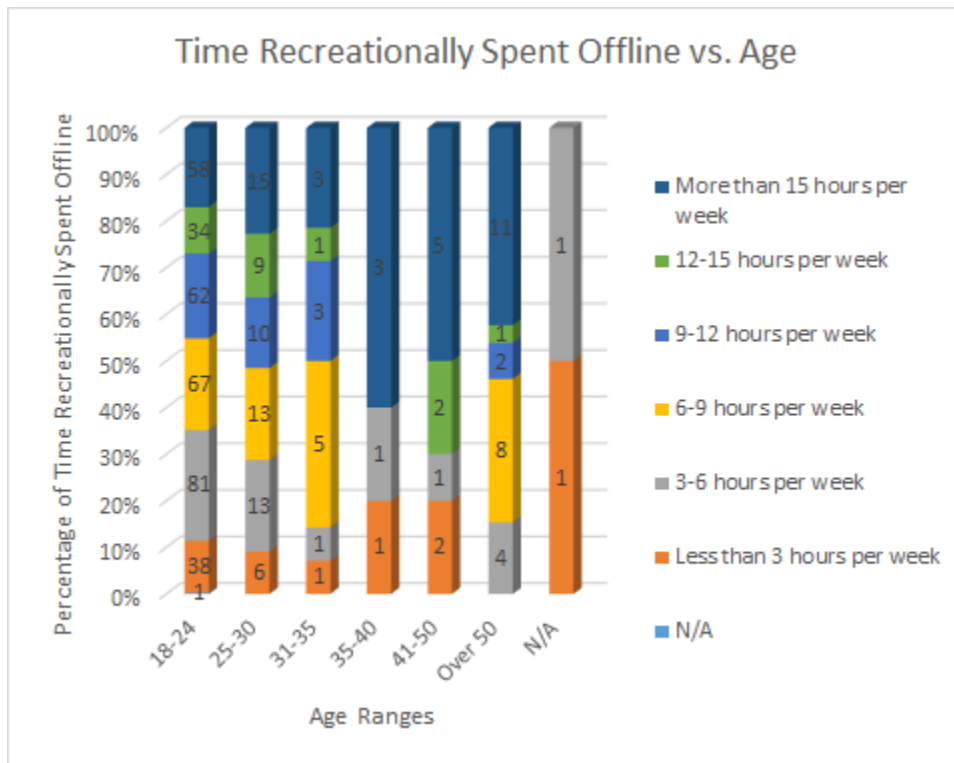
A possible explanation for why those who are mostly extroverted seem to uniformly use interactive media could be that it is an easy way to plan get-togethers and makes planning easier (for example, with a Facebook event invite one can see who is coming and who is not and easily add details about the event that everybody can see), which allows extroverts an easy way to be around people, regain energy, and have a good time.



(Figure 30. A 100% stacked graph of the percentage of those who use interactive media versus the relationship status of all respondents.)

This graph shows that there is a slight increase between people who are single and people who do not use social media. There is no real difference, though, between those who do and do not use social media, and those who are in a relationship and those who are married. Additionally, there is not enough data to draw a conclusion about those who are engaged, divorced, or widowed.

It is possible that those who are single may use interactive media less than those who are in some kind of relationship, but the numbers are so close that it does not seem that there is any real correlation between those who use interactive media and relationship status. With more data a more proper conclusion may be able to be drawn, but current data does not seem to be any correlation as per this study.

