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CAN YOU HELP ME NOW?: THE EFFECTS OF CELL PHONE USE  
ON SOCIAL CAPITAL FORMATION IN A GROUP SETTING

by

Simon J. Purdy

A dissertation submitted to the Graduate College  
in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
Sociology  
Western Michigan University  
June 2016

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## CAN YOU HELP ME NOW?: THE EFFECTS OF CELL PHONE USE ON SOCIAL CAPITAL FORMATION IN A GROUP SETTING

Simon J. Purdy, Ph.D.

Western Michigan University, 2016

This study examines the cause and effect relationship between the use of cell phones, which are the widest spread communication technology in the modern day, and the formation of social capital which occurs among members of small groups. Previous research into the effects of cell phone use has primarily focused on individual-level effects, such as texting while driving, leaving a gap in our understanding of the technology's larger social implications. One social process that cell phones may affect is social capital, or the networks of assistance which exist in our lives, and the associated norms of trust and reciprocity therein. As an important aspect of our social lives, anything that may influence social capital (positively or negatively) is worth a thorough examination. Trends in both social capital and the use of cell phones suggest that there may be negative effects when it comes to the formation of social capital in the first place. Using social capital formation (calling upon others for aid and developing a sense of trust and reciprocity) as the main dependent variable, this study tests a number of hypotheses related to differences in interactions between members of a group in the presence and absence of cell phone use.

Utilizing an experimental design, undergraduate participants from a Midwestern university are placed into experimental (able to use cell phones) and control (not able to

use cell phones) groups, and asked to work through a small task during a testing period. Quantitative and qualitative methods of data collection and analysis (including t-tests, regressions and path analysis) are employed to understand how group members worked together and how they felt about their interactions. The results from this study indicate an overall negative impact of cell phones use on social capital formation, with differences in the types and degrees of interactions, and feelings of trust and reciprocity, occurring in the presence and absence of cell phone use. This relationship is nuanced by demographic considerations and the influence of perceived interaction quality. This study has implications for theoretical understandings and future research, offering insight to the impacts of technology on our social world.

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## Acknowledgements – Continued

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Simon J. Purdy

## TABLE OF CONTENTS

AKNOWLEDGEMENTS.....	ii
LIST OF TABLES.....	ix
LIST OF FIGURES.....	xi
CHAPTER	
I. INTRODUCTION.....	1
II. LITERATURE REVIEW.....	5
The Cell Phone.....	5
History and Popular Focus.....	5
Social Effects.....	11
Social Capital.....	19
Social Capital Dimensions.....	23
Theory and Trends.....	31
Measuring Social Capital.....	41
Cell Phones and Social Capital.....	46
Cell Phones: Networks, Trust and Reciprocity.....	47
A Source of Capital.....	54
Demographic Considerations.....	57
Research Questions and Related Hypotheses.....	62



Table of Contents – Continued

CHAPTER	
III. METHODS.....	67
Subjects.....	67
Recruitment.....	68
Data Collection.....	71
Experimental Design.....	81
Operationalization.....	84
Ethical Issues.....	89
Analysis.....	90
Quantitative Analysis.....	90
Qualitative Analysis.....	92
IV. QUANTITATIVE RESULTS.....	94
Univariate Analysis.....	97
Cell Phone Use.....	97
Social Capital.....	98
Interaction Quality.....	109
Information Sharing.....	115
Test Accuracy and Accomplishment.....	118
Compound Variable Univariate Analysis.....	120
Aid Given and Received.....	121

Table of Contents – Continued

CHAPTER

Compound Variable Univariate Analysis	
Reciprocity.....	122
Trust.....	124
Interaction Quality.....	126
Information Sharing.....	127
Quantitative Hypothesis Tests.....	129
Cell Phone Use and Social Capital Formation.....	130
Cell Phone Use and Information Sharing.....	142
Test Accuracy, Feelings of Accomplishment, and Cell Phone Use..	148
Information Sharing and Social Capital Formation.....	151
Cell Phone Use and Interaction Quality.....	158
Interaction Quality and Social Capital Formation.....	161
Demographic Considerations.....	166
Gender.....	166
Race and Ethnicity.....	170
Social Class.....	172
Grade Level.....	176
Prior Associations.....	178
Summary.....	179

Table of Contents – Continued

CHAPTER

V. QUALITATIVE DISCUSSION.....	181
Cell Phone Use and Social Capital Formation.....	181
Awkward Silence and Ice Breakers, Cell Phones and Group Interactions (Hypothesis 1).....	181
Trust, Reciprocity and Cell Phone (Hypotheses 2 and 3).....	199
Information Sharing and Interaction Quality.....	210
Effects of Cell Phone Use (Hypotheses 4, 5, 6 and 12).....	210
Effects on Social Capital Formation (Hypotheses 9, 10, 11, 13, 14 and 15).....	221
Interaction Quality and Information Sharing as Moderating Variables.....	230
“Wikipedia has let me down”: Cell Phone Use, Test Accuracy and Accomplishment.....	233
Test Accuracy (Hypothesis 7).....	233
Feelings of Accomplishment (Hypothesis 8).....	239
Summary.....	242
VI. THEORETICAL DISCUSSION AND CONCLUSION.....	245
Theoretical Discussion.....	245
“There’s an App for That”: Cell Phone Use and Social Interactions.....	245
Lasting Impressions? Cell Phone Use, Trust and Reciprocity.....	255

Table of Contents – Continued

CHAPTER

Interaction Quality and Information Sharing.....	260
Limitations and Directions for Future Research.....	263
Limitations.....	263
Future Research.....	267
Conclusion.....	269

REFERENCES.....	275
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APPENDICES

A. Human Subjects Institutional Review Board Approval and Informed Consent Form.....	287
B. Data Collection Materials.....	292
C. Regression Assumption Tests.....	301

## LIST OF TABLES

4.1	Summary of Univariate Results for Indicators of Aid Given and Received, Control Groups.....	101
4.2	Summary of Univariate Results for Aid Given and Received Indicators, Experimental Groups.....	102
4.3	Average Response for “Received Help” by “Asked for Help.”.....	104
4.4	Summary of Univariate Results for Reciprocity Indicators, Experimental and Control Groups.....	105
4.5	Summary of Univariate Results for Trust Indicators, Experimental and Control Groups.....	107
4.6	Summary of Univariate Results for Interaction Quality Indicators, Control Groups.....	111
4.7	Summary of Univariate Results for Interaction Quality Indicators, Experimental Groups .....	112
4.8	Summary of Univariate Results for Information Sharing Indicators, Experimental and Control Groups.....	116
4.9	Summary of Univariate Results for Compound Variables, Experimental and Control Groups.....	125
4.10	T-test Results for Social Capital Formation Variables, Experimental and Control Groups.....	132
4.11	Summary of Standardized and Unstandardized Regression Coefficients, Cell Phone Use Predicting Social Capital Formation.....	132
4.12	Summary of Standardized and Unstandardized Coefficients from Path Models (Experimental and Control Groups).....	136
4.13	Summary of Standardized Direct, Indirect and Total Effects from Path Model (Experimental Groups).....	137

List of Tables – Continued

4.14	Summary of Standardized Direct, Indirect and Total Effects from Path Model (Control Groups).....	138
4.15	T-test Results for Information Sharing Variables, Experimental and Control Groups.....	144
4.16	Summary of Standardized and Unstandardized Regression Coefficients, Cell Phone Use Predicting Information Sharing.....	144
4.17	T-test Results for Accuracy and Accomplishment, Experimental and Control Groups.....	150
4.18	Summary of Standardized and Unstandardized Regression Coefficients, Information Sharing Predicting Social Capital Formation.....	153
4.19	T-test Results for Interaction Quality, Experimental and Control Groups....	160
4.20	Summary of Standardized and Unstandardized Regression Coefficients, Interaction Quality Predicting Social Capital Formation.....	162
4.21	Summary of Total Effects in Male and Female Path Models: Unstandardized, (Standard Error), and Standardized Estimates.....	168
4.22	Summary of Total Effects in White and Non-White Path Models: Unstandardized, (Standard Error), and Standardized Estimates.....	171
4.23	Summary of Total Effects in Higher and Lower Parental Education Path Models: Unstandardized, (Standard Error), and Standardized Estimates.....	175
4.24	Summary of Total Effects in Upper and Under Classmen Path Models: Unstandardized, (Standard Error), and Standardized Estimates.....	177
5.1	Summary of Hypothesis decisions: Quantitative, Qualitative and Overall.....	243

## LIST OF FIGURES

1.1	Experimental Room Layout.....	76
4.1	Path Model of Cell Phone Use and Social Capital Formation, Experimental Groups Only: Standardized Coefficients.....	134
4.2	Path Model of Social Capital Formation, Control Groups Only: Standardized Coefficients.....	135
4.3	Comparison of Linear Regression Models for Indicators of Trust and Cell Phone Use.....	141
4.4	Regression Model, Information Sharing on Cell Phone Use.....	147
4.5	Quadratic Relationship Between Information Sharing Predictors and Aid Given and Received, Experimental and Control Groups.....	155
5.1	Relationship Between Reciprocity and Aid Given and Received, Experimental and Control Groups.....	203

## CHAPTER I

### INTRODUCTION

I had an experience recently that made me start to think more deeply about cell phones<sup>1</sup>, and the roles which they play in our social lives. After a day-long outing at the zoo with my family, on a particularly hot and humid summer day, I came across a young couple in the parking lot while loading my tired and hungry daughter into her car seat. In a nearby parking space, a young woman sat on the blacktop with her back against the wheel of her car, which had all of the doors open, looking at the screen of her cell phone, while her boyfriend sat in the passenger's seat looking through the glove compartment. I made brief eye contact with the young woman and recognized the look of frustration that accompanies a broken down car, a look I am all too familiar with given that I drove a 1978 Mustang back and forth to college, a 300-mile trip in some of the harshest weather Michigan has to offer, for several years during my undergraduate education. I approached and asked if they needed any help getting their car running. As it turned out, with a failure in their braking system, and without any family or friends within a two-hour drive, or the tools needed to fix the problem, they were effectively stranded. With some experience working on brakes, I offered to help, though, with a baby getting fussy, the best I could do was to offer some advice and loan them a few wrenches from my

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<sup>1</sup> In this paper, the term "cell phone" will be used throughout to refer to mobile communication technologies, and is equivalent to "mobile phone", "cellular phone" and other similar terms in its use.



toolbox. After receiving a call from the zoo's lost and found office, telling me that my tools had been left with them, I assume that the couple ended up getting home, and hopefully my small amount of help was able to make a difference.

On the drive home, I started thinking about the interaction I had just experienced, from almost "walking by" because it looked like they had things under control given that they had a cell phone (what do we usually ask when seeing someone who needs help in the modern day: "Do you need a cell phone"?), to the fact that, despite the ability to fix the brakes by themselves, they ultimately had to rely on the resources of a stranger (me) because their close family and friends were not available to help beyond the cell phone. As such, my experiences with this young couple illustrate the relationship which is of interest to the study detailed in this paper, between cell phones and social capital. Social capital, or "connections among individuals-social networks, and the norms of reciprocity and trustworthiness that arise from them" (Putnam, 2000, p. 19), is an important theoretical and practical concept in our social lives. Social capital offers benefits to individuals and larger social structures such as communities and politics, with the ability to call upon networks for help (finding jobs, fixing a flat tire, etc.), as well as higher levels of engagement with communities and civic organizations (Putnam, 2000; Coleman, 1990; Halpern, 2005). Social capital is manifest in the networks which we maintain, including strong ties with close friends and family and weak ties with less formal acquaintances (Granovetter, 1983), with different benefits coming from both types of these connections, including access to new information via weak ties and the ability to form new network connections (Granovetter, 1983; Putnam, 2000; Cross & Borgatti, 2004). And it is the formation of these new network ties, and the sharing of information

which is of interest in this study, given a need for a better understanding of the factors which affect the formation of social capital. With our example here, we can see that cell phones may be one of these factors, potentially limiting (or perhaps facilitating) the formation of new network ties, feelings of trust and reciprocity, or the obligations for helping others in a network, group, or community.

Cell phones, in this study, refer to mobile communications technologies from the most basic phone allowing voice communication on the move, to more advanced “smart phones” which offer access to the Internet and other sources of information while on the move. This technology has spread rapidly around the world in the last several decades, touching nearly every area of the globe, and cutting across demographic boundaries unlike other modern technological advances (Rainie & Wellman, 2012; Rainie, 2013; Katz, 2008; Portus, 2008). With such a widespread advancement in our technologies of communication, it would seem that there would likely be impacts on our social world. And though research into these potential effects does exist, when it comes to possible effects on networks, interactions, distraction, and more, the directionality of these relationships, and conclusions as to whether or not cell phones have a causal impact on any of these social phenomena is less clear. As such, there is a need to conduct research which examines cause and effect relationships between cell phones and important social concepts. Given that social capital, and its formation, is based in networks and interactions, areas which cell phones also appear to play a role, investigating the connection between cell phones and social capital is an approach which could help to shed light on both of these major factors in our social world.

In this study, we examine the factors which are important in both social capital and cell phone use, in order to establish a potential relationship between them which can be empirically examined. Utilizing an experimental approach, with small groups working on tasks in the presence and absence of cell phones, this study attempts to isolate the effects of cell phones on the formation of social capital, as opposed to existing social capital, via calling on others for help, sharing information, and the norms of trust and reciprocity which are present in these groups. This approach is unique in a field of research which relies on more descriptive and exploratory methods, and in this way, adds value to our understanding of both cell phones and social capital as they play out in our daily lives. Having a better idea of those factors which could promote, or potentially detract from social capital would seem to be of great interest and importance to social scientists, policy makers, educators, and just about everyone else who works with groups of people on a regular basis. Because eventually we will all need to call upon the help of others, be it to find a job or fix the brakes on our car.

## CHAPTER II

### LITERATURE REVIEW

#### The Cell Phone

##### History and Popular Focus

Cell phone technology may appear to be cutting edge at this point in history, but its roots can be traced back to the turn of the twentieth century. Pioneering efforts in the transmission of wireless signals was well underway at the turn of the twentieth century, with “Marconigrams” allowing for long distance ship to shore communication shortly after it was found, in 1901, that radio waves follow the curve of the earth and don’t simply pass straight out into space in (Murray, 2001). This early wireless technology was developed into “walkie-talkies” (large backpack mounted units) during World War II, and rose to popularity in the post-war years in this form as well as Citizen Band (CB) radios (Murray, 2001). The development of what we now refer to as the cell phone began in 1947, when Bell Labs introduced a way of transmitting signals over short distances (cells), along with a computer system that allowed users to pass seamlessly between these cells, thus freeing up the radio spectrum which was heavily burdened by non-cellular systems (Murray, 2001). It took until the 1980s for cell phones to start hitting the consumer market at a large scale (Murray, 2001), and from there it didn’t take long, as compared to its predecessors, like the landline telephone (i.e. traditional copper-wire based phones systems), for the cell phone to become the most widespread

communications technology in the world (Rainie & Wellman, 2012; Rainie, 2013). For example, while the landline telephone took about 45 years to go from a 5% penetration rate to 50% penetration of U.S. households, cell phones covered this spread in only about 7 years (Degusta, 2012). As of 2013, the Pew Research Center estimates that some 91% of U.S. adults own a cell phone, up nearly 30% since 2004 (Rainie, 2013). The cell phone has also had a remarkable spread globally, with “2G” (second generation transmission technologies) coverage available to around 90% of the world’s population as of 2012. The spread has been especially prominent in the “developing” world, where the cell phone redefines longstanding relationship between wealth and the spread of technology (Degusta, 2012), despite cost, which may be a testament to the desire for cell phones across the socio-economic board (Horst & Miller, 2006). In Jamaica for instance, as of 2006, there were 2 million cell phone subscriptions in the population, which totaled only 2.7 million people (Horst & Miller, 2006). This is a trend which is unusual for the spread of a technology, and suggests that the “digital divide” is less pronounced for cell phones than for the Internet or even the landline telephone (Katz, 2008; Portus, 2008), and thus the cell phone is more likely to touch a greater portion of society than other modern technologies.

Given these rapid rates of development and dispersion, it is not surprising that the cell phone is often looked at as unique in relation to other technologies. Perhaps the biggest factor which sets the cell phone aside from most other communications technologies is its mobility, allowing users all of the capabilities of a landline telephone (and then some) without the need to be tethered to a specific geographic location. This mobility allows us to have conversations with co-workers while commuting, or with our

grandmothers while camping in the middle of the woods, which may not seem like much at this point (or likely points forward) in history, but is a radical step for the way that we are able to communicate with one another, beyond a more fixed communication system. Not only can we contact others while on the move, but we also have our contacts with us wherever we go, making our entire network of friends, relatives, business partners, and acquaintances much more accessible than ever before (Horst & Miller, 2006). Along with placing calls, most cell phones allow users to send and receive text messages (otherwise known as “short messaging service”), a use which is often of less or no additional cost to the user (White & White, 2008). Perhaps due to the decrease in cost, and ease of accessibility (in the middle of a work meeting for instance), text messaging is one of the most common ways in which cell phones are used (White & White, 2008; Paragas, 2005). A recent study found that the average number of text messages sent (or received) by American teenagers on a daily basis is 30 (Lenhart, 2015), with certain lenses of the population (notably those between 18 and 24) sending and receiving an average of more than 100 texts per day (Smith, 2011). Sending and receiving text messages (“texting”) is often at a lower frequency among older age groups, with approximately 53% of American adults preferring to be contacted on their cell phone via a voice call (Smith, 2011). Beyond texting and phone calls, cell phones offer a host of other uses, from games and music to taking pictures and sending emails. With the advent and proliferation of the smart phone, which is basically a personal computer in its modern incarnations, the potential for more uses and access to nearly anything has been greatly expanded (DeGusta, 2012). Smart phones allow users to access the Internet (though this feature has been present in non “smart” cell phones for some time), and use a multitude

of applications for everything from finding a bathroom, to looking up a recipe, or getting a guided tour of a new city (Wheeler, 2015; Samiljan, 2015; Corpuz, 2015), are now in the hands of more than 50% of the adult American population (Smith, 2013). Despite the mobility of these devices, there are similarities between cell phones and other communications technologies, including the Internet (which is accessible by phone) and landline phones. These technologies are often referred to together as ICT, or Information and Communication Technologies (Biddix & Park, 2008; Schroeder & Ling, 2014), which suggests that, at least academically, comparisons can be made between them. With cell phones allowing for access to information and other people nearly anywhere and at any time, and with the technology touching the lives of such a wide swath of the population, it would seem very likely that there are effects from cell phones, and their use, on a variety of aspects of life. And indeed, in recent years there has been a host of research and public attention focused on the role of cell phones in our lives.

Teenagers die after texting while driving, our children are changing the way in which they speak and write, work life is coming ever closer to the home; these topics would seem right at home on nightly newscasts, daily newspapers, and online news sources to those who lived through the years in which cell phones had their meteoric rise. The cell phone, as a technological force which has swept the world, has indeed had its share of, and from time to time still grips, the public's attention. In 2007, Washington became the first state to pass a law specifically banning text messaging while driving a motor vehicle, and as of 2015, 46 U.S. states (including Washington) have enacted similar laws (GHSA, 2015) in an attempt to discourage a practice which is seen by much of the population to be dangerous (Atchey, Atwood & Boulton, 2011), but is still quite

widespread, with some 30% of U.S. drivers between 18 and 64 reporting that they had sent or read a text message while driving “in the past month” (Naumann, 2013; Bayer & Campbell, 2012). Perhaps it is not surprising that a cell phone related activity which can lead to injury and death was framed as a social problem, but all of the attention is interesting in that, at some level it shows we are actively thinking about how cell phones affect our personal behaviors and relations with others. Similar stories and research findings tend to pop up now and then. For instance, a recent study which found that when parents were more focused on their electronic devices (cell phones, smartphones, etc.) in restaurants, they were less engaged with their children, and were more likely to react harshly to the children as they made increasing bids for their parent’s attention (Radesky, et al., 2014). This also falls in line with research which suggests that multitasking with technological devices, such as cell phones, limits the effectiveness on any of the specific tasks which are being engaged in (Ophir, Nass & Wagner, 2009); like studying while instant messaging or parenting while on the phone, in both cases we might expect to find less effectiveness on both activities/interactions. These cell phone related issues and behaviors (which have received a good portion of previous public and empirical attention) all seem to have one thing in common, distraction.

This focus on distraction seems to suggest that there is a public opinion which views cell phones with a degree of caution, or even threat, as disruptive forces in our lives. Not to sound like an intergenerational condemnation of this “new-fangled technology,” but perhaps there is something off-putting about a change which has taken place so fast with the rest of society still trying to catch up. Previous studies suggest that we are still in the process of developing the norms, or “rules” associated with use of cell



phones, be it in a movie theater, at the dinner table, or while driving down the road (Murtagh, 2002; Paragas, 2005). For instance, do you let the phone ring while in a face-to-face conversation, or is it more appropriate to answer the phone (Baron, 2008)? It would seem that in some situations answering the phone or sending a text message is more acceptable than others, such as when in the presence of friends, while at other times it borders on disruption and even being “rude,” such as during conversations with a professor (Baron, 2008; Dretzin, 2010). This rapid change may help to explain some of the cell phones reception by the public, but there is another side to this perception. In many cell phone advertisements, there is an aspect of people coming together, whether on a date, in a crowd, or with a family, and interacting with one another (or using the phone to interact), without detracting from the social experience. For instance, in a recent advertisement for Android smart phones, images of people making connections across cultural and language barriers (facilitated by use of translation software on these cell phones) are used in order to reinforce the idea that cell phone users can “be together” even while maintaining a sense of independence (Android, 2015). And so, despite the seemingly underlying public view of distraction, the world keeps increasing its use of cell phones, perhaps belying these inhibitions with more positive portrayals of cell phones in advertising and other media. After looking at these more popular approaches to the effects of cell phones, it appears that there is something missing: a discussion of how these effects, and others, play out on a larger scale, beyond just the individual level effects. How do cell phones affect us socially, what role do they play in our social relations with one another? And it is to this question that we turn to next in our examination.

## Social Effects

As a technology which deals with communications, the main issue that we will examine, when it comes to the influence of cell phones on larger social phenomena, is whether or not cell phones add to, or detract from, our engagement and interaction with other individuals. As with most emerging issues, there are multiple takes on this influence, with research and views pointing towards both a possible increase, and a possible decrease in individual interconnection due to cell phone use. As was mentioned above, the advent of cell phones has greatly increased our abilities to communicate, which break us free from a set location and allow us to reach nearly anyone at any time. And in this way, the cell phone offers us a “perpetual contact” with those we know (Katz, 2008; Katz & Aakhus, 2002), which, when coupled with the mobility which is offered by this technology, would appear to allow for the possibility of making lasting connections with a wider variety of people (Urry, 2007). And these connections might also be quite useful. For instance, past research suggests that cell phones, and cell phone use, are a means of social support, such as a member of an addiction support group adding more “supportive” contacts to their phone to call upon, instead of those connections which may have had a more negative influence in the past (Campbell & Kelley, 2008). It seems to be the popular view that this increase in the ability of interaction has translated into more engagement with others, a view which is supported by advertisements, which show multitudes of people talking and texting one another, thus facilitating interactions, events, and activities using their phones.

In support of a positive relationship, previous research has found that cell phones allow individuals to maintain multiple lines of communication simultaneously, such as

texting or talking to a friend on the phone, while eating lunch and holding a conversation with others (Humphreys, 2005), which may indicate that more interaction is taking place in general. Along these same lines, research suggests that cell phones act as facilitators of social relationships as they allow individuals to stay connected regardless of location, and also to an extent allowing people to be connected to a form of community simply by owning a cell phone, and thus using it as a status symbol, a trend which is found to be stronger among those who are “late-comers” to cell phone use or are otherwise socially deficient (Wei & Lo, 2006). This seems to suggest that cell phones, even when not being used, can offer social benefits in the form of engaging with others. And indeed, it has been found that greater use of mobile phones, for email and phone calls, relates to stronger connections and relationships, especially among family and close friends (Miyata, Boase & Wellman, 2008; Wei & Lo, 2006). Furthermore, it has been shown that established trusting networks are supported and maintained by the use of cell phones (Julsrud & Bakke, 2009). A recent study by Hampton, Goulet and Albanesius (2014) offers further evidence of a positive influence from cell phones on engagement and interaction, suggesting that using a cell phone while alone in a public place offers a reduction in isolation, along with feelings of security, and thus suggests an increase in public interactions along with the spread of cell phones. This demonstrates a major benefit of cell phones, as they allow for increased interactional opportunities, even when physically detached from existing networks or in locations/situations where such communication would otherwise not be possible.

Along these same lines, cell phones might also have an impact on who these new connections are made with, leading to a higher degree of network diversity among users

of this and other communications technologies. This view holds that cell phones help to open up a world of new possibilities through an increase in engagement and the efficiency of the technology. In other words, the more we are able to communicate, and the easier that it becomes to communicate with a diversity of people, the more diverse our communications become. There is some empirical work to back up this view as well. For instance, research conducted in India suggests that cell phone users have transitioned their ties from those which are locally based, to ones which have more a more worldly and external basis (Sooryamoorthy, Miller & Shrum, 2008). Further research suggests that use of cell phones (and other forms of communication technology) indirectly influence more network diversity through increased engagement in groups and organizations such as neighborhoods, volunteer organizations, and public spaces in general (Hampton, Lee & Her, 2011). Past research has also found that mobile phone mediated discussions have the potential to extend an individual's sphere of public discourse, or conversations about public affairs, especially when networks are strong and wide in scope (Campbell & Kwak, 2011). Research in Jamaica appears to suggest that cell phones are useful in the maintenance of networks, be they widespread and diverse, or small and more closely linked (Horst & Miller, 2006). And so it appears that with increases in cell phone use, there may have actually been an increase in the scope and diversity of people's networks, both through their existing network contacts, and through the building of new connections. Taken together, this evidence seems to offer support for the view that cell phones have served to increase the amount and scope of our engagements and interactions with one another, as well as serving to reduce the

possibility of social isolation, a factor which could have further negative effects on social engagements and interactions.

There is another side to this relationship however, with research pointing to the possibility that as our cell phone use has increased, our levels and quality of engagements have actually been negatively affected. To begin with, it is important to note that we seem to take for granted that cell phone use will increase our levels of engagement with one another. This assumption appears to underlie much of the empirical work and public discourse around this issue, which is, in and of itself, a potential problem, in that it may prevent us from engaging in critical empirical work. Indeed, for such a widely used technology, there has been comparatively little critical empirical work conducted on the social effects of the cell phone since the beginning of its rapid spread around the world (Katz & Akhus, 2002b). This is not to say, however, that critical examinations of cell phone use and interpersonal engagement do not exist. For example, previous research suggests that while the amount of communication has increased overall, the presence of cell phones has led to a lower quality of engagement, especially in those interactions which do not take place over the phone (Misra, Cheng, Genevie & Yuan, 2014; Przybylski & Weinstein, 2013; Hampton, Goulet & Albanesius, 2014; Humphreys, 2005). This includes experimental research, examining the interactions between dyadic groups, which suggests that there is a causal impact of cell phone use on face-to-face interactions (Misra, et al., 2014; Przybylski & Weinstein, 2013). For example, Misra et al. (2014) suggest that although engagement can, and does, take place face-to-face when a cell phone is present, the presence of a cell phone significantly decreases the quality of conversations, and those individuals engaged in this situation tend to have less empathy

towards their conversational partner. As such, when it comes to building networks and making new connections, cell phones may actually hinder this process by diminishing the “‘here and now’ interactions with co-present others” (Misra, et al., 2014, p. 17). As such, we need to look more closely at the relationship between cell phones, isolation and network diversity.

Although cell phones allow for multiple lines of communication, and thus would seem to increase the possibility of interactions with others, research has also suggested that when a call is received on a cell phone, it has the tendency to alienate the cell phone user from others who are present (Humphreys, 2005). This may be due to the ritual nature of communications, and how cell phones raise anxiety related to not knowing the status of the other or oneself in a potential interaction (Ling, 2008), though it has also been shown that individuals tend to revert to their own personal norms for cell phone use, thus not detracting from relationship outcomes (Hall, Baym & Miltner, 2014). Previous studies also indicate that the use of cell phones in public places can limit the likelihood of reaching out to make connections with those around us, and thus we are very much alone in the presence of others while using our phones (Ling, 2008; Turkle, 2011). This was the case in my interaction with the young couple whose car had broken down. Before I approached and asked if they needed help, I saw that one of them was on the phone, which made me hesitate, as I didn’t want to “butt in” or interrupt. At the same time, it is possible that the young woman on her phone was also experiencing a similar uncertainty, and thus was retreating into the cell phone as a method of feeling safer, or more comfortable, as opposed to reaching out to make a new connection. Past research has found a trend of cell phone users retreating from the world around them, in that cell

phones allow users to “keep unwanted experience out... and... pull desirable experiences in” (Groening, 2010, p. 1339), and thus shutting off possibilities for social engagement in general. We can see then, that there could be potential social harms related to a decrease in interactions. Additionally, it has been observed that those with lower levels of social skills (and who are more likely to be isolated in the first place) also have a higher level of cell phone use, and that increased use of cell phones for calling others tends to relate with higher levels of loneliness (Hampton, Goulet & Albanesius, 2014; Jin & Park, 2012). Because of these trends and findings, it seems possible that cell phones may actually be serving to increase our isolation, while at the same time making us feel as though we are more social.

This process of being more social while simultaneously becoming more isolated, may have to do with the makeup of our social networks and those contacts whom we interact with via cell phones. Given what we have seen, previous research would seem to suggest that cell phones do not diversify our networks. Rather, they may limit our ability to make new connections, thus decreasing the possibility of forming new connections in our networks. This may be due to the cell phone acting as a sort of “digital umbilical cord,” keeping us tied to our preexisting networks wherever we go (Ling, 2004; Paragas, 2009; Geser, 2005). As such, it is possible that cell phones contribute to the “nucleation,” or contracting, of our social networks around a smaller group of strong ties, such as those with close friends and family members (McPherson, Smith-Lovin & Brashears, 2006; Purdy, 2010). For example, when moving away to college (or a new town, etc.), one may use their cell phone to maintain those relationships which already exist from “back home.” This connection with close friends and family members, and the

maintenance of these relationships, appears to be a major use of cell phones, with some 65% of adult cell phone users in a recent survey reporting that cell phones have made it “easier to stay in touch with the people you care about” (Smith, 2012). Because of this focus on existing strong relationships, via the cell phone, one might therefore miss out on opportunities to make new connections such as during social events or even knocking on a neighbor’s door to borrow some laundry detergent. This nucleation effect may positively influence our ability to maintain our close relationships (such as keeping up with a group of friends after high school), but at the same time it decreases the likelihood that connections or engagement will be made outside of this existing network. Basically, this line of reasoning holds that a very strong core network makes individuals less likely to reach outside of the network to make new ties that could be diversifying and beneficial. But why is this the case?

Previous research suggests that this pattern may be due to more than just a “time displacement,” or spending more time with technology than in other pursuits, like making new connections (Nie, Hillygus, & Erbring, 2002), especially since cell phones allow for multiple lines of communication (including face-to-face) to occur at the same time (Humphreys, 2005). As was mentioned above, cell phone-based conversations among large networks have been shown to be more productive when it comes to issues of public concern. However, this same study finds that this effect only exists in large networks of highly like-minded individuals (Campbell & Kwak, 2011), thus suggesting that network diversity is not a major element when that network is maintained via cell phone communication. Also, use of cell phones to contact and maintain existing relationships may offer a sense of security and trust in others (Kobayashi & Boase, 2014), and further,



such cell phone mediated contacts may affect “people’s self-reliance, making them unable to operate alone and leaving them dependent on the [cell phone] as a source of assistance and advice” (Katz, 2005, p. 173). These findings suggest that the cell phone itself may be a causal factor in the trend of nucleation, drawing our attention away from new connections (much like the distraction research discussed above), but also playing the role of fulfilling certain needs (support, information, attention, etc.) which eliminates the drive to make a diversity of new connections in the first place. And so it would seem that cell phones may be better suited for maintaining existing networks than for expanding the scope and diversity of one’s network.

Given that there appears to be evidence supporting the social effects of cell phones as both positive and negative, at least when it comes to network diversity and social interactions, there is certainly room for improvement when it comes our understanding of this technology. As we have seen in our examination of this literature, it may well be that cell phones have different social effects based on a more finite definition of terms, as is the case with networks. When considering the strength of network ties, it would appear that stronger relationships are more suited to support via cell phone communication, while weaker, more diverse network relationships may actually be negatively affected. And so, despite the number of studies looking at the social impacts of cell phones, our conclusions as to the nature of these effects are muddled at best. Interestingly, of all the research reviewed here, only two experimental studies (Przybylski & Weinstein, 2013; Misra, et al., 2014) seem to shine through in their attempts to establish a causal link between cell phones and social interactions. Indeed, most of the studies reviewed herein rely on more descriptive and exploratory approaches,

from surveys to field observations, and thus are only speculative when it comes to whether or not cell phones and their use are having a causal impact on our social world. This is not surprising, especially given the relative infancy of this field of study, with the majority of work having been conducted since the turn of the twenty first century. As such, there appears to be a need for an explanatory look into the actual causal effects of cell phones and their use on social processes. In this spirit, the goal of this study is to take a step in this explanatory direction. Before we begin however, we need a specific and meaningful social concept on which to test the impact of cell phones, and to this end we will now shift a discussion to social capital.

### Social Capital

Social capital is a concept which, like many others in the social sciences, has been conceptualized and applied in a variety of different ways. From a focus on networks and structural factors, to the norms, values and ideology which contribute to economic success, rural development and a host of other social and individual pursuits, analyses of social capital have taken many different directions (Coleman, 1990; Putnam, 2000; Uphoff, 2000; Helliwell & Putnam, 2000; Arku, Arku & Filson, 2009). Despite these many approaches, there are common themes in most studies of social capital, which are often pulled from more general definitions, such as that offered by Putnam (2000), who states that social capital generally refers to “connections among individuals-social networks, and the norms of reciprocity and trustworthiness that arise from them” (p. 19). In other words, social capital is the “stuff” which helps to facilitate collective action between members of a society, neighborhood, work group, or any other conglomeration

which at times must work together for some purpose of mutual benefit (Uphoff, 2000). These networks and norms are both an individual and structural basis. Networks are built by individuals making connections with others (Putnam, 2000), but the conditions under which the networks form, and in which one might feel comfortable reaching out to call upon their network (i.e., reciprocity and trust), are more structural in that they are built into the society or group in their influence on members (Lochner, Kawachi, & Kennedy, 1999; Putnam, 2000; Dekker, 2004). As a structural and individual concept, social capital has many benefits to offer individuals, beyond the collective benefits felt by groups as a whole, such as gaining needed knowledge and information or economic advancement (Coleman, 2000; Putnam, 2000). Furthermore, those groups, societies and communities with higher levels of social capital tend to benefit even the most poorly networked individuals (Putnam, 2000). With such a widely applicable concept with benefits and contributing factors at many levels of society, getting a bead on what social capital looks like can be tricky. In this regard, it will be beneficial to look at an example.

Take for instance a neighborhood that is in need of repair, with run down houses, overgrown yards, etc. A resolution of these issues would likely benefit all of the residents, in the form of improved property value, community building, or even the deterrence of deviant behavior if we draw from “broken windows theory” (Wilson & Kelling, 1982). But coming up with a solution, let alone carrying out the needed repairs, would likely require more than the efforts of one individual. Therefore, in this issue of collective benefit (even if it is one’s own home which is being repaired), there would be a need for a collective effort. Those who spearhead such a project would need to utilize their interpersonal networks (which might include local business owners for donations, a

tree trimming service, friends and neighbors, or city council members) in order to generate help and support. Along with this networking, there is also a need for trust among those involved in the project (Putnam, 2000), such that those who carry out the work, or even those who organize the effort, are not seen as taking away from the community or not contributing enough to the project.

This also brings up issues of generalized reciprocity, in that relying on the help and kindness of others, in order to paint a house or fix your front steps, is not a guarantee of specific returns but more general “help down the road” (Putnam, 2000). Without the existence of networks, a level of trust between participants, or a norm of generalized reciprocity, a project such as this might never be effective in its ends. And with these factors at play, helping move a project like this along, we can see the benefit of social capital. We should note here that help, or support (in a number of forms) is one of the main incarnations of social capital. As James Coleman (1990) says, “the more extensively persons call on one another for aid, the greater will be the quantity of social capital generated” (p. 321). With this basic understanding of what social capital looks like, it becomes evident that social capital is “productive, making possible the achievement of certain ends that in its absence would not be possible” (Coleman, 2000), just as other forms of capital, like tools (physical capital), or skills in construction (human capital), both of which are rallied and put to use through social capital, would also be necessary for the neighborhood improvement project (Putnam, 2000; Coleman, 2000).

And yet, we still have not nailed down what constitutes social capital. Is it found in the networks which are called upon for aid, or is it more reliant upon shared norms of reciprocity or feelings of trust between members of a given group? Much of the research

into the concept seems to suggest that it is a combination of these factors, which make up multiple dimensions of social capital (Uphoff, 2000; Coleman, 1990; Halpern, 2005). For instance, Helliwell and Putnam (2000) suggest that differences in the “breadth and depth of civic community... and... political behaviors” (measures of networks and involvement) can be used, in part, to establish how much social capital is endowed in different regions of a country, and thus to explain why certain areas are more economically successful than others.

In contrast to this large scale structural approach, Cross and Borgatti (2004) look at characteristics of interpersonal relationships, like the willingness to share knowledge with others, in order to investigate the realization of social capital at the individual level via the utilization of these relationships within networks. As we can see then, the different dimensions of social capital can help to inform an understanding of the concept as a whole, albeit in quite different ways. As social capital can be conceptualized as an aspect of social structures, and not of the individuals within them (Lochner, Kawachi & Kennedy, 1999), these dimensions (networks, trust and reciprocity), are necessary for assessing and measuring social capital at the individual level (Lochner, Kawachi & Kennedy, 1999; Putnam, 2000; Coleman, 1990). Given this multiple dimensionality of social capital, and thus the myriad ways that the concept can be approached, we will turn now to a more specific examination of these factors, in order to flesh out a working conceptualization of social capital as it will be utilized in the current study.

## Social Capital Dimensions

### Networks

As we have seen thus far, relationships with others are a vital part of social capital. Without others to provide information, support, resources, knowledge, and so on, completing tasks and reaching goals in a social context would be a daunting endeavor. Each of us has our own set of relationships which constitute the networks from which we might hope to draw these forms of support when needed, thus employing our social capital (Coleman, 2000; Halpern, 2005; Putnam, 2000). According to Coleman (2000), one of the main purpose of these relations, as they relate to social capital, is to facilitate action (or holding the potential for action until called upon), such as knowing a local politician who can help to provide a street sweeper for a neighborhood clean-up, or a neighbor who knows how to patch a leaking roof. One way in which these relations facilitate action is through the sharing of information, such as within academic circles, which make it easier to stay up to date on the latest research or theory development without needing to read through thousands of pages of text (Coleman, 2000), or in finding a new job, where having contacts in your field would make it easier to hear about new openings in a timely fashion (Putnam, 2000).

When it comes to social capital then, it would appear that what you know personally is far less important than who you know within a network (Putnam, 2000). Indeed, much of the empirical work on social capital has looked at the extent of networks in order to establish the existence of social capital, especially in light of the rise of modern technology, an area of great interest in the current study (Huysman & Wulf,

2004; Krishna, 2002), as can be seen in the work of Putnam (2000), who extensively maps the connections between Americans and social institutions and organizations. It would seem that if nothing else, networks (and the relationships they contain) are a vital part of studying and understanding social capital (Krishna, 2002). But this is not to say that all social relationships are created equally, and there may be some types/forms of networks which are more apt to producing social capital than others.

Given that who you know is an important aspect of social capital, it would seem that having close-knit relationships with as many members of your network as possible would be a good approach to strong social capital. For example, in a study of the diamond market, Coleman (2000) finds that the strong bonds between merchants builds a sense of community, in which support is regularly reciprocated. Such a close network, with a large degree of “strong ties,” or those consisting of family and close friends (Granovetter, 1983), allows merchants to regularly hand each other bags of diamonds for private examination. The “strength of these ties makes possible transactions in which trustworthiness is taken for granted and trade can occur with ease” (Coleman, 2000, p. 17). In other words, without strong network relationships, the social capital for such a business enterprise to succeed would be much more difficult. We will discuss the importance of trust in social capital below, but for now it is important to note that the stronger a network tie, the greater the likelihood that there will be a norm of trust at play. This type of social capital is known a “bonding social capital,” which “tend[s] to reinforce exclusive identities and homogenous groups” such as those found in “fraternal organizations, church-based women’s reading groups, and fashionable country clubs” (Putnam, 2000, p. 22). As such, collective efforts within these close-knit groups would

likely call upon the support (knowledge, skills, etc.) of those who are known well by other group members in order to be successful. And so, a network full of strong ties can indeed be beneficial for social capital. But what if the problem, or solution, at hand falls beyond the capabilities of such an immediate and close-knit network? In such a case, it might seem that having a network with more diversity and more far-reaching ties would be beneficial.

Returning to our example of a neighborhood cleanup project, suppose that the only people on your block that you knew (and were able to call upon for help) were your immediate neighbors, and perhaps beyond that you had very close relationships with family members and friends outside of the neighborhood (who might not be able to offer the support necessary in a timely manner). Now let's say that a problem arises, such as a broken water main while digging in a flower bed, and no-one within your close-knit group of family and close friends has the skill set or plumbing related knowledge needed to stem the flow of water. In this case, we might say that you have fairly weak social capital, given that your network is not able to come together in order to aide you in the solution to the problem. This is an illustration of the importance of network diversity, in that having a network composed of people, institutions, and other connections, beyond just immediate family and friends can bring more potential for support in a wider range of situations, from job openings and housework to public policy and civic action (Granovetter, 1983; Putnam, 2000). We might say that such a network would have a wealth of "weak-ties," those which are composed of acquaintances and those one might not keep in touch with on a regular basis (Granovetter, 1983).



Despite being called “weak,” such ties have been shown to be an important factor in the success of collective or even individual actions (Granovetter, 1983), allowing for a bridging across different social groups and a broader potential for support and even reciprocity (Putnam, 2000). Basically, the more people you know, the more options you have. And given that strong ties require more upkeep (such as regular conversations, or a more specific reciprocity when help is offered), it would likely be difficult to have a very large network full of strong ties (Granovetter, 1983, Putnam, 2000). Often, in the absence of strong ties, due to physical distance or lack of necessary skills/knowledge, weak ties can be called upon to fill in the void. The main strength of this “bridging social capital” (Putnam, 2000), then, is to make connections outside of our smaller close-knit networks, and to bring together the skills, knowledge, abilities, and resources of multiple close knit groups via a weak tie (Granovetter, 1983). But this is not to say that weak ties cannot themselves be a form of social capital. Indeed, in my experience with the young couple whose car had broken down, I was a brand new acquaintance, the weakest of weak ties, who was able to offer support in the absence of a stronger tie (family members who lived a significant distance away). Having access to people who have the information or support that you need is therefore rather important, and the possibility of getting the right support or information for a wider variety of issues/situations is increased with weak ties in a network (Cross and Borgatti, 2004; Putnam, 2000).

It appears then, that both “strong” close-knit networks, and “weak” diverse networks are vital aspects of social capital. Therefore, not only is the existence of a network important, but also the formation of these networks, which we can logically conclude is part of the formation of social capital. This would seem to suggest that

having the ability to reach out and make new network connections, to call for aid from friends as well as strangers, and thus to create networks in the first place, is an important aspect to focus on, and one which is very much related to the remaining factors of social capital, trust and reciprocity.

### Trust

As a factor involved in social capital, trust is one of the norms which helps to facilitate the relationships and interactions in which social capital resides, as per our discussion of networks above. As a norm, trust regards the feelings that individuals have of the groups, or communities in which they live and work (Halpern, 2005), as well as the general environment of these trusting feelings (or lack thereof) which is created for anyone who joins such a group or community (Putnam, 2000; Halpern, 2005). As such, the “trustworthiness” of groups and individuals can feed off of one another, with more trust in a community influencing more trust between individuals and vice versa (Putnam, 2000). As we saw in the example of the diamond merchants (Coleman, 2000), having a general sense of trust in members of a network can lead to higher degrees of social capital in the operation of a business. These high levels of trust would seem to relate more to those relationships we would consider “strong ties,” and indeed, with these close relationships we tend to find higher levels of trust (Levin & Cross, 2004). While higher levels of trust in strong ties seems to be an important factor when it comes to maintaining relationships (Coleman, 2000), it is not necessarily beneficial when it comes to network diversity.

Those networks with lots of weak ties (and hence less trust overall) are more likely to be beneficial in terms of gaining new information (Levin & Cross, 2004), which is one of the main functions of social capital when it comes to facilitating action (Coleman, 2000). Because of this, past research finds that trust, generally used as an indicator of social capital at both the structural and individual level (Nath & Inoue, 2009; Brehm & Rahn, 1997; Inkeles, 2000; Shah, 1998), is especially effective in the transfer of knowledge when it exists in weak tie relationships (Levin & Cross, 2004). This is rather interesting, as it seems that a high level of trust in strong tie relationships is less effective than perceived lower levels of trust in a weak tie relationship when it comes to gaining new knowledge, given the diversity that weak ties bring to the table (Levin & Cross, 2004). In other words, perceived trust is less important in strong existing relationships (where trust may be taken for granted), while in newer and weaker relationships, perceived trust plays a more important role in facilitating exchanges of information. As such, it appears that trust may play a major role in setting up the potential for a useful exchange between network members (Levin & Cross, 2004), or even the possibility of reaching out and making new connections in the first place. For example, if a general sense of trust exists within a newly formed group, let alone an existing group, such that members see the likelihood of being helped when they request it (Cross & Borgatti, 2004; Van Den Hooff, De Ridder & Aukema, 2004), then it would seem more likely that new connection would be made in the solution of problems. And it is this approach to trust, as a factor which aids in the formation of new connections and knowledge sharing that will be important to account for in our investigation of social capital as we move forward. In

this way, trust is related to the last of the social capital dimensions we will consider, reciprocity.

### Reciprocity

Whereas trust helps to build and strengthen the networks of relationships in which social capital exists, facilitating the interactions which take place within them, reciprocity also contributes to social capital in the cohesion of group members as they work towards both individual and collective benefits. Reciprocity refers to the expectation of fulfilling obligations which exist between members of a network (Putnam, 2000; Coleman, 2000). Basically, reciprocity is a “you scratch my back and I’ll scratch yours” situation, in which help given by others (whether offered or called upon) is repaid, based on an obligation which arises out of the interaction (Putnam, 2000).

This obligation for repayment differs based on the situation/network in which the interaction takes place. In tight knit networks, and those in which members work together directly with one another, the obligation for reciprocity tends to be more specific. That is, repayment of help and favors is expected on a one-for-one basis, “I’ll do this for you if you do that for me” (Putnam, 2000, p. 20). In those networks and social structures which are more widespread (like a community), the obligation of reciprocity tends to be more general, with a sense of payment and repayment built into the structure itself. This general reciprocity is more like “karmic balance,” in which people might offer help or support without wanting any specific repayment in return (Putnam, 2000). This was very much the case in my experience with offering tools to the couple with the broken down car. I will probably never see them again, so I didn’t expect a specific

return of favor, but perhaps someday when my car breaks down someone will stop on the side of the road and offer to help me. This would be reciprocity in probably the most general sense, receiving help from strangers, though when a police officer stops to help you with your car (even if you have never donated to a sheriff's association) this is also a form of generalized reciprocity built into a social structure (Putnam, 2000). Despite its form, "the density of outstanding obligations means, in effect, that the overall usefulness of the tangible resources of [a] social structure is amplified by their availability to others when needed" (Coleman, 2000, p. 21). In other words, the more people within a network help each other, whether expecting a specific return or not, the greater the sense of reciprocity and the more likely that information, or help, will be exchanged between members.

We can see, then, that trust plays a major role in the form of reciprocity which exists in a network. With a high degree of trust, there is likely to be a more general sense of reciprocity, with members less hesitant to help one another when they feel as though they will be repaid down the line, or that other members will actually help them in the first place (Coleman, 2000; Putnam, 2000; Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004). Similarly, a higher level of trust can relate to feelings of cohesion and "togetherness," which have been found to support more generalized reciprocity and thus more utilization of social capital (Nath & Inoue, 2009; Van den Hooff, De Ridder & Aukema, 2004).