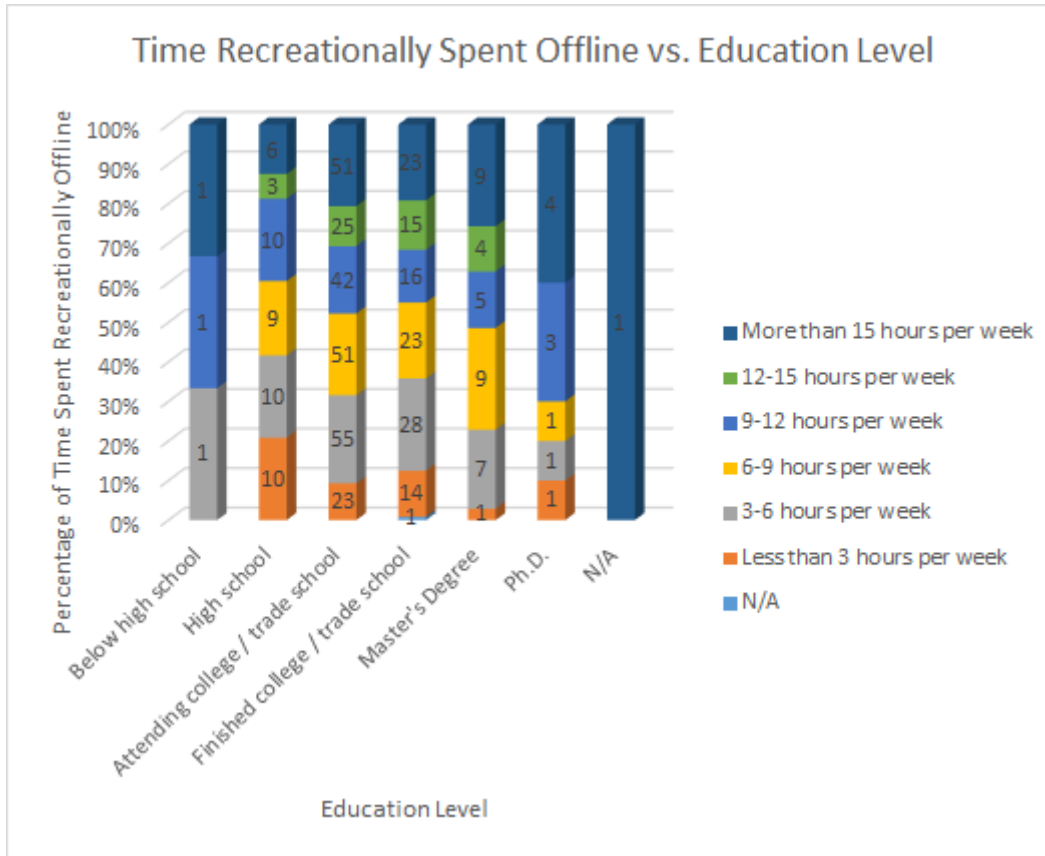


(Figure 31. A 100% stacked graph of the percentage of reported time spent recreationally offline versus age range of all respondents.)

Within this graph, it seems that as people get older, they spend more and more time offline recreationally. While those in the 18-24 age range show a fairly even spread of how much time they spend recreationally offline, the amount of hours spent offline per week increases exponentially as the age group gets higher and higher.

The reason for this has been previously postulated, being that those who are in a younger group may feel more comfortable with social media and computers since they grew up in an age where computing power and services offered rapidly matured, whereas those who are in an older age group grew up in an age where computers were not quite so convenient, and most interaction was done offline. Even though there is insufficient data for the 35-40 and 41-50 age group, with a higher surveyed population it is possible that this trend would continue.

Another possibility for this trend could be that those in a younger age group are still in school and therefore must spend more time on schoolwork and other required activities, whereas those in older age groups are finished working by the end of the day, and they may enjoy more free time to spend out with friends.

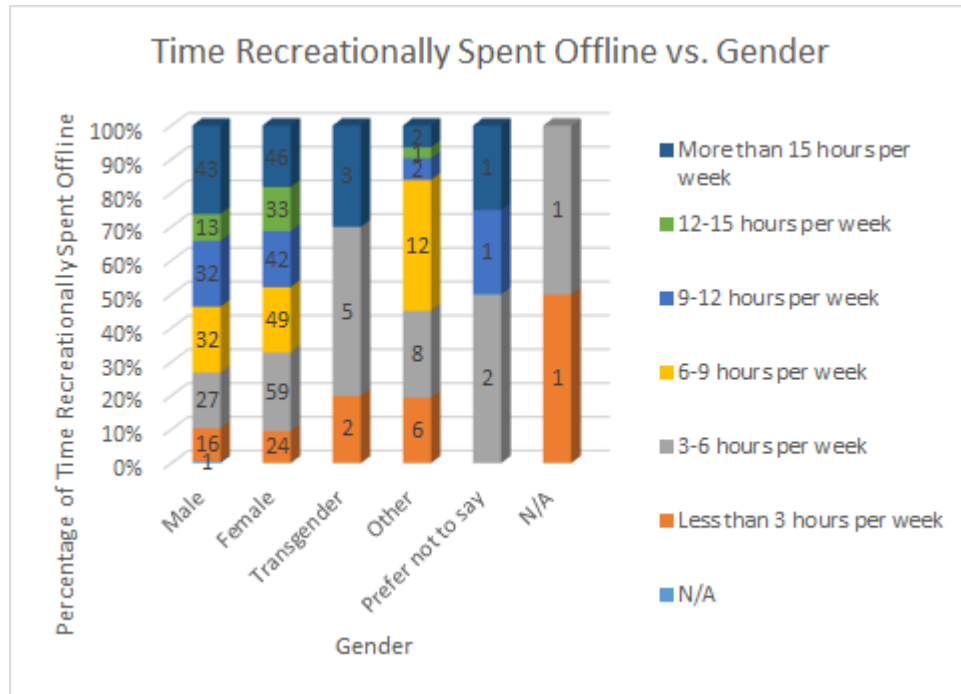


(Figure 32. A 100% stacked graph of the percentage of the reported time spent recreationally offline versus the education level of all respondents.)