The act of asking for help, or sharing support, can be a rather difficult and potentially "dangerous" task for those involved (Cross & Borgatti, 2004), and therefore reciprocity and a sense of togetherness are important in order for the exchanges to take

place. Are you comfortable with sticking your neck out and asking for help? Will you be looked at differently by your co-workers because you didn't know the information covered in last week's training? In these cases, there are definite social perils (at least perceived) which could come from reaching out to member of a network for help. Likewise, the person offering the support could also face some potential risks. Is the information be given accurate? What if you tell your boss the wrong thing, will you get fired? And so, while a diverse network is important in order to have access to needed information and help, feeling that other members of your network are accessible, and that they will help you when asked, is also an important factor when it comes to utilizing social capital (Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004). Given our discussion of social capital thus far, we can see that a conceptualization of social should take into account multiple dimensions, as networks, trust and reciprocity are all very much intertwined. Why then should we care about social capital? Is it just another trumped up academic concept that can be broken down into ever finer interpretations and definitions, or does it actually hold significance to our understanding and operation of the social world?

### Theory and Trends

Regardless of how it is approached, social capital has received quite a bit of attention over the years, both in academic and public spheres, as a factor which is of great importance to human society. While the term "social capital" is a relatively recent phenomenon, coined by several academics in the twentieth century (most notably James Coleman and Robert Putnam), the theoretical underpinnings of the concept have been

around for much longer (Coleman, 1990; Putnam, 2000; Halpern, 2005). For instance, Alexis de Tocqueville (1966), in his observations of the U.S. in the mid-nineteenth century, made note of the importance of organizational memberships and voluntary associations when it came to the operation of a democratic society. While not social capital per se, this does hint at the role of networks in societal operation, which isn't far from our understanding of social capital thus far (Halpern, 2005). Max Weber (2011) also offers some insight into social capital with his discussion of religion as a force for economic development, with these networks (and associated norms and values) offering benefits to members (Halpern, 2005).

Perhaps most notable in early social theory related to social capital is Emile Durkheim. Durkheim lays out the idea that larger social factors and forces have an influence on individuals, and that these "social facts" reside outside of the individual, which sounds very familiar to conceptions of social capital as a structural factor (Putnam, 2000; Halpern, 2005; Lochner, Kawachi, & Kennedy, 1999). In his examination of suicide, Durkheim (1979) offers more insight by showing that social cohesion, or the lack thereof (disorganization) can contribute to different levels of suicide. For instance, he states that times of war or social disturbance "rouse collective sentiment, stimulate partisan spirit and patriotism, political and national faith, alike, and concentrating activity toward a single end...they force men to close ranks and confront the common danger, the individual thinks less of himself and more of the common cause" (Durkheim, 1979, p. 208). In other words, larger social forces bring people together, and because of this cohesion, there are benefits to both society and individuals, in the form of decreased disorganization and suicide rates (Halpern, 2005).

More modern work has also placed social capital in the fore front of importance for social theory. Manuel Castells (2000) suggests that we now live in a “network society,” or one which is not based on fixed social structures, but rather is composed of the multitude of network (from corporations and governments to interpersonal networks) through which information flows. Because of this new importance of networks, it would only seem fitting that the social concept which resides within networks and gains its power from them (i.e. social capital) would be of particular importance, especially where the movement of information is concerned. These bases and directions for inquiry suggest that social capital has held an important place in our theoretical understanding of the social world for some time prior to our recognizing it as a specific concept, and that it will likely remain an important concept in one form or another in the future.

As it is a theoretically important concept, there have been many attempts to understand the how social capital has changed historically. Perhaps most notable is the work done by Robert Putnam, which has informed the debate over social capital in the U.S. for the last several decades. Putnam (2000), whose definition we began with, suggests that social capital has been declining in the U.S. over the last half century. He notes changing levels of membership and participation in civic engagement activities and social organizations/groups, such as fraternal organizations and even bowling leagues (Putnam, 2000). This decrease in community and social involvement suggests a loosening of social bonds, via less diverse networks, as well as a decrease in the norms of reciprocity and trust which are vital to the formation and utilization of social capital.

Putnam goes on to suggest that low levels of social capital have the potential to affect (at least partially) many aspects of social and democratic life, from educational



attainment to crime rates and the operation of democratic systems. For instance, in order for the U.S. tax system to operate successfully, it depends (at least in part) on a collective sense of trust and reciprocity among citizens, that everyone will contribute and do their part, and in areas where social capital is higher there is a positive correlation with tax compliance (Putnam, 2000). Along these lines, it seems that much of the discussion of social capital involves the potential harms which can result from lower levels. On this same note, Eric Klinenberg (2002) examines the deaths associated with the 1995 Chicago heat wave, finding that it was isolation, and lack of social connections and trust, which played a large role in determining who was most affected by the natural disaster. With such sensational examples of the effects of social capital, both positive and negative, it is no surprise that it has garnered both public and academic attention, especially when discussions of declines or “self-improvement” are involved (Badger, 2015; Willard, 2015). Given the important role of social capital in our world, it is important to examine what previous research says about the factors that contribute to a decrease (or increase) in levels of social capital.

Previous studies have looked at a number of factors that may influence social capital, both positively and negatively. According to Putnam (2000), social capital is negatively affected by things attributable to the modernization of society, such as busy schedules, tight budgets and suburban living to name a few. All of these things contribute to a sense of individualism, and have the potential to cut into the collective basis upon which social capital is built (Van den Hooff, De Ridder & Aukema, 2004). Alexis de Tocqueville noted that individualism, or the “calm and considered feeling which disposes each citizen to isolate himself from the mass of his fellows and withdraw

into the circle of family and friends...” (1966, p. 506), is a product of democratic societies that can lead to egoism, or self-love (de Tocqueville, 1966). That is, that the equality which arises from a democratic structure influences individuals to rely less on interactions and relations with others, and more on their own interests and pursuits (de Tocqueville, 1966). Similar patterns of individualism have been found in more recent years. Robert Bellah, et al. (1996) argued that individualism has the tendency to make people less involved in their communities and therefore more likely to be manipulated (1996); in effect, American individualism has handed over control of the government from the citizens to “a new breed of professional politicians who specialized in the accommodation of interests rather than in civic virtue” (Bellah, et al, 1996, p. 255). Individualism has a long history of being related to declines in social capital, and associated negative effects, and as such, many things might be contributing to this sense of individualism.

One of the most interesting factors that may be contributing to a rise in individualism is modern technology, especially television and mass media. According to Putnam, television use has played a major role in isolating individuals and is “the single most consistent predictor” (2000, p. 231) when it comes to civic disengagement and declines in social capital, both individually and collectively (Putnam, 2000). Part of this may be due to the television being a private form of entertainment, draws individuals into their own private lives whereas they might be drawn out into public with other forms of entertainment like theatres or social clubs (Putnam, 2000). Shah (1998) finds that television use relates negatively with trust, and that a factor which may contribute

negatively to participation or engagement with others could also negatively affect trust and thus the potential for social capital formation.

Along these same lines, research has also looked at the influence of the Internet on social capital in modern times. Some of this past research seems to suggest that there is a positive relationship between Internet use and social capital. For instance, whereas television tends to draw people away from interaction in its very one sided use, the Internet has the potential to be used to make connections with others, engage in the civic and social world, and even serve as the platform on which networks and relationships reside (Kwak, Poor & Skoric, 2006; Shah, et al., 2002; Turkle, 2011; Castells, 2000). Online communities for instance, offer us a look into the ways in which this technology might help to bolster social capital.

The concept of the virtual community first emerged in the late 1970s to mid-1980s, with the advent, and spread, of bulletin board systems, or platforms on which people could communicate with, and find information from, others on a variety of topics (Rheingold, 1993). Howard Rheingold, a user of the Whole Earth 'Lectronic Link (WELL), one of the first such bulletin boards, documents the sense of community that came from using the WELL, such as when he needed information on removing a tick from his daughter's head, coming together with others to provide information to a WELL member whose son was diagnosed with Leukemia, or gathering for picnics and other celebrations/gatherings offline (1993). From these early beginnings, which we might today consider rather outdated (email messaging was the latest and greatest technological tool of the WELL), there has grown a wide array of different types of platforms and activities to which have been applied the label of virtual community.

One of these forms of virtual community is the “confession site,” which involves a messaging platform, in which individuals can anonymously post their most personal thoughts, emotions and secrets, from suicidal feelings and drug use, to romantic encounters, embarrassing events and regrets (Turkle, 2011). Based on interviews with participants, Sherry Turkle has found that some users feel “relieved and less alone” after posting their confessions and reading those of others, and thus have a feeling of connection and community with people who are otherwise complete strangers (2011, pp. 237-239). This seems to illustrate several important factors related to social capital, including mutual support, reciprocity and trust, along with network building with a greater diversity of members than might be possible in a face-to-face context. Similarly, another virtual community appears to exist in the world of online gaming.

Massively multiplayer online role playing games (MMORPGs) are a huge business in the U.S. and around the world, with one single game, World of Warcraft, involving nearly 8 million members in 2014 alone (Makuch, 2014). These games, like World of Warcraft, Second Life, Everquest, and many more, allow players/participants to interact with others (who they may or may not know offline), working together in order to achieve various goals (Turkle, 2011). In World of Warcraft for instance, players often form close knit groups, known as guilds, who interact on and off the game (through emails, messages and meetings) in order to complete “quests” within the game (Turkle, 2011; Dretzin, 2010). These relationships that are formed along a shared purpose would seem to constitute social capital as per our conceptualization above. We also see feelings of community among those participating in these games, who reported that they feel connected with others and that in some cases the virtual world of the game is seen as

more supportive than what is experienced in the “real world” (Turkle, 2011, p. 161; Dretzin, 2010). This may suggest that a form of digital social capital, not based in the offline world, can have real effects on individuals.

We may also see this type of network building on social networking websites, such as Facebook and Myspace. On these sites, one of the primary features is the constitution of networks, adding and “friending” people, including those we know well, acquaintances, as well as much weaker relationships and even complete strangers (Boyd, 2006). This establishing of networks of relationships, and the potential for interactions with these networks does indeed seem to give people a feeling of connection and community (Boyd, 2006; Turkle, 2011). This is illustrated for instance when a student starts at a new college and begins to add their new acquaintances, people who have the same major, or who live in the same dorm, to their networks and as a result feels more connected with those in the college community, and thus has more possibilities for social capital. While all of this seems to suggest that the Internet has a wholly positive impact on social capital, there is also research which suggests that there is more to the interaction.

Previous studies have indicated that Internet use might actually relate negatively with social capital, in terms of displacing time which might otherwise be spent engaging civically or interacting with others, and decreases in a sense of offline community, with heavy Internet users less likely to know their neighbors (Nie, Hillygus & Erbring, 2002; Katz & Rice, 2002). Ultimately the relationship is probably much more complex, with different types of Internet use contributing to social capital in different ways, though research seems to suggest the most common uses of the Internet (including social

networking) does not have a significant impact (Purdy, 2013). As we saw above, however, the Internet appears to be a haven for building of networks and even the building of trust and reciprocity. And yet, these virtual communities might not be all that they appear to be when it comes to social capital. Research into virtual communities suggests that differences exist with traditional communities when it comes to the impacts and benefits, and thus the social capital, which arises out of and is felt by members of these two forms. Sherry Turkle suggests that there is a difference between traditional and virtual communities when considering communities in times past:

I grew up hearing stories about those times. There was envy, concern that one family was doing better than another; there was suspicion, fear that one family was stealing from another. And yet these families took care of each other, helping each other when money was tight, when there was illness, when someone died...What do we owe each other in simulation? .. What real-life responsibilities do we have for those we meet in games? Am I my avatar's keeper? (2011, p. 239).

What Turkle seems to be suggesting, is that with virtual communities there is somehow less commitment of those involved both to the community itself, and to other members. Such a lack of commitment might be due to the fact that, despite being actual communities, the virtual is still considered to be less than "real" to some extent. And this feeling of non-reality could perhaps translate into a lack of collectivism, trust and reciprocity. For instance, if you are interacting with another person on a game like World of Warcraft, who looks like a giant troll, and survives regular attacks with swords and magic spells, it might not be surprising to find that there is an air of fiction to the entire relationship, despite the fact that you are working together towards some collective goal. Likewise, while we can see that virtual communities allow for, or even facilitate, the formation of weak ties, such as on social networking websites or games, these might

actually be very weak or perhaps even superficial ties. That is to say, the ties which we form in online communities might not translate over into real world social capital, like finding a job or getting picked up when your car dies, which is based on the strength that is found in weak ties formed in traditional communities and face to face interactions (Granovetter, 1983).

In Turkle's description of the difference between virtual and traditional communities above, she notes that there is also an aspect of conflict and disagreement which has the tendency to arise in communities. The major difference that this brings up, is the way in which these conflicts are dealt with. In the traditional community, the sense of general reciprocity and physical proximity would seem to suggest that when conflict arises it must be dealt with, even if this means putting it aside and helping those with whom the conflict is based when they are in need (Putnam, 2000). Basically, even if you don't like your neighbor, the fact that she lives right next door means that you might be more inclined to offer help or support when she breaks her leg and needs someone to walk the dog. But in online communities, this physical proximity does not necessarily put you into close contact with other members, and thus makes issues somewhat more distant, and perhaps reduces the possibility of social capital being fully utilized.

As with the television, there may also be a degree of individualism which comes to bear in virtual communities. Virtual communities are very much individually focused as members self-select into those communities which best suit their needs, creating specialized "personal communities" (Castells, 2000, p. 389). This is opposed to more traditional communities, such as those based on family or education, in which there is much less ability to self-select. As we have seen, a sense of individualism tends to be

negatively related to social capital, with members able to opt out of the community/network should conflict arise, and thus a decrease in reciprocity and trust. And so, despite the ability to build vast networks online, without the accompanying norms of trust and reciprocity, the Internet might not be the panacea for decreasing levels of social capital. But what about a technology which is a bit more personal in its use and purpose, like the cellular phone? How might use of this technology affect the formation and utilization of social capital? It is these questions to which we will turn our focus for the remainder of this paper.

### Measuring Social Capital

Based on the dimensions of social capital that we have discussed thus far, we need to shift our focus to how we might conceptualize and measure social capital in the current study. Previous research tends to focus on the three main dimensions/factors as indicators of social capital, most prominently the composition and extent of social networks. For instance, Putnam (2000), in his extensive examination of social capital in the U.S., looks at many aspects of social networks, mapping patterns of membership in social institutions (using survey data and public records) such as civic and religious organizations. Taking a different approach, Moses Acquash (2009) interviewed managers from family and non-family owned businesses in Ghana, collecting information on the composition of their networks, and how the networks were used, as his measure of social capital. As was discussed above, the strength of the ties which compose a network are an important aspect of social capital, and previous studies have utilized this aspect of as well. Dhavan Shah (1998) found interpersonal trust to be a factor which arises out of



community/civic participation (i.e., network building and usage), an important distinction which would not have been found if only network related measures were employed.

When it comes to specific measures of reciprocity however, there seems to be a lack of previous research making a specific distinction between measures of trust/trustworthiness and those of reciprocity. Indeed, many studies focus only on trust without any mention of reciprocity as an indicator of social capital (Brehm & Rahn, 1997; Shah, 1998; Inkeles, 2000). However, in these studies, it appears that reciprocity is indeed being measured, though not being named as such. For instance, Cross and Borgatti (2004), include measures of engagement (feeling that someone will be willing to engage in solving a problem) and access (feeling that others are generally available to help), which would seem to hint at a more general feeling of reciprocity in group settings when it comes to sharing information. Likewise, Van den Hooff, De Ridder, and Aukema (2004) look at the willingness of group members to share information with others as a form of collectivism, which reflects the quality of general reciprocity that is important for social capital (Putnam, 2000). Importantly, there are very few previous works on social capital which utilize only a single dimension of social capital. This suggests that in an assessment of social capital, all three of the major dimensions need to be included, so that a full picture of the concept can be found.

In the current study then, all three dimensions of social capital must be taken into account, but at what level of society should these dimensions be measured? As was discussed above, the dimensions of social capital exist and contribute at both the individual and structural level (Putnam, 2000; Lochner, Kawachi, & Kennedy, 1999). Social capital that is entrenched in institutions or even geographical regions (due to

established networks and the cultural norms of trust and reciprocity) has an impact on individuals in the production of social capital and its benefits, like economic prosperity, at a structural level (Helliwell & Putnam, 2004). Therefore, approaching social capital at these higher levels of society, such as looking at the availability of civic opportunities within communities (Helliwell & Putnam, 2004), is likely to provide useful information regarding the state of social capital, both for individuals and for higher levels of society.

However, a structural approach might miss the dynamic nature of social capital, which “comes about through changes in the relations among persons that facilitate action” (Coleman, 2004). Networks belong to individuals, in the connections and relationships that they have, their different capacities of trust and reciprocity which make it more or less likely that they will reach out and make those connections in the first place. Because of this, social capital can be measured at the individual level, such as looking at each individual's civic involvement or feelings of trust and confidence in others and institutions with which they interact (Brehm & Rahn, 1997; Dekker, 2004). Dekker (2004) suggests that at the individual level social capital, as inherent in networks, should be investigated by looking at relationships, networking, and available resources; while social capital inherent in norms and values should be investigated by looking at specific trust and reciprocity within these relationships.

Similarly, one could assess social capital by looking at the behaviors of individuals within groups or communities, such as the willingness to share information, make new connections, or work with others to solve a problem, and incorporate indicators of trust and reciprocity to round out the picture of social capital (Cross & Borgatti, 2004; Dekker, 2004; Van den Hooff, De Ridder and Aukema, 2004). This

individual level approach to social capital would seem to be the most effective for those studies which seek to explore the mechanisms by which social capital is influenced in its formation and utilization, as opposed to those which are interested in “taking stock” of social capital on a larger scale. In other words, while “communities with healthier stocks of social capital are better able to avoid... problems than those with weak stocks... ‘communities’ do not join the PTA or enlist in farming organizations, parents and farmers do” (Brehm & Rahn, 1997). Given that the goal of the current study is to investigate such an interaction, a social factor which might influence social capital as it manifests at the individual level, it seems most promising to approach social capital by observing the behaviors and feelings of individuals.

This brings us to a final factor for consideration when it comes to conceptualizing and measuring social capital: existing capital, or capital formation? An examination of previous works on social capital reveals that there is a distinction to be made between measuring social capital as it exists in the lives of individuals (or social structures) and the formation of social capital in the first place. Many studies involving social capital are geared towards an account of what social capital looks like, or how different levels of social capital affect various social phenomena. For instance, Richard Rose (2000) examines how social capital functions in Russia, where institutions and organizations play a different role than in other nations, finding that networks used for different purposes (health care vs. job searches) tend to differ in composition of membership and levels of trust. On a different angle, Helliwell and Putnam (2000) examine what social capital looks like in Italy, suggesting that it helps to explain differences in economic status between geographic regions. This approach to social capital (which appears to be a

majority of cases) is more descriptive, and focused on those things which social capital effects on a larger scale, taking for granted the processes by which the capital came to be in the first place.

On the other hand, we have those studies which are more interested in the formation of social capital, and the factors which play a role in its utilization. While fewer in number than those studies looking at existing social capital, and thus in need of more development, these studies offer unique insight into the causal factors of social capital at the individual level. Shah (1998) takes this approach in his examination of the effects of television use social capital, finding that for different types of programming there is an effect on trust that may then lead to a higher, or lower, possibility of social capital utilization. Looking more at the formation of social networks in the first place (via making network connections), Cross and Borgatti (2004), and Van den Hooff et al. (2004) look at the factors which affect those seeking information, and those willing to share it, such as access to network members, perceived engagement of others and a sense of collectivism. In this regard, they find that the sharing of information creates reciprocity and that using social capital effectively has more to it (in terms of relational factors) than simply the size of one's network. As we can see, there are merits in both of these approaches to social capital conceptualization, as both contribute to our understanding of a complex concept. However, for our purposes in this study, looking at those factors which might influence/affect social capital, it seems that a focus on the formation of social capital will be most rewarding, given that this is the gateway to the establishment of social networks (and a precursor to the use of social capital in existing networks), and especially since there is a need for development of this area of social

capital research. That being said, our attempt to shed new light on social capital by approaching it with an individual level focus on its formation (pulling on all three of its dimensions) should prove to be useful to our understanding of the social world, given the importance of this concept both theoretically and practically.

### Cell Phones and Social Capital

Up to this point, we've seen that cell phones have had a major impact on our lives, both personally and socially, though whether the effects are positive or negative is still up for debate. And now that we have demonstrated social capital as a major, and measurable, factor in social life and theory, which may well be affected by technological advances, it is time to turn our attention to what the relationship between cell phones and social capital might look like. Only a handful of previous studies have made an explicit effort at examining this relationship in particular, perhaps due to the timing of both cell phone and social capital related research, with the focus on cell phones seeming to come after the major empirical and theoretical efforts related to social capital. For instance, in his book *Bowling Alone*, Robert Putnam (2000), who is often considered to be one of the main players in the development of social capital as a social concept, makes only passing reference to the cell phone, noting that it has likely helped the spread of telecommunications.

But many other previous studies have had a more implicit approach, not looking at social capital or cell phone use directly, yet developing results which might help us to reach a better understanding of how these two major factors in our social lives are related. In our approach to the relationship between cell phones and social capital, we will look at

the different dimensions of social capital (networking, trust and reciprocity), as well as the role of cell phones as potential sources of capital. We will conclude with a discussion of some demographic considerations in this relationship, before transitioning into the research questions and hypotheses which are the focus of this study in its examination of cell phones and social capital.

#### Cell Phones: Networks, Trust and Reciprocity

When we think of the cell phone, one of the first things that jumps out in its relationship with social capital is the role it plays in social networks. As a communications device, one of the main purposes of a cell phone is to contact other people, and as such it is not surprising that much of the research and discussion of effects on social capital revolves around the network dimension. In an ethnography of cell phone use in Jamaica, Horst and Miller (2006) find that cell phones allow users to maintain large networks which they utilize for a variety of benefits, from maintaining existing networks to asking others for help with college money and even “hooking up” with sexual partners. This example seems to show that cell phones have a positive relationship with social capital, in helping to support networks and giving access to, those networks which we may need to call upon for help and support. Similarly, Putnam (2000) suggests that telecommunication technologies (including the cell phone) help to “offset some of the disconnection” (p. 169) with networks, characteristic of individualism, that can lead to decreases in social capital. This would seem to fall in line with the more utopian side of cell phone research, which, as we discussed above, suggests that this technology helps to increase network scope and diversity and even

offers new avenues of connection due to being a status symbol (Wei & Lo, 2006; Campbell & Kwak, 2011; Sooryamoorthy, Miller & Shrum, 2008).

At the same time, it appears that cell phones allow for the mobilization of network resources, such as in the case of student protests and other collective actions (Rheingold, 2008; Biddix & Park, 2008). For instance, cell phones have been shown to play a major role in the mobilization of resources (human and otherwise) in political movements in recent years from Central America to the Middle East, allowing users to transmit information and video otherwise censored in the mainstream media, and even offer new forms of collective action such as “flash mobs” (Rheingold, 2008; Morozov, 2011; Castells, 2012).

All of this seems to suggest that cell phones would have a positive relationship with social capital via networks. And yet, if we look more closely, we can see that the relationship may not be so straight forward. We have seen that cell phones may help to maintain those close relationships with family and friends, our “strong ties” (Campbell & Kwak, 2011; Julsrud & Bakke, 2009; Miyata, Boase & Wellman, 2008; Wei & Lo, 2006). In this way, cell phones may be very useful in the upkeep of networks from which social capital can be utilized, especially since these strong ties include those relationships which tend to be more trusting and which have a higher degree of reciprocity (Granovetter, 1983; Coleman, 2000). Because of this, it would appear that cell phones may have a positive effect on what Putnam (2000) calls “bonding social capital,” in the support and maintenance of close knit networks (Chan, 2013).

At the same time, we have seen that cell phones may have a negative effect on network diversity, limiting the likelihood of reaching out and making new connections,

by offering up instead the security of strong ties via the digital umbilical cord (Misra, et al., 2014; Przybylski & Weinstein, 2013; Ling, 2008; Turkle, 2011, Geser, 2005). Therefore, it may be possible that cell phones limit the formation of the “weak ties” on which “bridging social capital” relies for its strength (Granovetter, 1983; Putnam, 2000). This nucleation of networks, and increase in the potential for social isolation despite the capability of more contact with others, would seem to play into the pattern of individualism which has been shown to affect the strength and impact of social capital throughout the ages (Putnam, 2000; de Tocqueville, 1966; Van den Hooff, De Ridder & Aukema, 2004). To this end, it would seem that cell phones could be compared with the television, air-conditioning, refrigerators, and other technologies which have made individuals less reliant on social gatherings and support, and more content in their own isolated social spheres (Eitzen, 2013; Putnam, 2000). And yet there may be a kind of “hyper-individualism” at play with cell phones, as they allow users to actively select the networks and information (especially when considering Internet capabilities) which they feel are most worthwhile or comforting to them (Groening, 2010).

We have also seen that there may be some negative effects on social capital when it comes to non-traditional communities/networks such as those which exist in the virtual world, given their self-selecting and transitory nature (Turkle, 2011; Castells, 2000). With cell phones, the networks which are maintained likely have more basis in “real-life” (i.e., you have to get someone’s phone number in the first place), though the actual maintenance of these relationships may take place only via phone conversations or even text messaging. In this case, there would also seem to be an air of superficiality when it comes to cell phone based networks. For instance, if someone “tweets” (posts a message



to their Twitter account) via their phone (or even sends out a text message) that they need help with a project or a broken down car, there may be less impetus to help than if the call for help were in person or even by voice over the phone. Similarly, the mobility of the cell phone means there is a high degree of transition, and a lack of truly knowing where anyone in your network is at any given time (whereas with a landline phone if they pick up it means they are in a definite reliable location), which could lead the person calling upon their network for help in a state of not knowing about the certainty of a response, let alone help actually coming through. As was demonstrated by Cross and Borgatti (2004), a lack of access (or known access) to network members can have a negative impact on the formation of social capital via information sharing.

Framing this relationship within an examination of the formation of social capital would also appear to be worthwhile. In our discussion of social capital above, we noted that there are a number of factors which might affect the formation of social capital, including access to network members, feelings of engagement and a sense of collectivism and togetherness within a group or network (Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004). As discussed above, cell phones may have a potentially negative impact on social capital via a lack of reliable access to group members. When it comes to engagement with others, and an expectation of their willingness to engage with you in knowledge sharing or problem solving, cell phones might also have an effect. Cell phones within established networks, in which members have a high degree of trust, seem to relate positively with members working together (Julsrud & Bakke, 2009).

At the same time however, when it comes to making new connections, or solving problems/sharing information among networks with weaker ties, it would appear that cell

phones relate more to feelings of loneliness and distrust (Hampton, Goulet & Albanesius, 2014; Jin & Park, 2012; Kobayashi & Boase, 2014), and thus alienating group members from one another when a strong tie is not present (Humphreys, 2005). And therefore, while social capital may be supported by cell phone usage in existing networks, it may not be formed as readily in new networks when cell phones are present or in use. Furthermore, the research which suggests that cell phones affect the quality of face-to-face conversations, and feelings of empathy among conversational partners in a negative manner (Misra, et al., 2014; Przybylski & Weinstein, 2013), would seem to suggest that in those situations where cell phones are present or in use, there is a lower likelihood of developing a sense of togetherness and reciprocity among network/group members.

Take, for example, a workplace in which cell phone communication is prevalent. If some group members from this workplace do not feel as though their co-workers are fully connected with the task at hand (being called away, receiving and sending texts during meetings, etc.), it would seem reasonable to think that they might have less trust in the ability of these co-workers to help them when needed, and thus there may be a lack of reciprocity due to a lower level of collectivism (due to cell phone use) in the workplace. This example also illustrates the importance of a willingness to ask for help/information in the first place (Van den Hooff, De Ridder & Aukema, 2004). If the individual requesting information or help does not feel that the potential contributor is willing to help (being distracted from the situation by a cell phone, etc.), they are less likely to actually make that connection and take the first step in forming social capital. On the other hand, if cell phones are the tool which is facilitating the asking, or potentially even bringing two people together in the first place (“you have the new iPhone, how do you

like it”?), then we might potentially see a positive impact on the willingness to exchange information and form social capital. The key word here is “tool,” and in the end that is what a cell phone is. While in some cases it might be used in such a way as to facilitate the formation of social capital, in others its use may serve to detract from this formation.

In order to illustrate the importance of considering the cell phone as a tool in our examination of social capital, we must look to research which has been conducted on the influence of Internet use on civic engagement. Civic engagement, or “formal group memberships and social participation” (Shah, 1998, p. 479), is a concept closely related with social capital, playing a role in the development of weak ties and a sense of reciprocity within groups and communities (Putnam, 2000). Over the last several decades, scholars have noted a decrease in civic engagement and, much like social capital as discussed in this paper, have looked at technological advances as potential culprits, both in its decline and potential renewal (Putnam, 2000; Jennings & Zeitner, 2003; Shah, et al., 2002). Much like in our discussion of the effects of cell phones however, there appears to be an inconclusive divide between positive and negative directionality for this relationship (Boulianne, 2009). Previous studies seem to suggest that there may be differences in the effect of Internet use on civic engagement due to the type of use, such as entertainment or news gathering (Shah, Kwak & Holbert, 2001; Moy, Manosevitch, Stamm & Dunsmore, 2005; Xenos & Moy, 2007; Purdy, 2013). It would seem then, that using the Internet for more civic purposes relates positively with civic engagement, but – here is the important part – the majority of Internet users do not appear to be taking part in these civic Internet activities. (Purdy, 2013). And thus there is a downside to such a “positive” relationship, with the majority of users not utilizing the Internet (as a tool) to

its full civic potential and thus not experiencing its possible civic benefits. This same pattern may be at play when it comes to cell phones and civic engagement.

When it comes to networks, trust, and reciprocity, there is surely a potential for cell phones to be used a tool in their development and thus the formation of social capital. But are cell phones being used in this way? For instance, Horst and Miller (2006) describe the social networks of Jamaicans (in which cell phones play a major role) as in large part devoted to “link-ups” and sexual liaisons more so than to the development of business contacts or social support systems. As such, it would appear that instead of utilizing phones for furthering social capital, less weighty pursuits are more common. Likewise, if we look at the major uses of cell phones in the U.S., as discussed above, we see that texting is very prevalent among much of the adult (and teenage) population, with upwards of 100 text messages being sent or received on an average day by those between ages 18 and 24 (Smith, 2011; Lenhart, 2015). This is important, because previous research has found that text messaging is related to lower levels of trust and reciprocity in work groups (Julsrud & Bakke, 2009).

On the other hand, there are a growing number of cell phone users accessing the Internet for everything from sending emails, using web based messaging services to using social media sites like Facebook and Twitter (Lenhart, 2015), and research has shown that using cell phones for online communicative purposes (such as social networking) relates more positively to bridging social capital and maintaining weak ties with network members, though feelings of support may not be positively influenced, and thus the realization of social capital may not have a positive influence from such cell phone use (Chan, 2013). And so we can see that considering the cell phone as a tool, with a

multitude of uses, can help to shape our understanding of its potential impacts on social capital.

### A Source of Capital

However, to simply write off the cell phone as a tool, which can be used for any purpose, doesn't really bring us closer to answering the question of how this technology affects the formation of social capital. One may be tempted at this point to draw parallels between social capital formation and driving when it comes to cell phones, given the overt focus on "distraction" which seems to pervade the literature. While it might make a good public campaign, with warnings against "distracted" networking such as "don't text and build social capital," leaving it at that would be doing a disservice to the complexity of both cell phone use and social capital. As we have seen, cell phones can be used for much more than just communicating with others, with Internet access and a multitude of programs or Apps allowing for smart phones (and more basic cell phones) to access and share an expanding world of knowledge and information. Because of this, it is possible that the cell phone could become the "other" (basically a member of one's network) from whom information, support, etc., is accessed and called upon. In other words, a cell phone could act as a source of a sort of "digital capital," which fills in for, and thus decreases the need for those connections and sources of support which are fundamental to social capital. In the argument made by Putnam (2000), as to the reason for declines in social capital, individualism plays a key role, with more home-based and less social pursuits (like watching T.V.) replacing more social and out-based pursuits (like going to the movies, or a club meeting). In this regard, it would seem that cell phones could also

relate to decreases in social capital given their tendency towards individualism and self-selection, as discussed above.

Looking at social capital formation, a cell phone with access to nearly limitless information may serve to decrease the willingness of individuals to seek out others who may be able to help with a given problem. However, given that the cell phone was developed within an increasingly individualized society, especially in the U.S. (Murray, 2001; Bellah, et al., 1996; Putnam, 2000), it may be that use of the cell phone is not encouraging individualism (and associated declines in social capital), so much as it is fitting into a society which demands “increasing levels of individual and collective autonomy” (Castells, 2008, p. 449). If this is the case, then it may be that those individuals using cell phones may be both less likely to seek out information from others themselves, and also more likely to be approached by others who may not have access to this information given an increased sense of awareness that they have higher levels of human, or knowledge, capital to contribute to group or network operation (Cross & Borgatti, 2004). And yet, despite this seeming positive, such digital substitution for social capital may have its downside, because Google can’t fix everything, and eventually we will all need the support of real live human beings, be it a doctor, a neighbor, or a stranger with a tool to lend in a parking lot. If in the process of digital substitution, and decreased reliance on the formation of new network connections, we lose the skills necessary to make these new connections, or as research has suggested those with lower levels of social skills are more likely to substitute cell phones for maintaining network ties (Jin & Park, 2012), then it may be that the advancement of information and communications technologies are actually detracting from social capital.

As with the research on both cell phones and social capital, we can see that when it comes to a relationship between the two, there appears to be quite a bit of room for improvement. Given the research we have looked at thus far in the relationship between cell phones and social capital, we can draw out several patterns which will be explored further in order to add to our understanding of the causal effects (positive, negative, or none at all) which cell phones and cell phone use have on the formation of social capital. As was discussed above, it appears that cell phones, given their relationship with strong ties, may be more likely to support a bonding social capital in existing social networks, and perhaps detract from the bridging social capital in those networks which have more weak ties. Because of this, an examination of the role which cell phones play in weak tie networks, or in groups which have not yet had the chance to form ties, may go a long way in helping to understand how cell phones affect social capital by focusing on the process of forming new connections and asking for help. As Coleman put it, “the more extensively persons call on one another for aid, the greater will be the quantity of social capital generated” (1990, p. 321). If we can isolate the effect of cell phones on groups members calling upon one another for aid, we should be able to demonstrate an effect on the formation of social capital.

Along these lines, we have seen research which suggests that perceptions of the access to, and willingness of, others to engage in problem solving positively affect calling upon others for aid in the sharing of information, which would appear to be related to the social capital dimensions of trust and reciprocity. We have also seen research which suggests that cell phones could have either a positive or negative effect on these factors, playing the role of a source of information, or decreasing the likelihood of trust and

reciprocity in the formation of new connections, and even affecting the quality of relationships/interactions which may occur. As such, in an examination of cell phones and their effects on social capital formation, it is important to take into account the effects of cell phones on perceptions of access, willingness and engagement of other group members, as well as the quality of the conversations and interactions which take place with and without the presence of cell phones. In this way, the current study aims to get a more detailed idea of where cell phones fit into this process of social capital formation.

## Demographic Considerations

### Cell Phone Demographics

Cell phones and social capital are aspects of our social world which touch nearly everyone, but this is not to say that everyone is affected by, or experiences, cell phones and social capital equally. Given our focus on the effects of cell phones on social capital formation, it behooves us to address several demographic possibilities in this relationship, in order to carry out this study to its fullest potential. To begin with, there are some demographic differences when it comes to use and ownership of cell phones in the U.S. Men have been found to be only slightly more likely than women to own a cell phone, 81% vs. 83% as of a 2010 sample, though this difference has not been found to be significant (Lenhart, 2010). When it comes to how cell phones are used however, it has been found that women make slightly fewer phone calls than men, that teenage girls outpace boys in the average number of text messages sent and received, and that men are more likely than women to use their cell phones to get news online (Lenhart, 2010; Lenhart, 2015; Smith, 2012). But overall, these differences do not appear to be so major



as to warrant special consideration during the research process, especially due to the fact that the presence of cell phones is of interest (Misra, et al., 2014; Przybylski & Weinstein, 2013), and ownership rates are so close.

In terms of race and ethnicity, it has been found that, as of 2010, 87% of African Americans and 87% of Hispanics own cell phones, while whites, at 80% ownership, are significantly less likely to have cell phones (Lenhart, 2015). This is an interesting pattern which would seem to fall in line with previous research which finds that there is less of a digital divide for cell phones than other technologies (Horst & Miller, 2006; Katz, 2008; Portus, 2008). It has also been found that racial minorities are more likely to send and receive text messages, and to “receive large numbers of calls” via their cell phones (Lenhart, 2010). These racial differences might seem to suggest that when it comes to the relationship between cell phone use and social capital, the effects may be more pronounced for minority group members. And so, when considering the composition of networks/groups to be tested, racial differences will need to be accounted for.

Perhaps the biggest differences in cell phone use and ownership, fall along class and age lines. Studies have shown that those with lower levels of income and education are less likely to own cell phones, with 71% of those who live in household making less than \$30,000 owning cell phones vs. an average of 88% of those living in households with incomes above \$30,000 (Lenhart, 2010). Likewise, when it comes to education, 90% of those with a college degree own a cell phone, which is significantly higher than the 78% of those who own a cell phone with less than a college degree (Lenhart, 2010). Despite these differences in ownership, it appears that cell phones hold an equally important place in the lives of users across education levels, with around 65% of all cell

phone users having slept next to or with their cell phones so as not to miss calls or text messages (Lenhart, 2010; Smith, 2012).

When it comes to age, there is a large gap in the rate of ownership, with 86% of those younger than 65, and only 57% of those age 65 and above, owning a cell phone as of 2010 (Lenhart, 2010). Similarly, when looking at the indicator of sleeping next to, or with, a cell phone, it appears that there is a negative relationship between age and the importance of cell phones (Smith, 2012). It has also been found that older adults are less frequent cell phone users when it comes to text messaging and phone calls (Lenhart, 2010). Because of these differences, it would seem that controlling for age is something to watch out for during the current study, while controlling for education and income may be less important, though attention is paid to this and all other demographic factors related to cell phone use during the data collection and analysis processes.

#### Social Capital Demographics

Demographic factors may also play a role in the presence, formation and experience of social capital. One of the main factors to consider in this regard is age, with research suggesting that generational changes may account for some of the observed decline in social capital (Alwin, 2013; Putnam, 2000; Halpern, 2005). For instance, members of each generation have different social and historical experiences which shape their perceptions of the world, such as the great depression, the Vietnam War, or the September 11th attacks have profoundly shaped the lives of the individuals who lived through them (Alwin, 2013). Research has shown that “younger” generations, like generations X and Y, tend to have lower general levels of trust in others (Alwin, 2013), and thus may have a decreased tendency for forming social capital by making new

connections. On the other hand, members of all generations have shown a decrease in their trust of organizations such as the government, which may help to explain the overall decrease in social capital (Alwin, 2013; Putnam, 2000).

Research also suggests that younger individuals tend to have higher levels of autonomy, and thus less reliance on formal connections, as opposed to older individuals who tend to have more formal community involvements and obligations, age might be negatively related to the formation of new network connections (Putnam, 2000). This may be due in part to personal life experiences, such as getting married or having children, which makes connections with schools, medical professionals, and other organizations more of a necessity (Putnam, 2000). When it comes to race, research suggests that the declines in social capital discussed thus far, have occurred across all racial groups (Putnam, 2000). However, when considering racial and ethnic communities, especially those which have religion as a central factor, there may be positive effects on social capital. For instance, during the civil rights movement of the 1960s, churches in the African American communities of the south played a major role in mobilizing resources necessary for the cause, from manpower organizing speeches to transportation and food (McAdam, 1999). Because of these relationships, it will be necessary to account for age and race during data collection and analysis in this study.

Another demographic factor which has been shown to affect social capital is class, often assessed by way of education level. It has been shown that, like age, higher levels of education relate to more formal community and organizational connections, and less erosion of social capital in general has been found among college graduates over the years (Putnam, 2000). It has also been shown that increases in demands on time have a

negative effect on the spread of social capital through new connections, commitments and obligations, and as such there may actually be negative effects on social capital among the upper classes (Halpern, 2005). Because of this, it would seem that social class is an important factor to consider in the research process.

When it comes to gender, women tend to have fewer formal social and community connections than men (Putnam, 2000). This may be due in large part to the historical exclusion of women from politics, the economy, education, and many other aspects of social life. And yet, despite these historical patterns, women tend to have higher levels of interaction with network members (Putnam, 2000), and therefore may be more likely to make new network connections. Further research suggests that in social structures with gendered expectations of behavior, such as schools, there may be effects on the way in which social capital is formed, such as men having more pressure to form “useful” social connections (Stelfox & Catts, 2012). Because of this, it was important to account for gender during this study, ensuring that those participating in the research did not feel gendered expectations on their behavior.

This brings us to a final point related to these demographic factors in a test of the relationship between cell phones and social capital. As we have seen thus far, there may be effects on both cell phone use and social capital due to race, class, age and gender. And while these effects exist, they do not (with the exception of age) appear to be major factors at play in the relationship under question. And yet, the different life experience of members in these different demographics may well affect the norms which they bring to the table in terms of interactions. Previous research suggests that relationship quality is positively affected when those involved have a shared norm related to use of cell phones

in their interactions (Hall, Baym & Miltner, 2014). Given the importance of interaction quality to the formation of social capital, it is important to account for potential differences in norms based on these demographic factors, by testing the relationship in groups/networks in which membership is similar (and in which membership is dissimilar) when it comes to age, race, class and gender.

### Research Questions and Related Hypotheses

#### Research Question 1

How does cell phone use affect the formation of social capital?

Given the research which suggests that cell phones relate to the maintenance of networks composed of strong ties (Campbell & Kwak, 2011; Julsrud & Bakke, 2009; Miyata, Boase & Wellman, 2008; Wei & Lo, 2006), the research which suggests that cell phones may decrease the possibility of reaching out and making new connections due to the access to and security of strong ties (Ling, 2008; Turkle, 2011, Geser, 2005), and the work related to social capital which holds that calling upon others for aid relates to the generation of social capital (Coleman, 1990), we can expect to find that:

Hypothesis 1: When cell phones are used in a group, members will be less likely to call upon others for aid.

Given the research which suggests that the presence of cell phones relates to a lower quality of conversation, and lower levels of empathy among conversational partners (Misra, et al., 2014; Przybylski & Weinstein, 2013), the research which suggests that cell phone use may relate to feelings of loneliness and distrust (Hampton, Goulet &

Albanesius, 2014; Jin & Park, 2012; Kobayashi & Boase, 2014), and the work which suggests that feelings of togetherness and perceived willingness of others to engage in problem solving, relate to social capital via reciprocity and trust (Nath & Inoue, 2009; Van den Hooff, De Ridder & Aukema, 2004), we can expect to find that:

Hypothesis 2: When cell phones are used in a group, members will report lower levels of perceived reciprocity.

Hypothesis 3: When cell phones are used in a group, members will report lower levels of perceived trust in fellow group members.

#### Research Question 2

How does cell phone use affect the sharing of information in groups?

Given the research which suggests that perceived feelings of access to others who can help, the willingness of others to engage in problem solving, and a sense of togetherness, are positively related sharing information in groups (Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004), and the research which suggests that cell phone use relates to a lack of reliable access to groups/network members and that cell phone use may relate to feelings of loneliness and distrust (Turkle, 2011; Castells, 2000; Hampton, Goulet & Albanesius, 2014; Jin & Park, 2012; Kobayashi & Boase, 2014), we can expect to find that:

Hypothesis 4: When cell phones are used in a group, members will report feeling that they have less access to other group members.

Hypothesis 5: When cell phones are used in a group, members will report feeling that other group members are less willing to engage in problem solving.

Hypothesis 6: When cell phones are used in a group, members will report feeling less of a sense of togetherness with other group members.

Given these hypotheses, as well as the research which suggests that cell phones allow for more access to information and are being used for such purposes more frequently, especially with the spread of smart phones (DeGusta, 2013; Smith, 2013), the research which suggests that information sharing relates to group members feeling better about their interactions (Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004), and the research which finds that digital interactions may result in less commitment and may not be viewed as fully “real” (Turkle, 2011), we can expect to find that:

Hypothesis 7: When cell phones are used in a group, members will complete their task to a higher degree of accuracy.

Hypothesis 8: When cell phones are used in a group, members will feel less accomplished in regards to completing their task.

### Research Question 3

Do the factors affecting information sharing impact the formation of social capital?

Given the research which suggests that perceived feelings of access to others who can help, the willingness of others to engage in problem solving, and a sense of togetherness, are determinates of sharing information in groups (Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004), the work which suggests that trust and reciprocity among network/group members relates to social capital (Coleman, 1990;

Putnam, 2000), and the work related to social capital which holds that calling upon others for aid relates to the generation of social capital (Coleman, 1990), we can expect to find that:

Hypothesis 9: Group members who report feeling more of the determinates of information sharing will also report calling upon others for aid more.

Hypothesis 10: Group members who report feeling more of the determinates of information sharing will also report higher levels of perceived reciprocity.

Hypothesis 11: Group members who report feeling more of the determinates of information sharing will also report higher levels of perceived trust in other group members.

#### Research Question 4

How does cell phone use affect the quality of interactions?

Given the research which suggests that the presence of a cell phone in a dyadic communication setting leads to a lower quality of conversation and lower levels of empathy between conversational partners (Przybylski & Weinstein, 2013; Misra, et al., 2014), and the work which suggests that cell phone use can affect interpersonal communication outside of the dyadic setting (Ling, 2008; Turkle, 2011), we can expect to find that:

Hypothesis 12: When cell phones are used in a group, members will report lower quality interactions with other members.

#### Research Question 5

How does interaction quality affect the formation of social capital?



Given the research which suggests that lower levels of conversation quality may negatively affect face-to-face interactions (Misra, et al., 2014), and the work which suggests that interactions with others is a major aspect of the formation of social capital (Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004), we can expect to find that:

Hypothesis 13: Higher levels of interaction quality will relate positively with the quantity of group members calling upon one another for aid.

Hypothesis 14: Higher levels of interaction quality will relate positively with reported levels of perceived reciprocity.

Hypothesis 15: Higher levels of interaction quality will relate positively with levels of perceived trust in fellow group members.

## CHAPTER III

### METHODS

#### Subjects

In this study, a sample consisting of 235 undergraduate college students was used, with each participant randomly assigned to one of 17 experimental and 17 control groups. Members of the sample were recruited through in-person announcements in classrooms on the campus of a large-sized Midwestern public university. The sample was intentionally over recruited, with the anticipation of a “response rate” (i.e., showing up to the scheduled experimental sessions) of less than 100 percent.

Often times in the social sciences, research (especially experimental research) is carried out using undergraduate students as research subjects based on their convenience and accessibility for researchers working in the university setting (Milgram, 1974, p. 14). However, despite this widespread practice, there are several major issues related to the use of undergraduate students as subjects when it comes to the possibility of bias in research findings. For instance, there is the possibility that selecting subjects from a smaller population in which members are relatively close and may know one another (like a college campus) could raise the possibility of subjects letting others know about the research process (questions asked, research purpose, etc.) and thus potentially affecting the behaviors or responses of subjects in later rounds of data collection (Milgram, 1974; Cook & Campbell, 1979).

Another potential effect which can arise from the use of college students as research subjects is a limit on the generalizability of findings, especially when the research is focused on social issues which exist outside of just the college campus, like social capital (Cook & Campbell, 1979), regardless of the method used to select the sample or its representativeness of the student body being studied. Along these same lines, college students tend to be of a younger age, among other demographic differences, and thus differ in many opinions and practices (cell phone use, or the importance of volunteering) from other populations. This would appear to be of special importance in a study of technology and its impacts on social life, given that students tend to use technology more than other groups, with over 96% of undergraduates and 99% of graduate students owning a cellular phone (Smith, Rainie & Zickuhr, 2011), and thus results from such a study may not be accurate representations of the ways in which things like cell phones or computer use affect our behaviors or perceptions on a larger scale. However, given that this age group is likely to have the effects of cell phones magnified, due to higher levels of use, it would seem worthwhile to include (and even primarily focus on) college students in the sample. Therefore, and despite the potential for bias in the results, in order to gain a better understanding of how cell phone use affects social capital, the current study relies on college students as research subjects.