Ignoring the data from those who are below high school level due to highly insufficient data, there seems to be a correlation between education and time recreationally spent offline. The graph seems to show that as higher formal education is achieved, more and more time is spent recreationally offline.

A plausible reason for this has already been stated above, in that those who are in a lower education level are likely in a lower age group, and therefore are comfortable with social media, and those who have achieved higher education are likely in a higher age group and grew up in an era where face-to-face communication was considered

more normal. There is a slight deviation from this in the surveyed Ph.D. population, but this could be due to low numbers. With more information from those with a Ph.D., this information may even out.



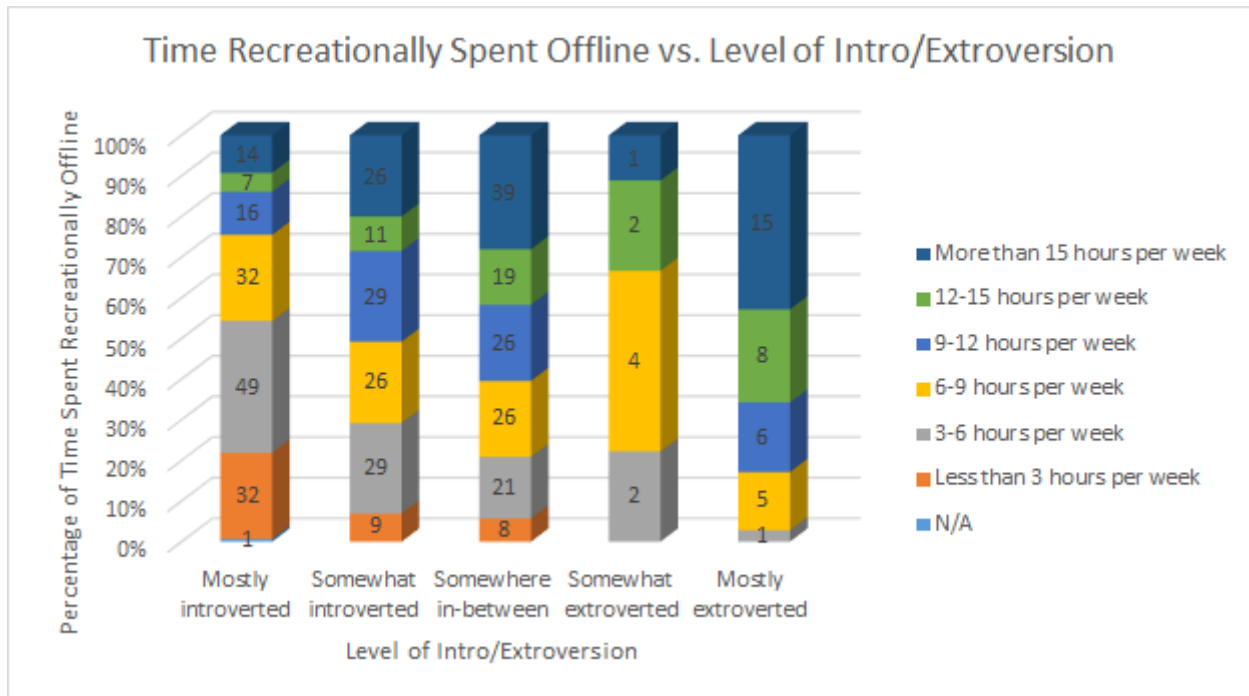
(Figure 33. A 100% stacked graph of the percentage of the reported time spent recreationally offline versus the genders of all participants.)

In this graph, there is a slight difference between those who consider themselves male and those who consider themselves female, in that it appears that males spend slightly more time recreationally offline than females starting around those who spend 6-9 hours per week offline. However, there is a large gap for those who consider themselves transgender or another gender in that these individuals appear to spend significantly less time offline.

The reason for males spending slightly more time offline than females may be a statistical anomaly in this survey, or it could be that what males and females consider recreational time offline are different, or other miscellaneous factors. However, it seems that the big data shown here is how those who consider themselves transgender (in spite of the small number of respondents) and those who consider themselves to be a different gender spent significantly less time recreationally offline. As previously stated, this could be because these individuals have a harder time finding an accepting place offline, so they turn to find interaction online for their own protection. Therefore, those who fall under this category would spend more time online, and would spend less time recreationally offline.