#### Recruitment

The recruitment effort was focused on the campus of a large-sized public university. Students were recruited for participation on a voluntary basis, with an announcement being made in undergraduate courses in the fall semester of 2015. Before

classroom recruitment began, professors were asked if they would be willing to allow this researcher to come into their class and spend a few minutes talking to their students about the research project. Emails were sent out to the professors of twenty courses in the middle of October for this purpose. Courses were non-randomly selected from across the university, from the social sciences to the arts, mathematics, engineering and natural sciences. For each discipline, both an introductory level course and upper level course were selected, in order to reach a greater diversity of students (not just freshmen in large lecture halls).

Despite this wide selection of courses, and due to the fact that professors had the option to decline the request, there was a definite grouping of courses from which permission was given to make the recruitment announcement. Perhaps due to the fact that this was a social science related research project, most of the professors who responded were teaching in the social and behavioral sciences (sociology, history, anthropology, criminology, and statistics). It appeared that those professors who were able to relate the project to their course were more likely to allow for the recruitment, as well as offer extra credit for participation in the project (which likely helped sample recruitment and ultimately participation). A total of 13 courses were scheduled for recruitment visits after the initial emails were sent to professors, which meant that approximately 1,000 students were invited to participate in the study.

The recruitment announcement discussed the opportunity of participating, for those students over 18 years of age, in a study of “knowledge acquisition,” though a complete description of the project was not given (i.e., the effects of cell phones on social capital formation), in order to avoid biasing the actions or perceptions of those who

volunteered for participation. After the announcement was made in the undergraduate courses, a sign-up sheet with the time slots available for the various data collection periods was circulated around the classes (students were instructed to select as many of the time slots as possible which fit in with their schedules). The time slots, and subsequent experimental sessions, were all located within the first two weeks of November, 2015, with start times ranging from 9:00am to 3:30pm Monday through Friday. In most courses, several different sheets were distributed, with different open time slots, in order to avoid grouping participants by class (i.e. having a group of friends who sit next to one another in class all sign up for the same session). Each sheet contained nine time slots, though, as the recruitment period progressed and time slots filled up, some sheets contained fewer options. The sheet also included a space to collect contact information for contacting subjects prior to data collection.

After the sign-up sheets were distributed, the professor in most courses proceeded with teaching the course while the researcher passed around envelopes that students could return the sheets into (filled out or not). This collection method ensured that students did not feel pressured to sign up for participation, and also allowed for anonymity and confidentiality of the student information that was collected. Giving students the opportunity to sign up immediately was intended to help increase the recruitment rate, but students were also able to contact the researcher later on, at their own convenience, to sign up for a time slot.

At the end of each day of recruitment, those students who selected time slots were assigned to sessions based on availability and the number of time slots which they selected. After assignment, an invitation email was sent to these participants detailing the

dates and times of their experimental session. This was followed by two more follow-up emails closer to the date of the session, which served as reminders with the specifics of the location and time of the session. In order to account for schedule conflicts and “no-shows” among assigned participants, each session was overbooked, with more members than necessary being able to sign up for each group (7 to 8, though some groups had as many as 10); therefore, even if several members did not come to the experimental session, there would still be enough participants to carry out the session.

Once the sessions were filled, and subject recruitment was concluded, experimental and control groups were randomly assigned. Each session was assigned a random number (using a random number generator) and, after sorting them numerically, experimental and control groups were assigned alternately beginning at the top of the list. This process allowed for the satisfaction of random assignment, and thus the experimental method utilized in this study was considered to be a true experiment.

### Data Collection

A variety of data were collected in order to test the hypotheses laid out in this study, and several different methods were employed to this end. The main method used in this study was an experiment, which placed participants into a group setting in order to test the effects of cell phone use on several different factors (social capital, interactions, and interaction quality). The experiment was chosen as the best methodology for this study for several reasons. First, given that the research questions and hypotheses deal with a cause and effect relationship, an experiment seemed better suited than something like a survey or participant observation, which would not be able to isolate the effects of

cell phone use by removing other variables from the picture (Cook & Campbell, 1979; Babbie, 2005). This was especially important for the subject matter under study, given that past research on the influence of technology has been criticized for a divergence between how people view the effects, and what the actual effects may be, including perceptions of Internet use on civic engagement, or cell phone use on driving performance (Purdy, 2013; Lessch & Hancock, 2004). Ophir, Nass and Wagner (2009), offer some insight into this divergence, when they found that chronic multitaskers tend to feel that their use of technology does not affect their cognitive abilities, while an examination of these abilities reveals that multitasking has a significant negative effect. Therefore, in the examination of cell phone use and its effects on social capital, an experiment allowed for isolating the effects of cell phone use, but also allowed for overcoming any divergence which may exist between feelings of how cell phone use affects social capital and the effects which actually take place. Random assignment, as discussed above, was utilized in this experiment for assigning experimental and control groups, and as such, this design can be considered a “true” experiment. The final experiment utilized a design along the lines of a static group comparison (though with the random assignment, it will not be a quasi-experiment), which focused on comparing results from the experimental and control groups, without a pre-test in either group (Cook & Campbell, 1979; Babbie, 2005).

As for the type of experimental design which will be used, a laboratory experiment was the best option in the present study, as opposed to one conducted in a field setting. That which is being studied had a major impact on this decision, though it truly was a back and forth between the two options. Although lab experiments offer the

greatest amount of control, and elimination of other variables that might have an effect on the outcome, they do not necessarily allow for the behaviors under study to be carried out in their natural setting (Babbie, 2005). For instance, in the current study, the formation of social capital (during a group task) is being considered as the main dependent variable, and as such, it would appear to be fitting to assign a group task in a more natural setting (like volunteering), which would allow for people to interact with one another and with their phones in the way that comes naturally to them. A field setting could also help to avoid demand characteristics and evaluation apprehension, with subjects in a more natural setting not feeling as though they are part of a research process or that they need to win the evaluation of the researcher(s) by altering their behavior (Cook & Campbell, 1979).

And so it might seem that a field experiment would have been the best option for this study. However, there are several factors which tip the scales in favor of a more lab oriented experiment in this case. One of the main deciding factors was actually one which would seem to be eliminated by a field experiment: demand characteristics. Demand characteristics, or conforming to a perceived hypothesis by research subjects (Cook & Campbell, 1979), raise the potential for bias and a lack of internal validity, especially in experimental research (Babbie, 2005, Cook & Campbell, 1979). As was noted above, when a subject feels as though he/she is a part of a research project, the likelihood for demand characteristics increases, and thus a field experiment helps to make a research subject feel less pressured in this regard. But in this case, the aspect which is being tested is the presence or absence of a cell phone, which necessitated a limit being placed on cell phone use in the control group. If we were to bring a group of people into



any setting, though especially one in which a task is to be carried out by a group, such as volunteering, and ask them to not use their cell phones, the possibility arises that the research subjects may assume the use of cellphones is an important aspects of the research and alter their behaviors accordingly (being extra productive, or making more effort to talk with other group members).

This also brings up the possibility of evaluation apprehension, in which research subjects try to win over the attention of the researcher by doing what they think the researcher wants (Babbie, 2005; Cook & Campbell, 1979). If cell phones (or the lack thereof) are seen as important to the research process, it is possible that subjects might try to behave as though this is the case. For instance, a participant might feel that the use of a cell phone is seen by the researcher to be a “bad” thing, so they could limit their use of it (in the experimental group), or emphasize the fact that they are not using it (in the control group). And so it would seem that in this study, telling people up front that they cannot use their cell phones in the control group, could bias results in an artificial way, such that it might appear there is more of a difference in socialization and social capital formation between the experimental and control group than there may actually be. The difficulty here stems from being able to separate control group members from the use of their phones without keying them off to the importance of cell phones in the study. This is where the laboratory experiment shows its strength for this study. Instead of asking group members to not use their phones as a part of the research they are participating in, the lab based experiment offers more potential for control in this regard, by allowing for more subtle suggestions that phones are not to be used (or that they can be used by the experimental group).

The experiment was carried out on the campus of the university from which students were recruited. When control group subjects entered the research area, they were informed that phones are not to be used by the use of signs “prohibiting” cell phone use in the surrounding area. Once they were primed against the use of cell phones in the setting, a comment by the researcher that cell phones were not to be used in this area would not seem to place cell phones as an object of study, but rather something which is prohibited by the setting itself. If, instead, the subjects were to meet outside (or indoors) in order to participate in a group task, the request that phones not be used might be framed differently, and thus subjects may exhibit bias along the lines of demand characteristics and evaluation apprehension.

And so, in this case, the best option to ensure internal validity of the experimental design and to make the presence or absence of cell phones as natural as possible, was to utilize a more traditional laboratory setting for the research. This is not to say that the lab itself had to come across as a traditional “science lab” however, and indeed, efforts were taken to ensure that the selected location was as comfortable and non-intimidating as possible for research subjects. The layout of the room, as shown in Figure 1.1 below, was designed with this aspect in mind, placing participants in close proximity with one another and thus potentially facilitating interactions between group members. The experimental room was furnished with pictures, chairs and tables, in order to create the feeling of a learning environment (much like a class room or conference room with tables arranged such that participants were all facing one another), the importance of which will become clear as we get into the design of the experiment and its measures.

Figure 1.1

## Experimental Room Layout



While the experimental method sets up the test of the causal relationship under study, the actual collection of data utilizes a triangulation of three different methodologies: participant observations, a survey, and focus groups. Triangulation involves utilizing multiple methods, multiple data collection points and/or multiple researchers/observers (Rogers & Goodrick, 2010, p. 446), which serves to increase the validity of a study in several ways. The validity increasing aspects of triangulation come in the form of comparing the results of each type of method, each observer and each population from which data are collected, in order to see if similarities exist; and if they do exist, then there is support for the correct observation of the factors under study, and

therefore of the validity of the research; and if similarities do not exist, or contradictions are found, having multiple sources of data can help to ferret out where the contradiction is located and why that might be the case (Rogers & Goodrick, 2010, p. 446; Flick, 2002, pp. 226-227). For instance, if in the current study data were collected from participants using only a single method (such as a survey, or the observation of their actions during the experiment), there would be a possibility that the results do not accurately reflect the relationship between cell phone use and social capital.

Another major benefit of triangulating with multiple methods is the fact that some methods are better at getting to certain types of information than others. This study will utilize both qualitative and quantitative methods for data collection; the quantitative methods (surveying respondents and count data from observations) will allow us to perform statistical analyses and thus make more valid conclusions about the cause and effect relationship under study, while the qualitative methods (observations and focus groups) will help us to collect rich information in order to uncover the meanings which underlie the relationship, and thus gain a better understanding of it. As such, this true mixed methods approach, with the same research questions being addressed by multiple methods (as opposed to “quantitative questions” and “qualitative questions”) allows the qualitative and quantitative data to complement and fill in the gaps in understanding which are present in each of the methodological approaches.

While triangulation may appear to be a benefit in terms of validation of results, there are some critiques related to the relying on triangulation for validity in social research. Bloor (1997) argues that triangulation has the potential to mislead when there is a disagreement in findings between the methods being utilized, given that one may be

the truly valid method of getting at the subject under study while the others are not adequately up to the task. As such, if triangulation is unclear in its validity when methods do not agree, to say that an agreement between triangulated methods is a fully valid finding may not be the best claim to validity (Bloor, 1997; Seale, 1999). However, despite such criticisms, we can be confident that a triangulation of methods will add to this study, if not to its empirical validity, then certainly to the depth of understanding which can be arrived at, especially when negative cases and instances of disagreement between methods are explored when they occur throughout the analysis (Seale, 1999; Flick, 2002).

In order to collect data during the experimental process itself, participant observations were made from within the group by confederates, as well as from outside of the group by myself, the researcher conducting the experimental proceedings. Participant observers within the experimental and control groups were trained to make detailed observations of the interactions which occurred between group members, noting the amount of interactions which took place, as well as perceptions of quality such as body language and tone of voice (Misra, Cheng, Genevie & Yuan, 2014). These observers also made note of cell phone use during the experimental period, including whether phones were visible, if they were being used, what they were being used for (texting, web use, phone call, etc.), as well as anything notable about the effects which cell phones may or may not have had during this process. The observers were instructed to take on the role of full participants during the experimental sessions, in order to avoid influencing the dynamics of the group. For instance, if a research is announced at the beginning of the study, participants in the group would likely interact with them in a

different way than if they felt the observers were actually fellow group members. A total of four graduate level participant observers were hired (using funding from the Kercher Center for Social Research) for the duration of the data collection period.

The researcher conducting the study (this author) made similar observations from “outside” of the group, with the goal of coming to a conclusion (with the assistance of data from the other observers) about the general feel of the group interactions, the engagement of group members, and the role of cell phones in the interactions which occurred during the experimental sessions. After each experimental session, expanded field notes were recorded on computer file for later analysis. Participant observers were given a form with which to standardize their observations, and this was also used to put their observations into computer format. This rich qualitative data is intended to help us “read between the lines” of the interactions and group processes at play, and is therefore an important component in the interpretive validity of the experiment and subsequent analyses (Altheid & Johnson, 1994).

After each round of experimentation, a survey was handed out to group members in order to collect data related to their experiences during the survey. The survey contained questions related to feelings of togetherness, access and willingness of fellow group members to engage in problem solving, as well as the quality of interactions, trust in fellow group members, feelings of reciprocity and amount of cell phone use during the test period (a question which will not be included on control group surveys). These questions allow for objective measures of the concepts related to information sharing, and social capital, so that they could be utilized in the quantitative analysis. As discussed above, basic demographic information had to be collected from respondents in order for

potential control variables to be used in the analysis. In order to collect this information, several questions were added to the survey, including those related to age, gender, race and socio-economic status. This posttest survey instrument can be found in Appendix B.

After the surveys were completed and returned, a debriefing session (around 10 minutes in length including the focus group session) was held with members of both the experimental and control groups. The focus group allowed for the research participants themselves to reflect on their experiences during the experimental “group activity.” In addition to serving as a debriefing, questions were posed to the group regarding feelings of effectiveness, interaction quality, group satisfaction, and potential barriers which group members felt in regards to these aspects of the group activity. This information was recorded using an audio recording device, and later transcribed into computer format for analysis. These focus groups and debriefing sessions served several major purposes in this study. First, they allowed the entire group to be addressed at once, which helped to save time and placed a lower degree of burden on the respondents themselves, something which a one-one-one interview might have compounded after the experiment had come to an end. Second, they allowed for the debriefing of the entire group as to the purpose of the research, and the mild deception which they were operating under during their participation. This was beneficial both from an ethical standpoint, as well as from a research standpoint, as any reactions to this debriefing could be noted, which could be a useful aspect in the interpretation of results. For instance, if group members felt that cell phones caused no barrier to their interactions, and reacted in a similar (or opposite) way once they realize the study was about cell phones and interactions, it could say something about their true feelings on the matter. Focus groups were conducted

throughout the data collection period in order to ensure consistency of method and observational techniques. Every group was debriefed after the conclusion of the experimental period.

### Experimental Design

Now that we have discussed the measures and methods which were used to collect data for this project, let us turn our attention to the experimental scenario in which the data was actually collected. The goal of this experimental design was to put research subjects into a situation in which engaging in interactions, sharing information, and working together towards some end, in other words social capital (Coleman, 1990), would be beneficial to them. What follows is that situation which was constructed.

Research subjects were invited to participate in a study of “knowledge acquisition,” which, as noted above, was intended to keep the true purpose of the research obfuscated so as not to affect the internal validity of the experiment. Once all of the research subjects were assigned to experimental and control groups and final notifications have been sent out regarding the meetings, they met the researcher at the “lab.” This lab setting did not look like a traditional science lab, but rather was made up to resemble a learning environment such as a conference or library room. Tables and chair were arranged in a “roundtable” in the center of the room, such that extra effort would not need to be exerted by participants in order to make contact with, or interact with, one another (see figure 1.1 above). For the control group, in the hallway(s) leading up to the lab, and on the door, were signs warning against the use of cell phones. No such signs were posted for the experimental groups.



Upon arrival, research subjects were greeted by the researcher, and were directed to sit anywhere they would like around the table. At the table, there were manila envelopes (containing the testing instrument), pencils and consent forms arranged for each of the participants who had signed up for the session. The formal consent forms briefly explained the purpose of the “study” which they signed up for. As the experimental sessions begin, the researcher walked the participants (including the participant observers) through the consent form (a copy of the approved consent form can be found in Appendix A). The “false” study is looking to better understand how people come to learn information which they don’t know off of the top of their heads (i.e. acquiring new knowledge). Inside of the manila envelopes was a “test” of sorts which contained a range of questions covering a multitude of subject areas and general knowledge topics. The test included questions which an expert panel (of graduate students and professors) deemed difficult, though not too difficult to the point that no one in the general public would possibly know the answer. The goal with the test was to make it potentially beneficial (as no one individual is likely to know all of the answers) to engage in a diversity of interactions with others, or other knowledge generating pursuits such as going online with a cell phone, in order to complete it. A copy of the test used in the experimental sessions can be found in Appendix B.

The researcher explains that this test is to be completed, to the best of the subjects’ abilities, by the end of a 20 minute “testing” period. Subjects were instructed to use all resources available to them, including other members of the group and anything that they may have brought with them. For the experimental group, the researcher told subjects to use any resource available to them in completing the test, including cell

phones. For the control group (that which did not have cell phones available), the researcher announced prior to the start of the test that: “Unfortunately, I was recently informed that there is some sensitive equipment being used in a room nearby, and because of this we are unable to use cellular and other wireless devices in this room. So this means that you can’t use cell phones while you are taking part in this test. If you are expecting, or need to make, an important call, you can step outside of the room to do so. My apologies for the inconvenience.” This announcement was intended to set up the difference between the experimental and control groups, with those in the experimental group free to use their cell phones as they wish, and the control group not having this option.

Once the “test” began, observations commenced on the part of the main researcher, who was able to float through the room, and the participant observers, who appeared as members of the group itself. Participant observers were instructed not to give answers away to other group members, or engage in interactions, unless they were approached by a member of the group in such a way. In this case, the standard participant observer response was to “play dumb”, and not come up with the answer right away. In this way, the observers were playing a more “peripheral role” while in their covert observational role, thus not influencing to a great degree the outcomes of the group task (Adler & Adler, 1994). These observers were thus able to attest to the quality of interactions and the role of cell phones, on an experiential basis. The main researcher did not interact with group members during this testing period (other than to answer any questions which came up), fulfilling a role as facilitator of the task and outside observer.

At the end of the 20 minute period, the researcher called the test to a close and collected the tests from group members by having them place the tests into the manila envelopes on the table (unless the test was completed early, in which case the test was closed when all group members had placed their tests back into the envelopes). The tests held by participant observers were collected in this manner as well, though kept out of the pile at the end of the experimental session. At this point, the posttest survey was administered, to all members including the participant observers, followed by the focus group, with the researcher asking questions of the group members as discussed above. During the debriefing session, directly after the focus group, the participant observers were identified as such, and the true purpose of the research project was discussed with the participants, allowing them to ask any questions that they had. Notes of any responses to the debriefing were made in order to follow up in regards to feelings of deception or feelings regarding cell phone use. After the debriefing, the group members were thanked for their participation and the experimental period came to an end. Altogether, the experimental session (from introduction to debriefing) took no more than one hour to complete, with the longest session lasting for just over 50 minutes, keeping well within the one hour promised to participants when they volunteered for the study.

### Operationalization

The variables for which data were gathered during the experimental process, and which were used to test the hypotheses listed above are as follows. See Appendix B for a copy of the survey instrument and, focus group schedules and other materials related to the data collection process.

## Variables

*Cell Phone Use:* the use of cellular phones during the experimental period. This main independent variable focuses on a number of different cell phone use related factors, including the presence, or absence, of cell phones (that which was manipulated during the experiment), and the degree of cell phone use during the experiment including the number of instances of cell phone use as reported by participants, and observational considerations of the level of cell phone use. These factors were utilized in the analysis, in order to construct cell phone use variables, including a dichotomous variable to represent the presence or absence of cell phone use between the experimental and control groups, a count variable based on reports of cell phone use by group members, and a qualitative variable representing the observed amount of cell phone use.

*Interaction Quantity/Aid Given and Received:* the amount of interactions which group members took part in during the experimental period. This dependent variable focuses on the amount of interaction which took place between group members during the experiment. To compute these variables, data was utilized from observers, as well as reports from group members to post survey questions about the number of times they asked for help/assistance in interactions with other group members, how many times help was given to them, as well as the number of people with whom the respondent had interactions during the testing period. With these indicators, both quantitative and qualitative assessments of interaction quantity will be available for the analysis.

*Interaction Quality:* the perceived quality of interactions which took place between group members during the experimental period. This dependent variable focuses on the quality of those interactions which took place between group members in

both experimental and control groups. This variable was measured using an adaptation of items from the Intrinsic Motivation Inventory (IMI) as used in previous studies (Misra, et al., 2014; Przybylski & Weinstein, 2013). These indicators, assessed based on agreement with the following statements on a 5 point Likert-types scale (1 being strongly agree to 5 being strongly disagree): “I felt a sense of connectedness with those who I interacted with during the test;” “I felt close to those I interacted with during the test;” “I would like the chance to interact more with those who I had contact with in this group;” “It is likely that those I interacted with during the test could become my friends if we interacted a lot”; as well as two additional indicators unique to this study: “The interactions I had with other group members were of a high quality” and “The interactions I had with other group members were useful to me”.

*Trust*: the feeling of trust that Individual group members had of the entire group. This dependent variable, a part of social capital, focuses on how much trust group members have in the rest of the group. Trust was assessed using indicators on the posttest survey, asking respondents how much they agreed with the following statements on a 5 point Likert-type scale (1 being strongly agree to 5 being strongly disagree): “I felt that I could really trust those who I interacted with during the test;” and “In general, the members of this group can be trusted to provide useful information.”

*Reciprocity*: the feeling of shared obligation which exists between group members. This dependent variable, a part of social capital, focuses on the feeling of being obligated to help others, and the feeling that others will return the favor of help during the test period. Reciprocity was assessed using indicators on the posttest survey, asking respondents how much they agreed with the following statements on a 5 point

Likert-type scale (1 being strongly agree to 5 being strongly disagree): “helping others during the test made me feel that I would be helped if I needed it;” and “I felt an obligation to help other group members during the test.”

*Access*: the feeling of being able to gain access to those who would be able to help in the solving of a problem. This variable (both independent and dependent) focuses on access to help, which has been shown to be an effective component of information sharing. Access was assessed using an indicator on the post survey, adapted from past research (Cross & Borgatti, 2004), asking respondents how much they agreed with the following statement on a 5 point Likert-type scale (1 being strongly agree to 5 being strongly disagree): “When I needed information or advice, group members were accessible to me to help me solve my problem.”

*Willingness*: the perceived feelings that other group members are willing to engage in problem solving. This variable (both independent and dependent) focuses on the willingness to help, which has been shown to be an effective component of information sharing. Willingness was assessed using an indicator on the post survey, adapted from past research (Cross & Borgatti, 2004), asking respondents how much they agreed with the following statement on a 5 point Likert-type scale (1 being strongly agree to 5 being strongly disagree): “When I asked other group members for help, I felt confident that they would actively engage in problem solving with me.”

*Togetherness*: the feeling of a sense of cooperation within the group by individual group members. This variable (both independent and dependent) focuses on the sense of collectivism within experimental and control groups (Van den Hooff, De Ridder & Aukema, 2004). Togetherness was assessed using an indicator on the post survey, asking

respondents how much they agreed with the following statement on a 5 point Likert-type scale (1 being strongly agree to 5 being strongly disagree): “I feel that there is a sense of cooperation in this group;” and “I feel that in this group there was a focus on shared goals.”

*Task Accuracy:* the accuracy with which group members were able to accomplish their task. This variable focuses on the success of group members in completing the task which they were presented with in the experimental period. Task accuracy was assessed at the individual level by counting the number of correct answers given on the testing instrument.