In spite of this, there may be many other factors outside the scope of this survey that may be studied further, such as differences in time that males and females spend on social media, their habits in regards to how often social media is checked, the types of activities that males and females enjoy, etc.

In spite of the fact that there were more male and female respondents than any other group, it would ironically seem that this is the most difficult group with which to draw conclusions.

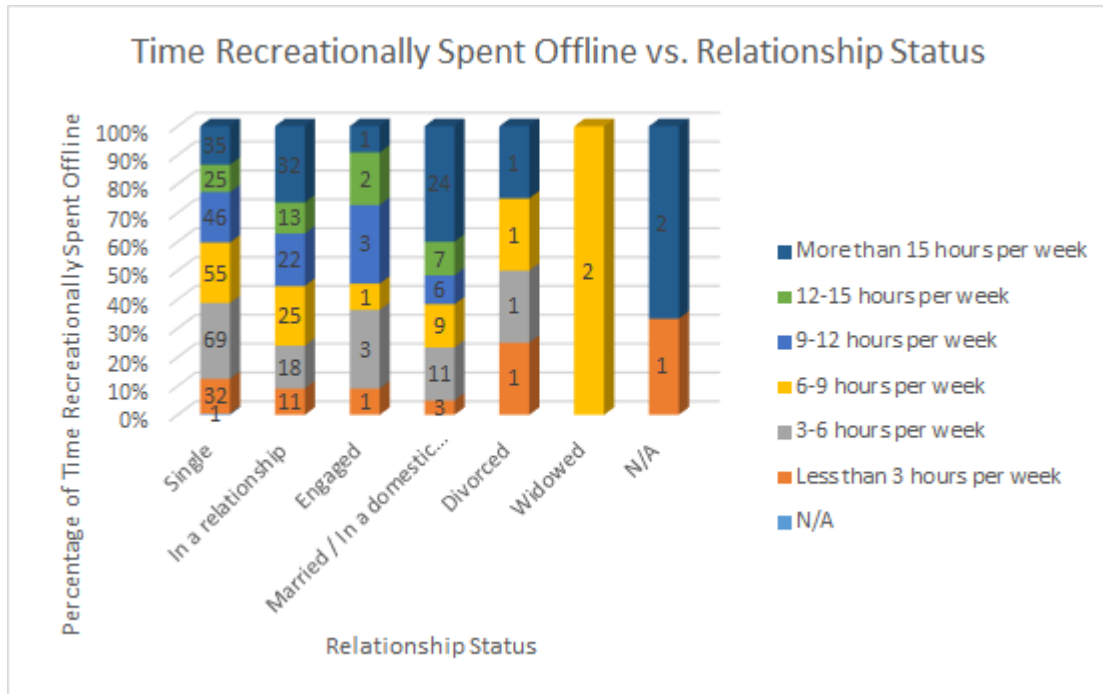


(Figure 34. A 100% stacked graph of the percentage of reported time spent recreationally offline versus the level of introversion and extroversion of all respondents.)

Beyond those who consider themselves somewhat extroverted due to insufficient data, this graph shows the predictable trend that those who consider themselves to be mostly introverted spend a lot less time recreationally offline, and the time spent offline increases until, on the other end of the graph, those who consider themselves mostly extroverted spend a significant amount of time recreationally offline.

As previously mentioned in discussions about introverts and extroverts, this is likely because those who are introverted recharge from being alone, and so in order to feel fully recharged, they would spend less time offline. On the other hand, extroverts

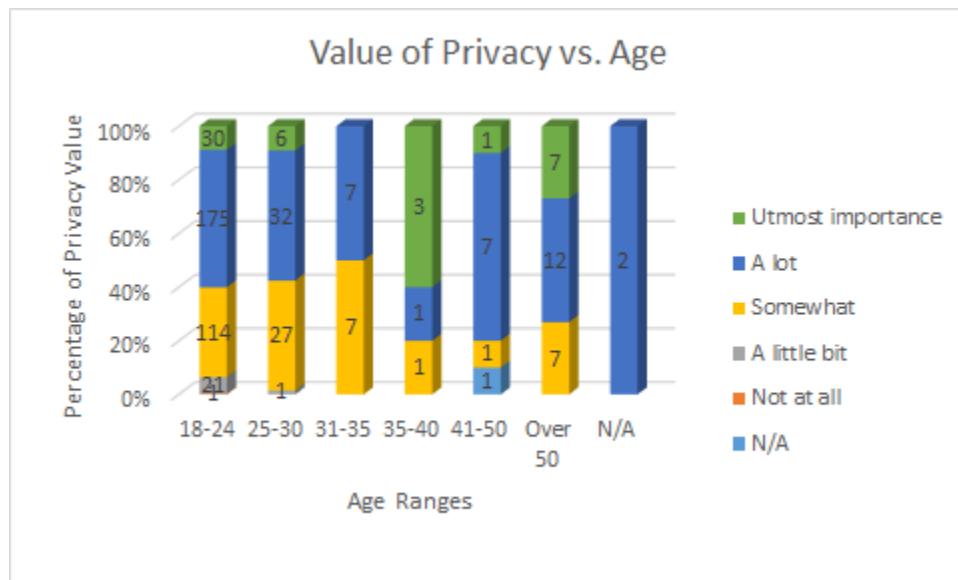
gain energy from being around other people, so those who are extroverted would spend more time offline in order to recharge themselves.