*Accomplishment:* the feeling of accomplishment related to the completion of the task. This variable focuses on the way that participants feel about the task they took part in during the experiment. Accomplishment was measured using an indicator on the post survey, asking respondents how much they agreed with the following statement on a 5 point Likert-type scale (1 being strongly agree to 5 being strongly disagree): “After finishing the test, I felt a sense of accomplishment.”

Variables in this study were assessed at both the individual and group levels. As we can see from the operationalization of the variables above, those which are derived from questions on the survey (such as *togetherness* or *reciprocity*) could be used in the analysis at the individual level. Those variables which were recorded via observations of the group, and thus the more qualitative data, could be utilized at the group level. This allowed for both quantitative analysis, which speaks to the cause and effect of the relationship between cell phones and social capital, as well as a qualitative analysis which

helps give insight into the nature of the relationship and the ways in which it may play out at higher levels of groups, organizations and society writ large.

### Ethical Issues

There are several ethical issues that were dealt with in this experimental design. The first main ethical issue is probably quite apparent at this point: deception. Indeed, as the true purpose of the study was concealed from respondents until they had completed the group activity and focus group, there was a degree of deception at play in this research. This deception was justifiable in the context and purpose of this research however. Given the issues of demand characteristics and evaluation apprehension as discussed earlier in this section, there was a need to be less than fully honest with research subjects about the focus on cell phones in order to accurately assess the relationship under study. The deception in this study was also not that severe, with no foreseeable physical or emotional harms likely to befall subjects once they learned the true purpose of their participation. However, despite the fact that no harms were immediately foreseeable, a debriefing process was held, as discussed above, in order to reveal the purpose of the research (and thus end the deception) as well as to offer support to research subjects in order to understand the deception which they were a part of. If subjects did have a problem with this deception, they were given contact information for the researcher, the primary faculty advisor, and the Office for the Vice President of Research (OVPR) at the university at which the research was conducted. All participants were presented with this information in the consent document. That way, if they wanted to contact the advisor or research compliance officials they could do so at a later date.



Another potential ethical issues which was foreseeable in the research design laid out above, was the separation of research participants from their cell phones during the research period. If for instance a subject was waiting on an important phone call, not having their phone could lead to some level of distress, discomfort, or even potential harm. This was not necessarily seen as a major issue in this research, given that students (a captive audience) are routinely denied access to their phones during class periods and projects. However, provisions were made in order to account for such situations, such as allowing respondents to carry their phones to receive important calls, and asking them to do so by stepping outside of the experimental room in order to do so. In this way, any issues of apprehension or potential harms were avoided due to the lack of cell phones for the control group during the experimental process.

## Analysis

After the collection of the quantitative and qualitative data, a series of analyses were carried out in order to test the hypotheses and attempt to answer the research questions as laid out and discussed above. This analysis was conducted in two main parts: a statistical quantitative analysis and a presentation of qualitative findings in order to help interpret and contextualize the quantitative findings. This section will summarize the process which was followed in both of these analyses.

### Quantitative Analysis

To begin the quantitative analysis, a detailed univariate analysis was carried out first. This step allows us to get a sense of what the data looked like, if they were

normally distributed, and where the typical participant fell in regards to each indicator question on the survey instrument. This step also helped to inform the multivariate analyses which followed. After the univariate analysis, factor analyses were carried out in order to see if compound variables could/should be computed, such as for social capital and its various factors/dimensions. The construction of these compound variables is beneficial for later analysis, in that it helps to eliminate the analysis of individual indicators, thus making the analysis less complicated, especially when it comes to the use of multiple dependent variables (as is the case in this study).

In order to test the hypotheses, a number of different approaches were utilized. Means comparisons between experimental and control groups were carried out using t-tests, such as with trust, togetherness or interaction quality. Beyond these basic comparisons, regression analyses were used, in order to account for the effects of multiple factors on the dependent variables, such as levels of cell phone use on feelings of trust, or interaction quality on reciprocity. When necessary, separate regression analyses were carried out for the same relationship (one for experimental groups and one for control groups), in order to gauge the effects of the presence or absence of cell phone use on the relationships of interest. All regression analyses were thoroughly tested to ensure that they offer the best, least squares, unbiased estimates (looking at homoskedasticity, linearity, multicollinearity and residual normality). The results from these tests are summarized Appendix C.

Given the complex nature of the relationships in this study, such as interaction quality as both an independent and dependent variable, a series of path analysis models were constructed in order to get an idea of how the relationships fared when all variables

of interest were taken into account. Two models, one for experimental and one for control groups, were used for the testing of hypotheses (along with the t-tests and individual regressions). Using these same path models, subgroup comparisons were also calculated in order to examine the effects of the demographic variables (gender, race/ethnicity, social class and grade level). All of these tests were used in concert with one another to get a picture of each hypothesis, and to draw a conclusion as to its support or lack thereof.

### Qualitative Analysis

After the qualitative data were transcribed from field notes and focus groups, they were examined for patterns in regards to cell phone use and social capital formation. Having already been informed as the potential directionality and magnitude of the relationships of interest, these qualitative data were initially utilized in order to fill in the gaps and add context to the quantitative results section. These data were separated into experimental and control groups, and read through with passages, words, and other pieces of data being noted and coded along theoretical categories. These theoretical categories included the variables (such as trust, interaction quality, and cell phone use) which composed the hypotheses. The goal of this coding approach was to classify groups (and individuals within groups) along these lines in order to uncover meaning which was not apparent in the quantitative analysis.

The qualitative results and discussion chapter (Chapter 5) approaches these qualitative results by first discussing what was found in the quantitative results section, and then presenting those findings which appear to relate to these findings (as

complementary, contradictory, or otherwise). Quotes, passages, and examples from participants and researchers alike were pulled from the data, in order to highlight and illustrate the points which were brought up during the discussion of how cell phones effect the formation of social capital. This effort to triangulate the findings in regards to the hypotheses was not the only purpose of the qualitative analysis. When patterns emerged from the qualitative data (such as having several groups engage in the same activities, or focus group members responding to questions in similar ways across groups) that did not appear to be related to any of the written hypotheses, they are also pursued. For instance, in the discussion of test accuracy and accomplishment, patterns are found which appear to speak to the formation of social capital and the effects of cell phone use therein (though the original hypotheses did not steer the quantitative analysis in this direction). Ultimately, the presentation of qualitative findings helps us to get a feel for how the effects of cell phones on the formation of social capital actually played out in the context of the experimental sessions.

## CHAPTER IV

### QUANTITATIVE RESULTS

Of the 235 participants who signed up for the study, a total of 130 arrived to the 34 scheduled experimental and control sessions, a “response” rate of 55 percent<sup>2</sup>. Groups sizes ranged from a low of two participants (plus one participant observer) to a high of nine participants (plus x participant observers). The average group size was 5.67 members for control groups and 6.03 members for experimental groups. For the quantitative analysis section of this project, the groups with only one participant were excluded<sup>3</sup>, along with the members of a control group which experienced cell phone use (despite the best efforts of the researcher)<sup>4</sup>. After these initial exclusions, a total of 123 participants (13 control groups, N=57, and 16 experimental, N=66) supplied data which could be utilized in the quantitative analysis.

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<sup>2</sup> As discussed in the methods section above, this lower response rate was predicted. Thus, over-recruiting for this project was a definite benefit, especially due to the spate of unseasonably warm weather in November which may have acted as a deterrent to staying inside as a research participant.

<sup>3</sup> The decision was made to exclude these groups (three control and one experimental) given that calculating several of the variables, such as the proportion of the group which was interacted with, necessitated a group size of more than one individual. It was also felt that these cases, in which only one participant was in the group, may not reflect the group dynamics which are of interest to this project. However, these cases were still utilized in the qualitative analysis, as they could offer insight into the impact of cell phones on dyadic interactions.

<sup>4</sup> Of the three members in the control group, two were observed using their cell phones to search for information after being asked not to use cell phones. Given this occurrence, it could not be assured that the responses and behaviors of the group members were free from the influence of cellular phones.

Looking at the composition of experimental and control groups, there are some differences that come to light. Of the control group members, 74% (n= 42) were female, while in experimental groups females made up 59% (n=39) of participants. The average participant in both experimental and control groups was around 20 years old (with a low of 18 and a high of 26), which suggests (perhaps unsurprisingly given the university sample) that both group types were very consistent in terms of age. Likewise, in regards to grade level at the university, both experimental and control groups consisted of members who were very similar: both group types had a median of “2”, or “Sophomore” standing. When it came to race and ethnicity, 49% (n=28) of control group participants identified as non-white minority group members (African American, Native American, Hispanic, Asian, Pacific Islander), while in the experimental groups 35% (n=23) of participants identified as racial or ethnic minorities. And so we can see that when it comes to gender and race/ethnicity, these differences between groups may need to be explored further and potentially controlled for in further analyses, while age and class standing don’t seem as though they will be problematic moving forward.

As for social class indicators, the average household income estimate was approximately \$53,000 for control group members and around \$47,000 for experimental group members. Both of these estimates were significantly and positively skewed, with the mean pulled up past the much lower medians (\$25,000 for control and \$15,500 for experimental medians). Control group members also reported a slightly higher level of parental education (Median=4, “Associates Degree”) compared to experimental group members (Median=3.5, between “Some College” and “Associates Degree”). A final measure of social class, the number of hours worked for a paycheck each week, was also

slightly different between groups, with control group members reporting an average of 12.8 hours and experimental group members reporting an average of 11.9 hours. Despite these differences, a series of t-tests used to compare the means for these social class indicators found no significant differences between the experimental and control groups. And so, when it comes to social class, it would appear that both experimental and control group members fall mostly within the middle to lower-middle class range when compared to national averages (Pew Research Center, 2015), which means that social class may not be a major factor in the analysis of cell phones and social capital.

A final “demographic” indicator which needs to be examined is the presence of existing ties within the experimental and control groups. As was noted in the previous section, when recruiting from classrooms, it was possible that experimental sessions could be filled with students who are already acquainted with one another (and thus there may be an impact on the formation of social capital, or lack thereof, beyond what was controlled for in the experimental design). When asked how many of their fellow group members they were acquainted with prior to participation in the study, the majority of respondents (70% of control group members and 74% of experimental group members) said that they were not acquainted with any other group members. From this majority of “0”, control groups ranged to a high of “6” other members and experimental groups to a high “3” other group members with whom individual participants were familiar<sup>5</sup>. As for

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<sup>5</sup> With this higher level, which only a few respondents reported, observations of the groups seem to indicate that this was due to the “familiarity” of faces from class, as opposed to existing relationships outside of the experimental sessions (i.e. members who reported knowing all other group members were not engaging with everyone as “friends” while sitting around waiting for sessions to begin). However, there were several instances in which two or more individuals did appear to be closer friends. These cases will be further explored in the qualitative analysis section of this paper.

differences between groups, it appears that the means (0.49 for control and 0.37 for experimental) are not significantly different when compared using a t-test. Despite the lack of difference between groups, there is still the possibility of these prior acquaintances having an impact on the relationship between cell phones and social capital formation, and thus further analysis may be required.

From this initial look at the composition of both experimental and control groups, we now turn our attention to the other quantitative responses which were gleaned from the post experiment survey instrument. Throughout this quantitative analysis (from the univariate descriptions of variables to the final path analysis models) the results for both experimental and control groups are presented. This further provides context about the differences and similarities between these two group types, in order to discover the relationships which are discussed and analyzed qualitatively later in this manuscript. To begin the quantitative analysis, we must look to the individual indicators and variables upon which these later relationships are tested.

## Univariate Analysis

### Cell Phone Use

The first, and main indicator of cell phone use is the dichotomous variable which labels participants as members of either control (“0”) or experimental (“1”) groups. This variable denotes whether or not cell phones were able to be used in the groups and, as discussed above, a total of 66 participants had this opportunity and 57 were unable to use their cell phones in control groups. A second measure of cell phone use was also included on the survey, with a question that asked participants in experimental groups



how many times they used their cell phones during the test. Response options ranged from “0” or not having used a cell phone, to “10 or more times” on a seven-point scale. The majority of experimental group participants (78.9%, n=52) responded to this question with a value between “5-6 times” and “10 or more times,” with 50% of participants having used their phones eight or more times during the experimental sessions. The mean for this indicator was 4.11, with a median of 4.50 and a standard deviation of 1.80, which suggests that the typical experimental group participant used their cell phone during the test approximately four to nine times during the testing period. Overall, these findings suggest a moderate to high degree of cell phone use among experimental group members. This is interesting, as there were fifteen questions on the test, and if most participants were not using their phones to answer every question (though some no doubt did), there would seem to be a degree of interaction/information sharing which took place in these groups. This is a pattern which requires more investigation as we move through the remainder of this analysis.

### Social Capital

The first section of the survey instrument contained questions related to the formation of social capital within experimental and control groups. These questions fell along three major groupings: trust, reciprocity, and interaction quantity (measures of aid given and received among group members), which are examined in turn.

### Aid Given and Received

The indicators which related to aid given and received (measured on a seven-point scale from “0” or no interactions to “10 or more” interactions)<sup>6</sup> were coded such that a higher response number indicates a greater frequency of interaction among group members. The final indicator of aid given and received, the proportion of group members interacted with, was calculated using two other indicators from the survey instrument. The reported number of group members who gave help during the test was divided by the group size (which was noted during observations) minus one member<sup>7</sup>. The resulting variable was recoded into four categories, “low”, “moderate low”, “moderate high” and “high” proportions of group members helping the individual respondents. The responses to these indicators are summarized for control and experimental groups in Table 4.1 and Table 4.2 below.

*Control.* Among control group members, the majority of respondents (61.4%, n=35) reported asking other group members for help in finding information or answering

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<sup>6</sup> It should be noted at this point that an error (and oversight) during survey construction left a non- mutually exclusive set of response categories on the first section of the survey. The value coded as “4” was 7-8 times and the category coded as “5” was 8-9 times (in regards to interactions and cell phone usage). Unfortunately, this error was not detected until well into the data collection process. Ultimately these indicators were combined into a compound variable, and therefore the difference between these two response categories was not seen to be that large of a factor. Thus, we move forward in the quantitative analysis with an assumption of an underlying continuum in these responses, and any discrepancies which come down to the difference in these response categories will be discussed should they arise.

<sup>7</sup> Group size was recoded such that those groups with five or more members were collapsed into a single value (5 or above) which corresponded to a similar category in the number of group members who offered help indicator. Given this recoding, it was decided that the resulting compound variable would be dealt with at the ordinal level with an assumed underlying continuum.

questions on the test seven or more times during the course of the experimental session, with 35% (n=20) reporting ten or more instances. The second indicator, asking how many times participants received help from other group members during the test, yielded similar responses with 64.9% (n=37) of participants saying that they received help seven or more times. And much like the asking for help indicator, 40% (n=23) reported receiving help ten or more times over the course of the testing period. With similar means for both of the indicators (4.10 and 4.37), and standard deviations of 1.80 and 1.61 respectively, we can see that the typical participant in a control group gave a response between 2.3 and 5.9 when it came to asking for help, and between 2.76 and 5.98 when it came to receiving help. Given these results, it would appear that asking for help and receiving help occurred at about the same (fairly high) rate in control groups. As can be seen in Table 4.3 below, when looking at how many times participants asked for help and received help, we can see that in control groups, the average response on the lower end of the “asked for help” (4 or fewer times) was a 3.21, or around five to six instances of help being given. This seems to suggest that in these groups, help was being given even when it was not actively being asked for by individual members.

When it comes to being asked to help by other group members during the test, participants in control groups reported doing so on average around three to four times. A majority of these participants (64.9%, n=37) reported being asked for help four or fewer times during the course of the test. In contrast to the first two indicators of aid given and received, it appears that there was a lower frequency of being asked for help than there was for asking for and receiving help. However, this is perhaps not surprising, given the dispersion of questions and requests for help throughout the group. For instance, while

any individual member could ask for help ten or more times, the questions could have been spread around the group, such that other members were each asked for help fewer than ten times each. As for the proportion of group members who helped during the test, the final indicator of aid given and received, the median response for control groups was 4.00, or “moderate/high.” The majority of control group participants (57.9%, n=33) reported a high proportion<sup>8</sup> of group members having helped during the testing period. Overall, we can see that for all of the indicators of aid given and received, control group participants appear to have a fairly high level across the board.

Table 4.1.

Summary of Univariate Results for Indicators of Aid Given and Received, Control Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
How many times did you ask a group member for help on the test?	4.10	4.00 (7-8 times)	3.22	1.80	-0.54	-0.59
How many times did you receive help from another group member during the test?	4.37	5.00 (8-9 times)	2.59	1.61	-0.37	-1.36*
How many times were you asked to help by other group members during the test?	2.21	2.00 (3-4 times)	3.31	1.82	0.86*	-0.21
Proportion of group members who helped during the test (Ordinal Recode)	3.35	4.00 (Moderate/High)	0.73	0.86	-0.93*	-0.45

\*p<.05, two-tailed

<sup>8</sup> The ordinal categories for this “proportion of group members who helped” variable are as follows: “Low,” from .0 to .25; “Moderate/Low,” from .26 to .69; “Moderate/High,” from .70 to .89; and “High,” .90 to 1.00.

Table 4.2.

Summary of Univariate Results for Aid Given and Received Indicators, Experimental Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
How many times did you ask a group member for help on the test?	2.09	2.00 (3-4 times)	2.73	1.65	0.78*	0.10
How many times did you receive help from another group member during the test?	2.85	2.50 (3-6 times)	3.30	1.82	0.41	-0.91
How many times were you asked to help by other group members during the test?	1.30	1.00 (1-2 times)	1.66	1.29	1.45*	3.52*
Proportion of group members who helped during the test (Ordinal Recode)	2.83	3.00 (Moderate/ Low)	1.40	1.18	-0.35	-1.45*

\* $p < .05$ , two-tailed

*Experimental.* When it comes to the first indicator of aid given and received, the majority of experimental group participants (63.7%,  $n=42$ ) reported asking other group members for help four or fewer times, and 85% ( $n=56$ ) reporting doing so 6 or fewer times. The mean of 2.09 and standard deviation of 1.65 indicate that the typical experimental group member responded between 0.44 and 3.71 (or around zero to six times). Compared to the control group responses above, we can see that experimental group members asked for help less frequency on average. As for the second indicator, with a mean of 2.85 and a standard deviation of 1.85, the typical experimental group member received help from others between one and eight times (68% falling between 1 and 4.7 on the response scale). Much like the control group then, it would appear that asking for help and receiving help occurred at close to the same rate for experimental group members. However, when looking at the relationship between these first two

indicators, some differences with the control group do appear. As we saw above, there appeared to be aid received by others, even when the frequency of asking for help was lower. However, as we can see in Table 4.3 below, in experimental groups, the responses appear to suggest that asking for help and receiving help occurred at about the same rates. This is interesting, as it may suggest that members of experimental groups didn't offer unsolicited help as much as in control groups (at least among the lower end, or those who only asked for help a few times if at all)<sup>9</sup>.

The third indicator of help given and received, being asked for help by others during the test, had a lower average than the first two indicators among experimental group members (mean=1.30). The majority of experimental group participants (59.1%, n=39) reported that they were asked for help by others four or fewer times and, in total, 87.8% (n=58) reported being asked for help six or fewer times during the test, with 31.8% (n=21) not being asked for help at all. With a standard deviation of 1.29, we can see that the typical participant reported being asked for help between zero and four times (values 0.01 to 2.59). As for the final indicator of aid given and received, the proportion of the group which help out during the test, the median response for experimental group members was 3.00 (moderate/low). Interestingly, the modal category for this indicator was "high", with 43.9% (n=29) giving this response. And yet, despite the large

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<sup>9</sup> Subsequent t-tests reveal that unsolicited help (help received minus help asked for) was significantly higher overall in experimental groups (.287 control vs. .757 experimental,  $p < .05$ ). However, when looking at the average unsolicited help levels based on frequency of having asked for help we see a slightly different pattern than the overall comparison: 2.21 for those asking for help 4 or fewer times in control groups vs. .970 for experimental groups at the same level (where ultimately a greater proportion of the participants were located). Thus, along the lower end of asking for help, more unsolicited help was indeed given in control groups.

proportion at the upper end of this distribution, the typical respondent still gave a lower level response than what was found in the control groups (68.0% within 1.65 to 4.00 for experimental vs. 2.49 to 4.0 for control). Overall, looking at all four indicators, it appears that aid was given and received at a moderate to low level in experimental groups. And further, these results seem to suggest that there was a higher degree of interaction (aid given and received) among control group members than among those in experimental groups.

Table 4.3.

Average Response for “Received Help” by “Asked for Help.”

How many times did you ask a group member for help on the test? (Response values)	How many times did you receive help from another group member during the test?	
	Control Mean	Experimental Mean
0-4 times (“0-2”)	3.21	1.97
5-9 times (“3-5”)	3.89	4.49
10 or more times (“6”)	5.75	5.00

### Reciprocity

The next set of indicators related to social capital formation dealt with the dimension of reciprocity. These two indicators, “helping others during the test made me feel as though I would be helped if I needed it” and “I felt an obligation to help other group members during the test” were measured on a seven-point scale from “strongly agree” to “strongly disagree.” The responses were recoded prior to the analysis such that higher values would indicate more agreement with the statements. These responses are summarized for both control and experimental groups in Table 4.4 below.

Table 4.4.

Summary of Univariate Results for Reciprocity Indicators, Experimental and Control Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
<u>Control</u>						
Helping others during the test made me feel that I would be helped if I needed it.	5.28	6.00	2.13	1.46	-0.87*	0.15
I felt a sense of obligation to help other group members during the test.	5.25	6.00	2.40	1.55	-0.67*	-0.43
<u>Experimental</u>						
Helping others during the test made me feel that I would be helped if I needed it.	5.30	6.00	3.17	1.78	-1.10*	0.38
I felt a sense of obligation to help other group members during the test.	4.83	5.00	3.68	1.92	-0.75*	-0.39

\* $p < .05$ , two-tailed

*Control.* The responses from control group members were very similar when it came to both indicators of reciprocity. The majority of participants (77.2%,  $n=44$ ) gave a response of five or higher on the seven-point scale when it came to “helping others during the test made me feel that I would be helped if I needed it,” and none of the participants reported that they strongly disagreed with this statement in control groups. With a mean of 5.28, a median value of 6.00 and a standard deviation of 1.46, the typical respondent to this first indicator was within the upper end of the response scale (between 3.82 and 6.74). As for the second indicator, “I felt a sense of obligation to help others during the test,” the majority of participants (68.4%,  $n=39$ ) gave a response of five or higher on the seven-point scale. As with the first indicator, these responses were also had a significant negative skew, with a median of 6.00, a mean of 5.25 and a standard



deviation of 1.55. Thus, the typical participant fell within the upper end of the response scale (between 3.7 and 6.8) for this indicator as well. These results suggest that there was a fairly high degree of perceived reciprocity among control group members.

*Experimental.* For the first indicator of reciprocity, “helping others on the test made me feel that I would be helped if I needed it,” the majority of experimental group members (77.2%, n=51) gave a response of five or above on the seven-point scale. A mean of 5.30, a median of 6.00 and a standard deviation of 1.78 indicate a negatively skewed distribution with the typical respondent falling on the upper end of the response scale (between 3.52 and 7.00). Interestingly, a larger proportion of respondents fall into the “strongly disagree” category (6.1%, n=4) for the experimental group (vs. 0% for the control groups) when it comes to this first indicator. As for the second indicator, “I felt a sense of obligation to help other group members during the test,” the majority of participants (63.6%, n=42) gave a response of five or above. With a mean of 4.83, a median of 5.00 and a standard deviation of 1.92, the typical respondent in this negatively skewed distribution gave an answer between 2.91 and 6.75 on the seven-point scale. This was the lowest average response for these indicators in both experimental and control groups, though it does not seem that this difference drastically changes the similarity between groups types when it comes to the indicators of reciprocity. Overall then, it appears that both experimental and control group members felt a relatively high degree of reciprocity during the test, with perhaps a slightly higher degree experienced by control group members.