(Figure 35. A 100% stacked graph of the percentage of reported time spent recreationally offline versus the relationship status of all respondents.)

Unfortunately, this graph does not seem to have many correlations or trends. Even keeping in mind that there is insignificant data for those engaged, divorced, and widowed, the only trend that seems somewhat constant is that those in a relationship and those who are married or in a domestic partnership have a tendency to spend more time offline than those who are single.

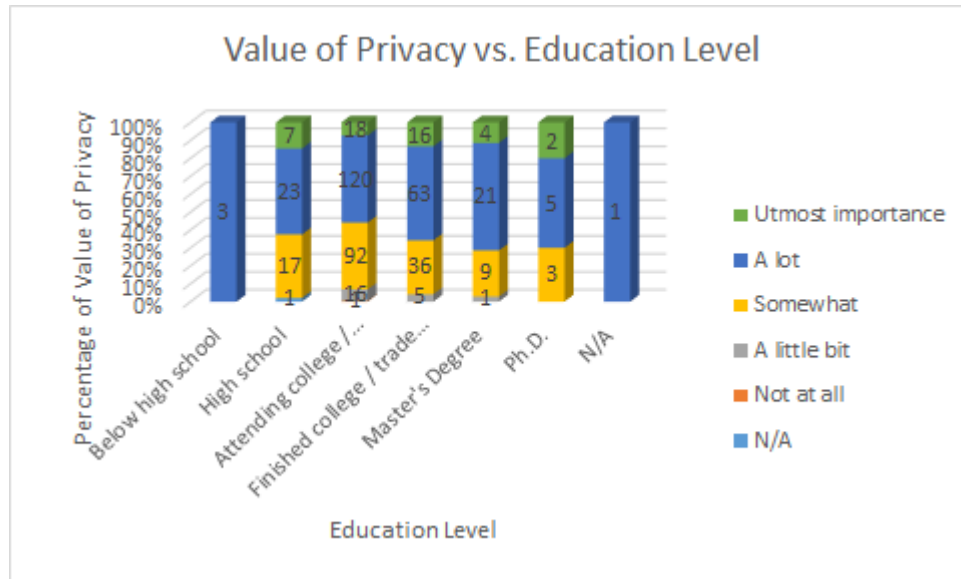
Of course, this could easily be because those who have a significant other want to spend time with them, and therefore would find themselves going out more. However, beyond the 15 hours or more per week category, the category between in a relationship and married or in a domestic partnership appears to have approximately the same percentage for each other category, and those who spend less than three hours a week online seems consistent across the graph. This could be due to online or long-distance relationships, wherein one would spend more time at their computers regardless of relationship status in order to spend time with each other.



(Figure 36. A 100% stacked graph of the percentage of the perceived value placed on privacy versus the age range of all respondents.)

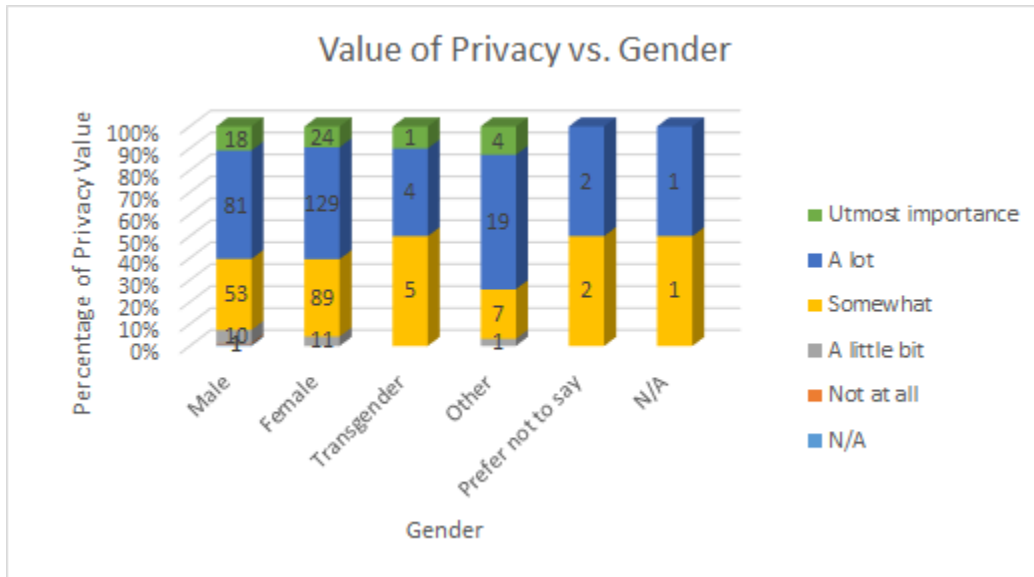
This graph does not seem to show any correlation between age groups and privacy. It seems that beyond the 18-24-year-old group who has a portion of those who