## Trust

The final set of indicators related to social capital formation deal with the dimension of trust. These two indicator statements, “I felt that I could really trust those who I interacted with during the test” and “In general, the members of this group can be trusted to provide useful information” were measured on a seven-point scale from “strongly disagree” to “strongly agree.” The responses were recoded prior to analysis such that a lower value represented a lower degree of agreement with the statements. The univariate results for these two indicators are summarized for both experimental and control groups in Table 4.5 below.

Table 4.5.

Summary of Univariate Results for Trust Indicators, Experimental and Control Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
<u>Control</u>						
I felt that I could really trust those who I interacted with during the test.	4.19	4.00	2.23	1.49	0.02	-1.01
In general, the members of this group can be trusted to provide useful information.	4.70	5.00	2.14	1.46	-0.38	-0.95
<u>Experimental</u>						
I felt that I could really trust those who I interacted with during the test.	4.59	4.50	2.06	1.44	-0.37	-0.26
In general, the members of this group can be trusted to provide useful information.	5.41	6.00	3.60	1.88	-1.16*	0.23

\* $p < .05$ , two-tailed

*Control.* The distribution of control group participants in regards to the first indicator of trust, “I felt that I could really trust those who I interacted with during the

test,” was fairly even across the response categories. The majority of participants (78.9%, n=45) reported that their level of trust in other group members was between 2.00 and 5.00 on the seven-point scale. With a mean of 4.19, a median of 4.00 and a standard deviation of 1.49, the typical respondent in this not significantly skewed distribution fell between 2.7 and 5.68. This would appear to indicate a middle range level of trust in fellow group members who were interacted with during the test in control groups. It is interesting to note that none of the participants reported that they strongly disagreed with this indicator statement, and as such it would appear that at least a little bit of trust was found in all of the control groups based on this indicator. As for the second indicator of trust, “In general, the members of this group can be trusted to provide useful information,” the majority of participants (84.2%, n=48) reported a value from 3.00 and 6.00, with 54.4% (n=31) at a value of 5.00 or 6.00. With a mean of 4.70, a median of 5.00 and a standard deviation of 1.46, a typical control group member gave a response between 3.24 and 6.16, which is higher on the scale than the responses for the first trust indicator. Furthermore, like the responses to the first indicator, none of the control group members reported that they strongly disagreed with this indicator statement. These findings seem to suggest that control group members found slightly more trust in the ability of fellow groups members to provide useful information than in the members themselves.

*Experimental.* Looking at the indicators of trust among control group members, the majority of participants (77.2%, n=51) reported a value from 4.00 to 6.00 on the seven-point scale when it came to the first indicator statement, “I felt that I could really trust those who I interacted with during the test.” With a mean of 4.59, a median of 4.50

and a standard deviation of 1.44, we can see that the typical respondent to this question fell between the values of 3.15 and 6.03. These results indicate a slightly higher response, on average, to this indicator for experimental group members than for those in the control groups. As for the second indicator of trust, "In general, the members of this group can be trusted to provide useful information," the majority of experimental groups members (74.6%, n=49) responded with a value between 5.00 and 7.00 on the seven-point scale, with some 39.0% of respondents saying that they strongly agreed with the statement. With a mean of 5.41, a median of 6.00 and a standard deviation of 1.88, the typical respondent in this significantly negatively skewed distribution falls between a value of 3.53 and 7.00. Interestingly, despite this average, which is both higher than the first indicator of trust for experimental group members, as well as for the same indicator among control group members, some eight percent of experimental groups members responded that they strongly disagreed with this statement regarding trust in usefulness of information provided by fellow group members (as opposed to no strongly disagree responses in control groups). These responses seem to suggest a higher degree of perceived trust among experimental group members than among control group members, and yet it would also appear that further investigation, in qualitative context, is necessary to fully account for these differences.

### Interaction Quality

The post experimental survey instrument contained six indicators which related to the quality of interactions which took place during the testing period. These six indicators, the responses for which are summarized in Tables 4.6 and 4.7 below, were

measured on a seven-point scale from strongly disagree to strongly agree. The responses were recoded prior to analysis such that lower values would indicate lower levels of agreement with the statements.

### Control

When it came to the control groups, the majority of respondents (77.1%, n=44) responded with values from 4.00 to 6.00 on the seven-point scale for the first indicator of Interaction quality, “I felt a sense of connectedness with those who I interacted with during the test.” With a mean of 4.86, a median of 5.00 and a standard deviation of 1.43, the typical respondent to this indicator gave a response between 3.43 and 6.29. This seems to indicate that control group members felt a moderate degree of connectedness with their fellow groups members overall. The second indicator of interaction quality, “I felt close to those I interacted with during the test,” had a majority of participants (70.2%, n=40) respond between 4.00 and 6.00 on the seven-point scale, much like the first indicator. A mean of 4.61, a median of 5.00 and a standard deviation of 1.42, means that the typical control group respondent to this indicator responded with a value between 3.19 and 6.03, which indicates a moderate degree of “closeness” between control group participants.

As for the third indicator of interaction quality, “I would like the chance to interact more with those who I had contact with in this group,” the majority of respondents (84.2%, n=48) are distributed across the middle of the seven-point scale, from 3.00 to 6.00. The mean of 4.30, median of 4.00 and standard deviation of 1.48 put

the typical respondent for this indicator at a lower level than for the first two indicators, (between 2.82 and 5.78). The fourth indicator, “It is likely that those I interacted with

Table 4.6.

Summary of Univariate Results for Interaction Quality Indicators, Control Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
I felt a sense of connectedness with those who I interacted with during the test.	4.86	5.00	2.05	1.43	-0.88*	0.69
I felt close to those I interacted with during the test.	4.61	5.00	2.03	1.42	-0.36	-0.24
I would like the chance to interact more with those who I had contact with in this group.	4.30	4.00	2.18	1.48	-0.16	-0.51
It is likely that those I interacted with during the test could become my friends if we interacted a lot.	4.35	4.00	2.48	1.58	-0.16	-0.79
The interactions I had with other group members were of a high quality.	5.04	5.00	2.61	1.61	-0.88*	0.39
The interactions I had with other group members were helpful to me.	5.35	6.00	3.34	1.83	-1.31*	0.79

\* $p < .05$ , two-tailed

during the test could become my friends if we interacted a lot,” follows this lower level pattern as well, with the majority of participants (80.7%,  $n=46$ ) responding with values from 3.00 to 6.00 on the seven-point scale. And also like the third indicator, this statement had responses with a mean of 4.35, a median of 4.00 and a standard deviation of 1.58, placing the typical control group respondent in the range from 2.77 to 5.93. The results from these two indicators appear to show a slightly lower “moderate” degree of

interaction quality in regards to the feelings towards potential futures with those who were interacted with during the test.

The fifth indicator of interaction quality, “The interactions I had with other group members were of a high quality” had a majority of participants (71.9%, n=41) respond between 5.00 and 7.00 on the seven-point scale. With a mean of 5.04, a median of 5.00 and standard deviation of 1.61, the typical respondent falls within the range from 3.43 to 6.65. This suggests that control group members rated the quality of their interactions at a fairly high level. The sixth and final indicator of interaction quality, “The interactions I had with other group members were helpful to me,” had a majority of participants (77.1%, n=44) respond with values between 5.00 and 7.00 on the seven-point scale. And

Table 4.7.

Summary of Univariate Results for Interaction Quality Indicators, Experimental Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
I felt a sense of connectedness with those who I interacted with during the test.	4.62	5.00	3.07	1.75	-0.62*	-0.44
I felt close to those I interacted with during the test.	4.03	4.00	3.38	1.84	-0.09	-0.92
I would like the chance to interact more with those who I had contact with in this group.	4.24	4.00	2.46	1.57	-0.10	-0.28
It is likely that those I interacted with during the test could become my friends if we interacted a lot.	4.73	5.00	2.11	1.45	-0.44	-0.00
The interactions I had with other group members were of a high quality.	4.74	5.00	3.12	1.77	-0.60*	-0.46
The interactions I had with other group members were helpful to me.	5.46	6.00	3.76	1.94	-1.16*	0.03

\*p<.05, two-tailed

much like the fourth indicator above, a mean of 5.35, median of 6.00 and standard deviation of 1.83, place the typical respondent on the negatively skewed distribution on the range from 3.52 to 7.00, which is a higher level than the rest of the indicators of interaction quality. Overall, these findings suggest that for control group members, there is a moderate to moderate-high degree of perceived interaction quality along what appear to be three distinct dimensions (connection/closeness, future interactions, and general quality). Whether these dimensions warrant the creation of multiple variables will need to be examined in the next stage of the analysis.

#### Experimental

The majority of participants in experimental groups (77.3%, n=51) gave a response between 4.00 and 7.00 on the seven-point scale for the first indicator of interaction quality. And as we can see from the results in Table 4.7 above, with a mean of 4.62, median of 5.00 and standard deviation of 1.75, the typical respondent felt a moderate degree of connectedness (from 2.87 to 6.37) with those they interacted with during the test. The second indicator of interactions quality, feelings of closeness, garnered a response between 4.00 and 7.00 from 65.2% (n=43) of experimental group members. A mean of 4.03, median of 4.00 and standard deviation of 1.84 places the typical respondent to the second indicator statement between a value of 2.19 and 5.87, another moderate level, which appears to be the trend. In comparison to the control group results above, the responses to these first two indicators appear to be quite similar in their distributions.



The third indicator of interaction quality, asking about the desire to interact more with group members in the future, had a response in experimental groups between 3.00 and 6.00 for 77.3% (n=51) of participants. A mean of 4.24, median of 4.00 and standard deviation of 1.57 place the typical respondent at a moderate level between 2.67 and 5.81 on the seven-point scale. This pattern is carried through to the fourth indicator as well, with the majority of respondents (74.2%, n=49) falling between 4.00 and 6.00 when it came to feelings about forming friendships with other group members. A mean of 4.73 and standard deviation of 1.45 find the typical respondent in the range from 3.28 to 6.18. Perhaps unsurprisingly, the moderate level of these two indicators does not appear to set them apart from the responses for these same indicators in the control groups.

The fifth indicator of interaction quality, dealing with perceived quality of the interactions themselves, had the majority of respondents (77.3%, n=51) falling between 4.00 and 7.00 on the seven-point scale. With a mean of 4.74, a median of 5.00 and a standard deviation of 1.77, the typical response to this indicator statement was within the range from 2.97 to 6.51. And finally, when it comes to the sixth indicator of interaction quality, the helpfulness of interactions, the majority of respondents (68.2%, n=45) fell within the highest values of 6.00 and 7.00. However, with a significant negative skew to the distribution, a mean of 5.46 and standard deviation of 1.94, the typical respondent was within the range from 3.52 to 7.00. And yet again, we see that with only slight variation between indicators, these last two components of interaction quality are within the moderate to moderate-high level.

Despite being a monotonous undertaking, this univariate examination of indicators has revealed that despite the range of questions which compose interaction

quality, that there are striking similarities in the responses between both experimental and control group members. As such, these findings may be a hint at what is to come in the later analysis, in spite of the theoretical predications laid out earlier in this study. And thus, further examination, especially of a qualitative nature, will be necessary to parse out any differences which exist between experimental and control groups when it comes to the quality of interactions.

### Information Sharing

The next major set of questions on the survey instrument dealt with aspects of information sharing in group settings, a sense of cooperation, shared goals, willingness to interact and perceived accessibility of other group members. Measured, along with the majority of questions on the survey, on a seven-point scale from strongly disagree to strongly agree, the responses were recoded such that a lower value would indicate a lower level of agreement with the indicator statements. These responses are summarized, for both experimental and control groups, in Table 4.8 below.

### Control

The first indicator of information sharing was the statement “I feel there is a sense of cooperation in this group.” The majority of control group participants (82.5%, n=47) responded to this statement at 5.00 or above on the seven-point scale. With a mean of 5.51, a median of 6.00 and a standard deviation of 1.81, the typical respondent fell within the range from 3.70 to 7.00. This distribution was found to have a significant negative skew, which as we can see from Table 4.8 is the case for all of these indicators in both

experimental and control groups. As such, this skewness may indicate a potential for corrections as we move forward with the quantitative analysis. The second indicator, “I feel that there was a focus on shared goals in this group” had a mean response of 5.68, a

Table 4.8.

Summary of Univariate Results for Information Sharing Indicators, Experimental and Control Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
<u>Control</u>						
I feel there is a sense of cooperation in this group	5.51	6.00	3.29	1.81	-1.51*	1.40*
I feel that there was a focus on shared goals in this group	5.68	6.00	3.58	1.89	-1.63*	1.58*
I felt confident that the other group members would actively engage in problem solving with me if asked.	5.67	6.00	3.62	1.90	-1.65*	1.59*
Group members seemed to be accessible to me when it came to helping solve problems.	5.70	6.00	3.50	1.87	-1.60*	1.37*
<u>Experimental</u>						
I feel there is a sense of cooperation in this group	5.41	6.00	3.88	1.97	-1.18*	0.11
I feel that there was a focus on shared goals in this group	5.47	6.00	4.10	2.03	-1.14*	-0.10
I felt confident that the other group members would actively engage in problem solving with me if asked.	5.46	7.00	4.74	2.18	-1.16*	-0.22
Group members seemed to be accessible to me when it came to helping solve problems.	5.56	7.00	4.44	2.11	-1.25*	0.00

\*p<.05, two-tailed

median of 6.00 and standard deviation of 1.89, which places the typical respondent within the range between 3.79 and 7.00. We can also see that with the negative skew, it is not

surprising to find the majority of participants (73.7%, n=42) at the upper end of the scale at 6.00 and above.

Both the third and fourth indicators of information sharing carried on this pattern of similarity in their distributions of responses among control group members. With a mean response of 5.67, a median of 6.00 and standard deviation of 1.90, the indicators statement “I felt confident that the other group members would actively engage in problem solving with me if asked,” had its typical respondent between the values of 3.77 and 7.00, with the majority of respondents once again falling along the upper end of the distribution (73.7% n=42 at 6.00 or above). The fourth and final indicator, “group members seemed to be accessible to me when it came to helping solve problems,” had the majority of respondents along the upper end of the scale as well, with 73.7% (n=2) at 6.00 or above. And with a mean of 5.70, median of 6.00 and standard deviation of 1.87, the typical respondent fell within the range of values from 3.83 and 7.00 on the seven-point scale. Overall, these four indicators suggest a moderate/moderate-high degree of information sharing conditions among control group members. Furthermore, these results seem to suggest a high likelihood of reliability may exist among these indicators as a compound variable for information sharing.

### Experimental

In much the same fashion as the control groups as discussed above, the first indicator of information sharing regarding cooperation, had a moderate to moderate-high level of responses, with an average of 5.41 and standard deviation of 1.97 placing the typical respondent in the range of values from 3.44 to 7.00 on the seven-point scale. And

much the same as the negatively skewed indicators already mentioned, the majority of respondents (75.7%, n=49) were at 5.00 or above. The second indicator follows this same trend, with a mean of 5.47 and standard deviation of 2.03 placing the typical respondent within the range of values from 3.44 to 7.00, and the negative skew placing the bulk of these respondents (66.7%, n=44) at 6.00 or above.

For the third indicator, which dealt with perceived willingness of fellow groups members to engage in problem solving, the majority of respondents (69.7%, n=46) at 6.00 or above on the seven-point scale. A mean of 5.46 and standard deviation of 2.18 shows that in this skewed distribution, the typical respondent falls between 3.28 and 7.00. The final information sharing indicator, perceived accessibility of group member to engage in problem solving, had a mean of 5.56 and standard deviation of 2.11, which means the typical respondent fell within the range of values from 3.45 to 7.00, with the majority of respondents (72.7%, n=48) at 6.00 or above.

As with the responses from the control groups, we can see that these indicators are very consistent in their moderate/moderate-high levels in regards to information sharing conditions. Although the means from the control groups are slightly higher across the board, it remains to be seen if these differences are significant. Ultimately, it is the similarity between these indicators which provides the most utility, as there may be room for more exploration/explanation of any differences with further analysis.

#### Test Accuracy and Accomplishment

The final indicators which we will consider relate to the test which was taken during the experimental session itself. The first was the accuracy of the individual

respondents on the test instrument. This was calculated by “grading” the tests and entering the number of questions correct as the score for each participant. The second indicator was measured using the seven-point scale (from strongly disagree to strongly agree) on the survey instrument, and asked respondents how much they agreed with the statement that “after finishing the test, I felt a sense of accomplishment.” Responses to this indicator were recoded such that lower values corresponded with lower levels of agreement.

### Control

When it came to task accuracy, the group mean scores on the test (number correct out of 15 questions) ranged from a low of zero to a high of 12.04. With a mean of 8.90, a median of 9.05, and a standard deviation of 2.46, the typical control group participant fell within the range of values from 6.44 to 11.36. Thus, we can see that control groups had a fairly low score on the test itself (an average of 59.0%). As for the sense of accomplishment which was felt by control group members, with an average of 4.60, median of 4.00 and standard deviation of 1.76, the typical respondent fell between 2.84 and 6.36 on the seven-point scale, which appears to be a fairly moderate level of feelings of accomplishment. With the majority of respondents on the upper half of the response scale (75.4%, n=43, at 4.00 or above) it would appear that despite relatively low scores on the test itself, control group members tended to have a generally positive outlook on their performance.

## Experimental

As for experimental group test performance, group mean scores ranged from a low of 10.714 to a high of 15.00. With an average score of 13.89, median of 14.00 and standard deviation of 1.07, the typical participant in this significantly negatively skewed distribution ( $-0.83, p < .05$ ) fell within the range of values from 12.82 to 14.96. The upper half of the experimental group participants (53.0%,  $n=35$ ) scored 14 points or higher correct on the test. When it comes to the sense of accomplishment which was felt by the experimental group members, the average response of 5.30, median of 6.00 and standard deviation of 1.81 indicate that the typical respondent fell within the range of values from 3.49 to 7.00 on the seven-point scale. This negatively skewed distribution ( $-0.96, p < .05$ ) had a majority of respondents (72.7%,  $n=48$ ) at 5.00 or above. These results are quite different from those in the control groups, with higher averages for both test scores and sense of accomplishment. Given these findings, it seems reasonable that significant differences between experimental and control groups will be found, though the reasoning behind these differences and the fact that not all experimental group members (who had access to phones) had perfect scores are explored further in the qualitative analysis.

## Compound Variable Univariate Analysis

Given the hypotheses laid out in this study, and in order to reduce the number of variables which were used in the analysis, a number of compound variables were created. After a series of factor analyses and reliability tests, in order to determine the suitability of indicators to be combined, the necessary indicators were added together to form compound variables. This section examines the factor analysis process as well as the

univariate results for the subsequent variables which were created.

## Aid Given and Received

### Factor Analysis

As laid out in the section above, there were four indicators which were focused on giving and receiving aid in experimental and control groups: “How many times did you ask a group member for help on the test?,” “How many times did you receive help from another group member during the test?,” “How many times were you asked to help by other group members during the test?,” and the proportion of group members who helped during the test. In order to discover whether these indicators focused on one common dimension of aid given and received, or whether multiple dimensions might be a better fit, a factor analysis was carried out. A Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of .737 and a Bartlett’s test of sphericity of 158.247 (df=6,  $p < .05$ ) indicated suitability for a factor analysis using these four indicators.<sup>10</sup> The analysis resulted in only one component, with factor loadings above .70 for all of the indicators, which accounted for 62.2% of the variance among the indicators. As the indicators only appeared to form one component, they were next tested for reliability. With a Chronbach’s Alpha of .787, which indicates decent reliability, they were added together to form the compound variable *Aid Given and Received* for both experimental and control group participants. The univariate results for this, and all other compound variables, are found in Table 4.9 below.

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<sup>10</sup> Based on the standard that KMO values above .50 are suitable for analysis, and that with a significant Bartlett’s statistic we can reject the null of an identity matrix.



## Univariate Results

The variable *Aid Given and Received* has a range of possible values from a low of one to a high of twenty-two. With this variable then, as values increase, we can assume a higher degree of interaction among group members and thus a higher level of aid being given or received.

*Control.* For control group members, the mean value for *Aid Given and Received*, was 14.02 and the median was 14.00. With a standard deviation of 4.52, the typical control group member falls within the range of values from 9.5 to 18.54, which appears to be on the high end of moderate for this variable.

*Experimental.* As for control group members, the mean value for *Aid Given and Received* was 9.08 and the median was 9.00. With a standard deviation of 4.72, the typical experimental group member falls within the range of values from 4.56 to 13.80, which would appear to be on the lower end of moderate for this variable. And so we can see that a higher degree of aid appears to have been given and received among control group members than among those in experimental groups, which holds with the pattern found among the individual indicators discussed in the previous section. It is also notable that the lowest value for control group members on this variable was five, while the lowest for experimental group members was one (the lowest value of the variable).

## Reciprocity

### Factor Analysis

The two indicators that relate to reciprocity, “helping others during the test made

me feel that I would be helped if I needed it” and “I felt a sense of obligation to help other group members during the test,” were entered into a factor analysis in order to determine whether they had enough commonality to be combined. A KMO score of .500 indicates that these two indicators are just suitable for a factor analysis, while a Bartlett’s test (19.18,  $df=1$ ,  $p<.05$ ) indicates suitability for factor analysis. These two indicators loaded on only one component (with factor loadings above .80 for both), and this single component accounts for 69.4% of the variance in the indicators. A reliability test resulted in a Chronbach’s Alpha of .558, which seems to indicate a moderate degree of reliability between indicators. Given that these two variables do have an underpinning theoretical relationship (plus the fact that these indicators make up a dependent variable), there is cause to combine them into a single compound variable *Reciprocity* (with values ranging from 2.00 to 14.00)<sup>11</sup>.

#### Univariate Results

*Control.* The average value of *Reciprocity* for control group members was 10.53 and the median was 11.00. With a standard deviation of 2.54, the typical control group participant fell within the range of values from 7.99 to 13.07, which is on the higher end of the distribution for this variable.

*Experimental.* As for experimental group members, with an average of 10.14, median of 10.00 and standard deviation of 3.06, the typical respondent fell within the

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<sup>11</sup> Even though this compound variable *Reciprocity* was utilized for the remaining analyses, questions regarding *Reciprocity* or its relationships were also dealt with by exploring the individual indicators when needed. This approach of using the compound variables but also examining the individual indicators was taken with the other compound variables in this study, including *Trust* and *Information Sharing*.

range of values from 7.08 to 13.20. Looking at the comparison with control group members, this would appear to be a very similar distribution focused on the higher end of the values, though with a slightly longer negative tail (the lowest value for experimental members was 2.00 and the lowest for control was 5.00, and 62.0% of respondents in control groups were at 10.00 or above, while nearly the same proportion, 61.0% were at 11.00 or above in control groups).

## Trust

### Factor Analysis

The two indicators which relate to trust, “in general, the members of this group can be trusted to provide useful information” and “I felt close to those I interacted with during the test,” were entered into a factor analysis to determine if they could be combined into a single compound variable. A KMO score of .500 indicates that these two indicators were only just suitable for the analysis, while a significant Bartlett’s test (24.139,  $df=1$ ,  $p<.05$ ) suggests that a factors analysis could proceed. The resulting analysis converged on a single component, with both indicators loading on this single dimension above .80 and accounting for 71.34% of the variance in these two indicators. A Chronbach’s alpha of .592 suggests a less than wonderful reliability for these indicators. However, as with the reciprocity variable above, the theoretical justification of the similarity between these two indicators suggests that they be combined into a single compound variable *Trust* (with values from two to fourteen). As with *Reciprocity*, this variable will be dealt with using its individual indicators should the need arise during later analysis.

## Univariate Results

*Control.* With a mean of 8.89, a median of 9.00 and standard deviation of 2.61, the typical control group participants had a *Trust* value within a range from 6.28 to 11.50. This would seem to suggest that control group members tended to feel a moderate degree of trust during the experimental sessions. However, it is interesting that again none of the control group members reported the lowest levels of trust as assessed by this variable (with 4.00 being the lowest, and only 5.3% of respondents classified into this value).

Table 4.9.

Summary of Univariate Results for Compound Variables, Experimental and Control Groups.