only care “a little bit”, people tend to value their privacy fairly equally across different age groups. Therefore, there does not appear to be a correlation between age and privacy, regardless of some insufficient data among certain age groups.



(Figure 37. A 100% stacked graph of the percentage of the perceived value placed on privacy versus the education level of all respondents.)

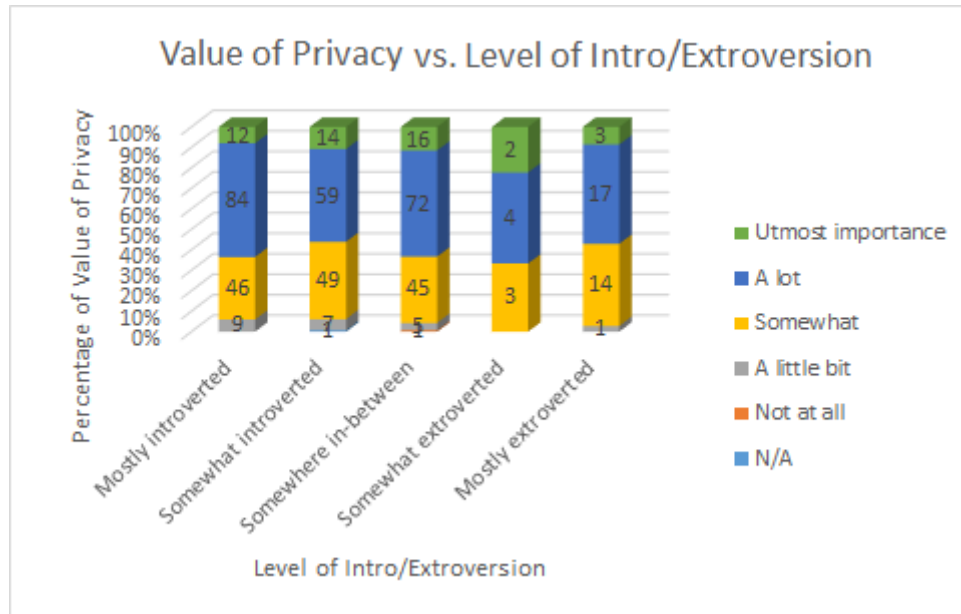
This graph does not appear to have any observable correlations. Much like the one above, there is a very slight correlation starting with those who are attending college or trade school. As education increases, security becomes more important, but there is insufficient data among those who have not completed high school or who have a Ph.D. Furthermore, many of the categories have approximately the same percentage of respondents. Therefore, it seems that education does not have a correlation with how much people value privacy.



(Figure 38. A 100% stacked graph of the percentage of the perceived value placed on privacy versus the genders of all respondents.)

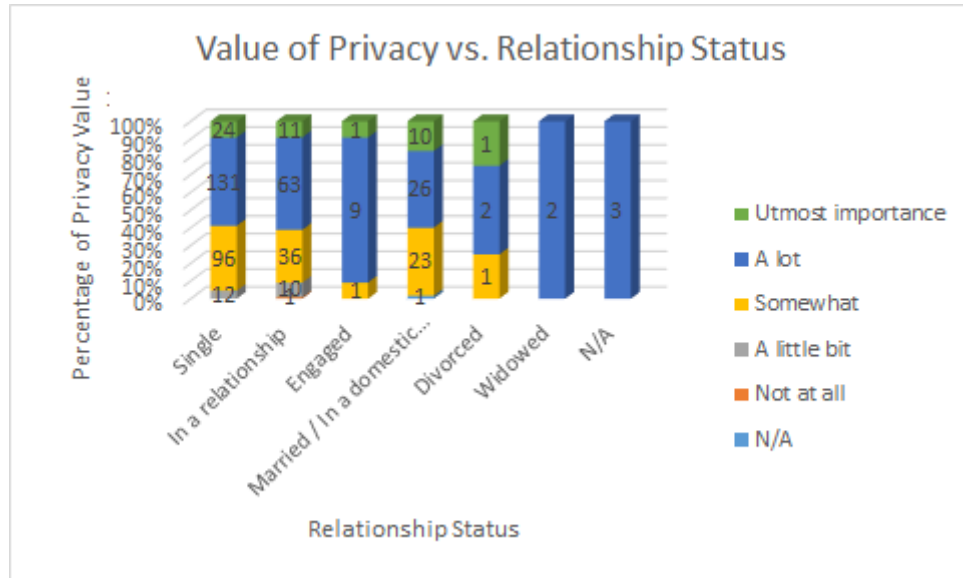
In this graph, males and females appear to value privacy approximately the same amount across each category. Although there is not enough data on transgender individuals to make a solid conclusion on correlation, it would seem that those whose gender is listed under “other” value privacy a bit more than their peers.

This is likely because of the previously stated trend that those of marginalized genders are more likely to have trouble finding safe spaces to express themselves, and therefore, seem more likely to be guarded than those who do not share this problem. This leads to an explanation about this correlation of the need to guard oneself for one’s own physical, mental, and emotional safety, and therefore valuing privacy a more than those who identify as male or female.



(Figure 39. A 100% stacked graph of the percentage of the perceived value placed on privacy versus the level of introversion and extroversion of all respondents.)

Excluding the insufficient data of those who categorized themselves under “somewhat extroverted”, there does not seem to be any correlation between the value of privacy and whether a person is introverted or extroverted. Of course, there are very slight deviations in the graph, but they do not seem significant enough to claim that there is a correlation. Therefore, it seems that whether a person identifies as an introvert, and extrovert, or somewhere in-between, this does not affect how important these individuals hold their privacy.



(Figure 40. A 100% stacked graph of the percentage of the perceived value placed on privacy versus the relationship status of all respondents.)

Between those who are single, those who are in a relationship, and those who are married or in a domestic partnership, there does not appear to be any true correlation regarding how people value their privacy and their relationship status. Additionally, there is not enough information from those who are divorced, widowed, or engaged to provide evidence for sufficient conclusions.

In those categories for which numbers are insufficient, the majority category picked seems to be that privacy is valued “a lot” by these individuals. Perhaps this may show a trend were more people to be involved, but as it stands, there is not enough data to make a correlation with these groups of people.

CHAPTER 4. CONCLUSIONS

General Conclusions

After examining the entire population who took the survey and examining how social factors compare to privacy factors, it appears to be true that there is some correlation between social factors and privacy over various issues. While not every comparison between a social aspect and a privacy issue wielded some sort of correlation, there is still plenty of data to indicate that factors such as age, gender, and education are not merely incidental when it comes how people views their privacy.

Overall, the item with the least correlation is the value of privacy, and this seemed consistent across all groups. Although there is no perfect consistency, and some data is hard to interpret due to insufficient responses from people in certain groups, the data that is plentiful did not show any strong correlation regardless of the social factor with which it is placed. Therefore, it seems that the value of privacy to individuals is approximately equal regardless of external factors.

In terms of the privacy value that seemed to hold the most correlation, that seems to be time that is recreationally spent offline. Regardless of the social factors involved, there always seemed to be some sort of correlation wherein one group would show themselves to spend more or less time recreationally offline, and this would change as the social factor changed, with fair consistency. This could be due to a possible connection between each social factor, such as extroverts, older individuals, and those who did not identify as transgender or another gender, to name a few, who would create some impact on how social interactions are handled.

The social factor that seemed to matter the most is gender. Whenever gender was involved, despite the lack of data from transgender individuals, the large discrepancies between those who identified their gender to be unlisted / “other” consistently had largely different results when compared to those who identified as male or female, and this was more or less consistent across all graphs in which gender was considered. This could be due to marginalized genders facing physical, emotional, and mental dangers, and would therefore cause people in these groups to be choosier about what they do and how they value certain privacy aspects.

On the other hand, the social factor that seemed to matter the least is relationship status. While there were some correlations between relationships, there were few enough respondents coming from such a high number of categories that it was difficult to come to a conclusion as to whether there was a true correlation. Even then, when the categories with enough respondents could be compared, this category seemed to have the least number of correlations among it.

Taking all of these factors into consideration and examining all of the graphs that have been produced from the respondents of the survey, though not every single combination of social factor and security factor produced a correlation, there are some graphs that have produced very strong correlations between social factors and security factors.

Simply put, in individual ways, each social factor and privacy factor combine to form a picture of what does contribute to an individual’s view of privacy while others do not. Understanding how these factors contribute to security could provide a wealth of information; understanding how these factors come into play could shine a light onto

how individuals in certain groups think. Two purposes could be derived from this: One could take more of a business view, and businesses and advertisers could use statistics to determine how to best market certain products based on their intended audience and the nature of the product. On the other hand, in the name of science and learning, this information could be used in order to provide training in security, assess security proficiency, and increase computer security overall by targeting those who fall under specific societal factors, and then tailor-making a course that would most speak to that group.

Future Considerations

Although the research put into this paper has been able to shed light onto a lot of different aspects of security, there is still more work to be done. There are results from the survey that have not been used and can be seen in Appendix A, such as a breakdown of how people feel about giving out their information across various interactive media platforms, in addition to how people feel about privacy offline. Although that data was not aggregated in this work, it could be used in the future to get further insight into how social factors and perceived privacy values play into both interactive media accounts and offline interactions.

In addition, although the survey had a good population, there were still many categories that had a severely lacking number of respondents. For example, there were only three respondents who did not complete high school, and this number is so small that it is highly improbable that any solid conclusion could be drawn from the data that these individuals provided in regards to their education. The same was true of some

genders and some relationship statuses, leaving some data incomplete. Interesting data could also be gleaned from the quantification of each individual response on a scale of one to five, and from finding the mean and median of security values for each social group.

If this line of research were to continue, there are a few ways that it could be thoughtfully expanded upon. A higher population in which to study would be beneficial, and to be able to get a lot more respondents for categories that are lacking would also greatly contribute. In addition, looking thoroughly at interactive media correlations could prove useful.

Finally, an interesting direction that this thesis could take would be to find out if there is any causation behind graphs where correlations exist; correlation does not equal causation, after all, and if there is indeed a scientifically noted causation behind these aspects, this data could be used for even more research and possible change.

It should also be noted that while using people in a survey population for test subjects, we find that individuals grow and change, and the data provided here in 2015 could become quickly outdated. This aspect is the “cruel angel” of working in this field – while the research done can provide a lot of useful and revealing conclusions, and we may hopefully use it to change peoples’ lives for the better, people, perceptions of security, and the Internet itself are constantly changing. Research becomes a constant race to keep up with ever-changing technology, and efforts to provide timely and contemporary data can prove exhausting. However, in spite of all of this, further research will ultimately further an understanding of the human side of security, which, it is hoped, can benefit technology users as a whole.

REFERENCES

- Madan, B. B., Gogeva-Popstojanova, K., Vaidyanathan, K., & Trivedi, K. S. (2002). Modeling and quantification of security attributes of software systems. In Dependable Systems and Networks, 2002. DSN 2002. Proceedings. International Conference on (pp. 505-514). IEEE.
- Moser, L. E. (1989, June). A logic of knowledge and belief for reasoning about computer security. In Computer Security Foundations Workshop II, 1989., Proceedings of the (pp. 57-63). IEEE.
- Ryan, P. Y. (2001). Mathematical models of computer security. In Foundations of Security Analysis and Design (pp. 1-62). Springer Berlin Heidelberg.
- Griffin, C., Madan, B., & Trivedi, K. (2005, July). State space approach to security quantification. In Computer Software and Applications Conference, 2005. COMPSAC 2005. 29th Annual International (Vol. 2, pp. 83-88). IEEE.
- DONG, L. W. M. L. J., & Zhi-Tang, J. L. (2009). An Optimized Method for Real Time Network Security Quantification [J]. Chinese Journal of Computers, 4, 022.
- Almasizadeh, J., & Azgomi, M. A. (2009, March). Intrusion process modeling for security quantification. In Availability, Reliability and Security, 2009. ARES'09. International Conference on (pp. 114-121). IEEE.
- Badenhorst, K. P., & Eloff, J. H. (1990). Computer security methodology: risk analysis and project definition. Computers & Security, 9(4), 339-346.

APPENDIX A: SURVEY RESULTS

Due to the large amount of data that the survey produced, the data will not be reprinted here. However, comprehensive survey results are available upon request, including data gathered about social media and offline data. All data collected was completely anonymous.

APPENDIX B: INSTITUTIONAL REVIEW BOARD APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4500
FAX 515 294-4267

Date: 4/10/2015

To: Arielle Czalbowski
42C Schilleter Village
Ames, IA 50010

CC: Dr. Doug Jacobson
202 Nuclear Engineering

From: Office for Responsible Research

Title: Quantifying Privacy in Information Assurance

IRB ID: 15-225

Study Review Date: 4/9/2015

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
 - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
 - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.