	Mean	Median	Variance	Std. Dev.	Skewness	Kurtosis
<u>Control</u>						
Aid Given and Received	14.02	14.00	20.45	4.52	0.03	-0.83
Reciprocity	10.53	11.00	6.47	2.54	-0.63*	-0.29
Trust	8.89	9.00	6.81	2.61	-0.13	-0.90
Interaction Quality	28.51	30.00	57.86	7.61	-0.56	-0.22
Information Sharing	22.56	25.00	52.11	7.22	-1.72*	1.81*
<u>Experimental</u>						
Aid Given and Received	9.08	9.00	22.32	4.72	0.45	0.26
Reciprocity	10.14	10.00	9.38	3.06	-0.73*	0.14
Trust	10.00	11.00	7.39	2.72	-0.95*	0.57
Interaction Quality	27.82	29.00	68.61	8.28	-0.62*	-0.10
Information Sharing	21.89	25.00	60.04	7.75	-1.29*	0.22

\*  $p < .05$ , two-tailed

*Experimental.* The typical experimental group participant was at a higher level for *Trust*, than what was found for control group members. With a mean of 10.00, a median of 11.00 and a standard deviation of 2.72, this typical respondent fell somewhere between the values of 7.38 and 12.72. There were a few experimental members who fell along the lower end of this variable (6.0% at 4.00 or below), though the majority fall at the upper end of the distribution (68.2%, n=45 at 1.00 or above). Looking at Table 4.9 above, we see that most of the compound variables for the experimental groups are negatively skewed, with a majority of respondents along the upper end, but a tail of respondents along the lower end.

## Interaction Quality

### Factor Analysis

There were six indicators which related to interaction quality: “I felt a sense of connectedness with those who I interacted with during the test,” “I felt close to those I interacted with during the test,” “I would like the chance to interact more with those who I had contact with in this group,” “It is likely that those I interacted with during the test could become my friends if we interacted a lot,” “The interactions I had with other group members were of a high quality,” and “The interactions I had with other group members were helpful to me.” With a KMO score of .801 and significant Bartlett’s test (472.364,  $df=15$ ,  $p<.05$ ) indicating suitability, a factor analysis was conducted. The analysis yielded a single component, with factor loadings between .692 and .899 for all of the indicators on this one dimension. This single component accounts for 64.87% of variance in the indicators. Given these results, the six indicators were added together into

the compound variable *Interaction Quality*, with possible values ranging from six to forty-two.

### Univariate Analysis

*Control.* The mean for control group members when it came to *Interaction Quality* was 28.51. With a median of 30.00 and standard deviation of 7.61, the typical control group member fell somewhere within the range of values from 20.90 to 36.12, which is pretty squarely in the moderate to moderate-high range for this variable. Without a significant skew to the distribution, this variable falls in line with the others thus far discussed, in that none of the control group members fell into the lowest values (the lowest being 10.00, with 1.8% of respondents).

*Experimental.* As for experimental group members, the mean response was 27.82, median was 29.00 and the standard deviation was 8.28. This meant that they typical experimental group member fell within the range of values from 19.54 to 36.10 for *Interaction Quality*, which is remarkably similar to the responses from control group members. These results suggest that experimental group members also tended to have a moderate to moderate-high degree of *Interaction Quality* during experimental sessions.

### Information Sharing

#### Factor Analysis

The four indicators which related to the conditions of information sharing - “I feel there is a sense of cooperation in this group,” “I feel that there was a focus on shared goals in this group,” “I felt confident that the other group members would actively

engage in problem solving with me if asked,” and “group members seemed to be accessible to me when it came to helping solve problems” - were expected to fall into three main dimensions. Togetherness, willingness, and accessibility, as discussed in the literature review, were all found to be key elements of information sharing in past research. And therefore, a factor analysis of these theoretically related indicators was carried out to see if multiple dimensions could be formed. A KMO score of .855 and significant Bartlett’s test (588.783,  $df=6$ ,  $p<.05$ ) indicate excellent suitability for factor analysis. The results of the subsequent factor analysis yielded a single component, with factor loadings for all four indicators above .90 and explaining some 90.0% of variance in these indicators. With a Chronbach’s alpha of .962 indicating excellent reliability for this single component, a compound variable *Information Sharing* was computed by adding the indicators together (with values ranging from four to twenty-eight).

#### Univariate Analysis

*Control.* With a mean of 22.56, a median of 25.00 and standard deviation of 7.22 when it comes to *Information Sharing*, the typical control group member falls within the range of values from 15.34 to 29.78. A significant negative skew to the distribution puts the majority of participants (66.7%,  $n=38$ ) were at a value of 24.00 or above, with a tail containing the rest of the members trailing off to the lower end of the distribution. As we can see then, there appears to be a relatively high level of *Information Sharing* for control groups.

*Experimental.* When it comes to the experimental groups, a mean of 21.89, median of 25.00 and standard deviation of 7.75 places the typical participant in the range

of values from 14.14 to 29.64 for *Information Sharing*. Much like the control groups, this distribution is also negatively skewed, with a majority of respondents (65.2%, n=43) at 24.00 and above with a tail trailing off to the lower end. These results seem to indicate that, like control groups, experimental group members were also at a fairly high level of *Information Sharing*.

### Quantitative Hypothesis Tests

The hypotheses, explained in full detail in the previous chapters, were tested (based on the quantitative survey data) using a variety of statistical techniques. To test the significance of differences between experimental and control groups, and thus the difference between cell phone use and non-cell phone use, a series of t-tests was utilized. In order to uncover the relationships between variables (for instance the degree of cell phone use and interaction quality), over twenty ordinary least squares (OLS) regression analyses were carried out, both among experimental groups and among control groups, in order to compare the relationships which occurred in these two group types. Prior to interpreting the final regression models however, each one was thoroughly examined in its assumptions of no multicollinearity, normality of residuals, linearity and homoskedasticity (and subsequent transformations and corrections were made when needed) to ensure the best least squares unbiased estimates were obtained.<sup>12</sup> As

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<sup>12</sup> A complete summary of the OLS assumption tests and corrections can be found in Appendix C. For most of the regressions, no corrections were needed, as issues of multicollinearity, residual normality linearity and heteroskedasticity did not arise. However, in some cases (notably regressions involving *Information Sharing*) non-linear terms were utilized, or log transformations were carried out, to meet the assumption of linearity. Several regression models (namely those in which a power model was utilized) were also weighted by 1/predicted values from a White's regression.



individual regression analyses were carried out for each of the fifteen hypotheses, and given the complexity of the relationship between the variables in this study (some being both independent and dependent variables), a path analysis was also carried out in order to get a feel for the overall relationships of interest.<sup>13</sup> In this section, the results from these analyses as they relate to each of the fifteen hypotheses laid out in the second chapter are presented. With these quantitative results, conclusions as to the support of the hypotheses can be drawn, as well as indicating areas which require further examination and discussion in regards to the qualitative data later in the analyses.

#### Cell Phone Use and Social Capital Formation

The first set of hypotheses (1-3) deal with the relationship between cell phone use and social capital formation. Both t-tests and regression models were used to test these hypotheses, the results from which are summarized in Table 4.10 and Table 4.11 below.

Hypothesis 1: When cell phones are used in a group, members will be less likely to call upon others for aid. **Supported**

Hypothesis 2: When cell phones are used in a group, members will report lower levels of perceived reciprocity. **Not Supported**

Hypothesis 3: When cell phones are used in a group, members will report lower levels of perceived trust in fellow group members. **Partially Supported**

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<sup>13</sup> Path analyses were conducted using the IBM AMOS modeling program. Two models were constructed to predict the endogenous variables of social capital formations, *Aid Given and Received*, *Trust* and *Reciprocity*. The experimental and control models demonstrated good fit for the data, with non-significant Chi-square tests (Experimental:  $\chi^2=17.195$ ,  $df=17$ ,  $p>.05$ ; Control:  $\chi^2=6.516$ ,  $df=6$ ,  $p>.05$ ), which has been shown to be the best predictor of model fit (Kline, 2011), as well as CFI and TLI scores close to 1.00, PClose scores above .45, and REMSEA scores near zero (.029 and .039 respectively) with 90% confidence intervals between .000 and .181 all indicating a close fit of the models to the data being used.

As was noted in the univariate results above, there appears to be a higher degree of calling upon others for aid, *Aid Given and Received*, in control groups than in experimental groups. A t-test was carried out in order to determine the significance of this difference, and, indeed, with a mean difference of 4.94 units, the difference was found to be significant between the group types ( $t=5.90$ ,  $df=121$ ,  $p<.05$ ). This result suggests that when cell phones are able to be used in groups (the variable which was manipulated in the experimental design), there is significantly less interaction in the form of calling upon one another for aid. This initial test demonstrates the impact of cell phones on interactions, but there is potentially more to the relationship.

In order to more fully understand the impact of cell phone use on *Aid Given and Received*, this dependent variable was regressed on *Cell Phone Use* among experimental group members. As we can see in Table 4.11 below, with a significant unstandardized coefficient of  $-.797$  ( $p<.05$ ), there is a negative relationship between these two variables such that for every one-unit increase in *Cell Phone Use* among experimental group members, we can expect to find a  $.797$ -unit decrease in *Aid Given and Received*. A beta of  $-.303$  indicates that this relationship is moderate in its effect size on *Aid Given and Received*. These results appear to indicate that degree of cell phone use also has an impact on interactions among group members. This regression also finds that *Cell Phone Use* accounts for 9.2% of the variance in *Aid Given and Received*, which would seem to indicate that, while the effects of cell phone use do impact the dependent variable, there is quite a bit more going on which we have yet to account for when it comes to the amount of interaction and aid giving/receiving which took place in experimental groups.

Table 4.10.

T-test Results for Social Capital Formation Variables, Experimental and Control Groups.

	Control Mean	Experimental Mean	t (df)
Aid Given and Received	14.02	9.08	5.90** (121)
Reciprocity	10.53	10.14	0.76 (121)
Trust	8.89	10.00	-2.29* (121)

\*p&lt;.05, two-tailed

\*\*p&lt;.01, two-tailed

Table 4.11.

Summary of Standardized and Unstandardized Regression Coefficients, Cell Phone Use Predicting Social Capital Formation.

	Aid Given and Received R <sup>2</sup> = .092			Reciprocity R <sup>2</sup> = .011			Trust R <sup>2</sup> = .014		
	B	Std. Err	β	B	Std. Err	β	B	Std. Err	β
Constant	12.347**	1.401	---	10.858**	.948	---	10.723**	.840	---
Cell Phone Use	-.797*	.313	-.303	-.176	.212	-.103	-.176	.188	-.116

\*p&lt;.05, two-tailed

\*\*p&lt;.01, two-tailed

Note: Coefficients represent only experimental group members, N=66

In order to gain a better understanding of how cell phones impact calling upon others for aid, we can look to the path analysis, which places these variables in a model with all other variables of interest in this study. The results from this path analysis are summarized for both experimental and control group models in Table 4.12 and Table 4.13 below, and the models are represented in Figure 4.1 and Figure 4.2 below. As we can see from these models and associated results, the relationship between *Cell Phone Use* and *Aid Given and Received* is not greatly affected by the addition of other variables predicting *Aid Given and Received*. The relationship remains negative, though it is slightly stronger in its effect size when considering the indirect effects through the

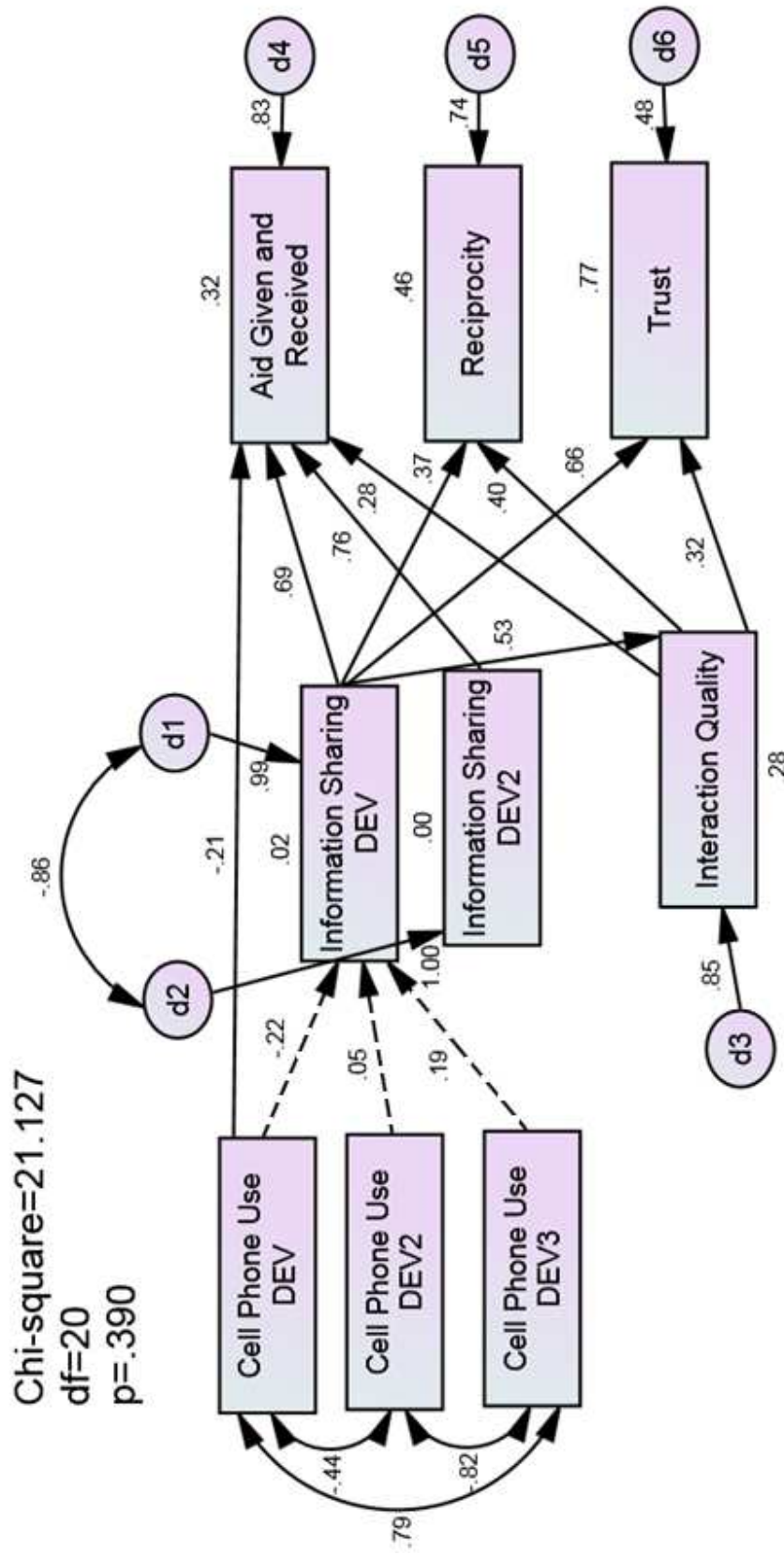
moderating variables *Information Sharing* and *Interaction Quality* ( $\beta = -.187$  indirect and  $-.394$  total). The non-linear cubic *Cell Phone Use* terms (DEV2 and DEV3) which were included in the model also appear to have an indirect effect on *Aid Given and Received* and, though they appear to indicate positive turns in the relationship, they are relatively weak in their total effects on *Aid Given and Received* while the general negative linear trend is stronger in its moderate effect size.

Given the results from all of these t-test, which indicates significantly higher levels of *Aid Given and Received* among control group members, and the regression models which find a significant negative relationship between levels of cell phone use and calling upon/giving aid in experimental groups, we find support for the first hypothesis. This supported hypothesis requires further examination with the qualitative findings, however, in order to determine what aid being given and received actually looked like in both experimental and control groups.

When it comes to the second aspect of social capital formation, the univariate results appeared to show a slightly larger mean value for *Reciprocity* among control group members than those in experimental groups. As we can see in Table 4.10 above, however, a t-test between the groups returned a non-significant value (.76,  $p > .05$ ). As such, the difference between the groups of .39 units is not found to be significant. This finding would seem to indicate that the presence of cell phones in experimental groups does not have an impact on perceived reciprocity among group members, contrary to the predicted relationship. Along these same lines, the initial regression of *Reciprocity* on *Cell Phone Use* did not find a significant relationship between these variables. As noted

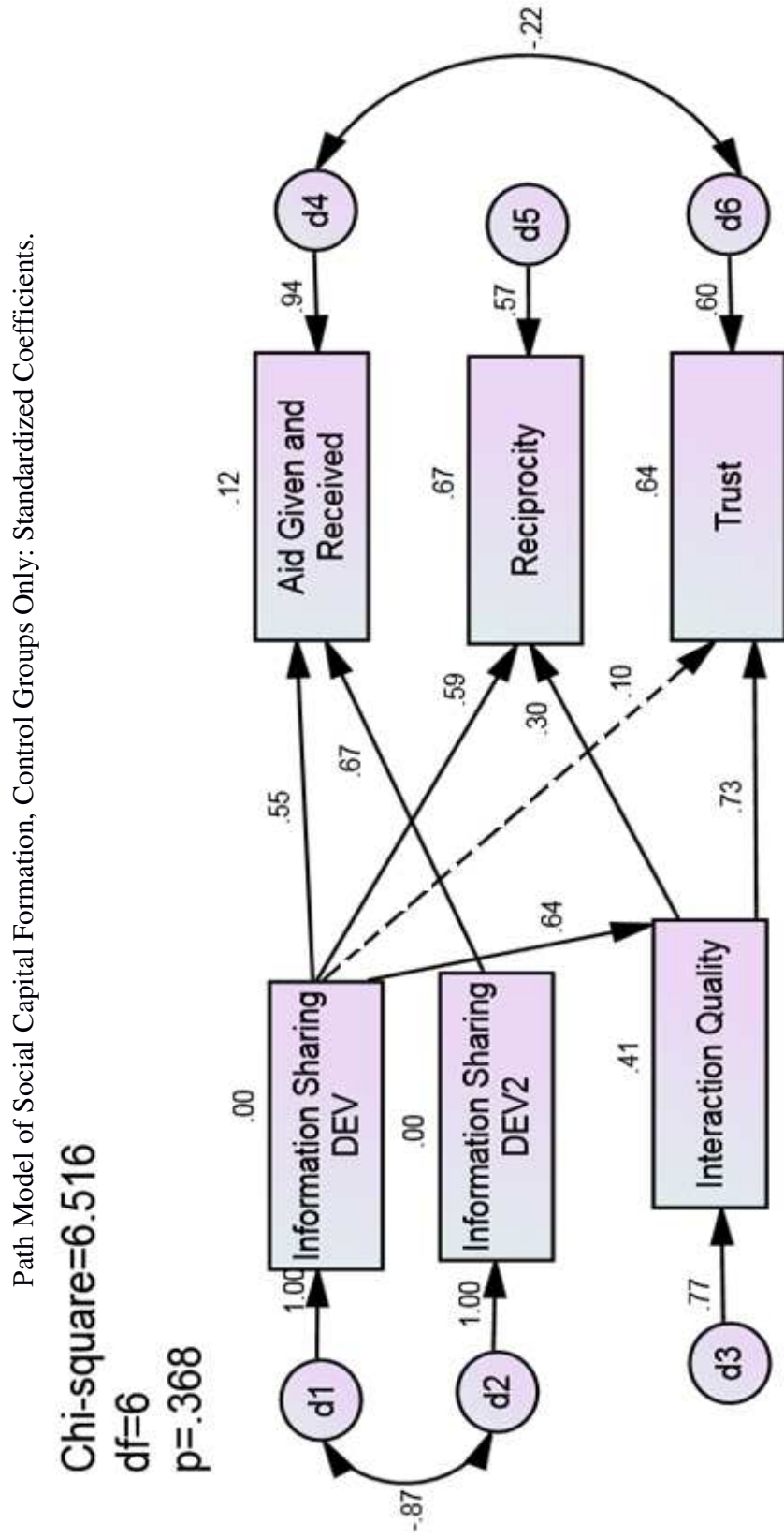
Figure 4.1.

Path Model of Cell Phone Use and Social Capital Formation, Experimental Groups Only: Standardized Coefficients.



Note: dashed lines indicate non-significant coefficients ( $p > .05$ ).

Figure 4.2.



Note: dashed lines indicate non-significant coefficients ( $p > .05$ ).

Table 4.12.  
 Summary of Standardized and Unstandardized Coefficients from Path Models (Experimental and Control Groups).

Dependent Variable	Independent Variable	Experimental Model			Control Model		
		Unstandardized Coefficient	Standard Error	Standardized Coefficient	Unstandardized Coefficient	Standard Error	Standardized Coefficient
Information Sharing DEV	← Cell Phone Use DEV	-.943	.529	-.224	---	---	---
Information Sharing DEV	← Cell Phone Use DEV2	.126	.312	.054	---	---	---
Information Sharing DEV	← Cell Phone Use DEV3	.100	.102	.192	---	---	---
Interaction Quality	← Information Sharing DEV	.577**	.114	.531	.677**	.108	.643
Aid Given and Received	← Information Sharing DEV	.428**	.132	.688	.348*	.156	.550
Aid Given and Received	← Information Sharing DEV2	.041**	.011	.761	.035**	.013	.674
Reciprocity	← Information Sharing DEV	.148**	.043	.369	.209**	.035	.594
Trust	← Information Sharing DEV	.233**	.025	.660	.036	.038	.099
Trust	← Interaction Quality	.105**	.023	.324	.253**	.036	.731
Aid Given and Received	← Interaction Quality	.160*	.069	.278	---	---	---
Reciprocity	← Interaction Quality	.149**	.040	.404	.101**	.033	.302
Aid Given and Received	← Cell Phone Use DEV	-.542*	.273	-.207	---	---	---

\*p<.05, two-tailed

\*\*p<.01, two-tailed

Table 4.13.  
 Summary of Standardized Direct, Indirect and Total Effects from Path Model (Experimental Groups).

Effects of:	Effects on:					
	Aid Given and Received	Reciprocity	Trust	Interaction Quality	Information Sharing DEV	
<b>Cell Phone Use DEV</b>						
Direct	-.207	---	---	---	-.224	
Indirect	-.187	-.131	-.186	-.119	---	
Total	-.394*	-.131	-.186	-.119	-.224	
<b>Cell Phone Use DEV2</b>						
Direct	---	---	---	---	.054	
Indirect	.045	.031	.045	.028	---	
Total	.045	.031	.045	.028	.054	
<b>Cell Phone Use DEV3</b>						
Direct	---	---	---	---	.192	
Indirect	.160	.112	.160	.102	---	
Total	.160	.112	.160	.102	.192	
<b>Information Sharing DEV</b>						
Direct	.688*	.369*	.660*	.531*	---	
Indirect	.148*	.215*	.172*	---	---	
Total	.835*	.583*	.832*	.531*	---	
<b>Information Sharing DEV2</b>						
Direct	.761*	---	---	---	---	
Indirect	---	---	---	---	---	
Total	.761*	---	---	---	---	
<b>Interaction Quality</b>						
Direct	.278*	.404*	.324*	---	---	
Indirect	---	---	---	---	---	
Total	.278*	.404*	.324*	---	---	

\*p<.05, two-tailed



Table 4.14.  
 Summary of Standardized Direct, Indirect and Total Effects from Path Model (Control Groups)

Effects of:	Effects on:			
	Aid Given and Received	Reciprocity	Trust	Interaction Quality
<b>Information Sharing DEV</b>				
Direct	.550*	.594*	.099	.643*
Indirect	---	.194*	.470*	---
Total	.550*	.788*	.568*	.643*
<b>Information Sharing DEV2</b>				
Direct	.674*	---	---	---
Indirect	---	---	---	---
Total	.674*	---	---	---
<b>Interaction Quality</b>				
Direct	---	.302*	.731*	---
Indirect	---	---	---	---
Total	---	.302*	.731*	---

\*p<.05, two-tailed

in Table 4.11 above, the trend between *Cell Phone Use* and *Reciprocity* appears to be negative and weak ( $B=-.176$ ,  $\beta=-.103$ ), but with an insignificant model which explains only 1.0% of the variance in *Reciprocity*, it does not seem that experimental groups had significantly lower levels of perceived reciprocity when cell phones were used to a greater extent.

However, these two initial tests deal only with the direct effects of cell phone use, and it is possible that the use of cell phones had an indirect impact on reciprocity through other variables. As we can see from the path model in Figure 4.1 above, the model that best fits the data does not include a direct relationship between *Cell Phone Use* and *Reciprocity*. However, through the moderating variables *Information Sharing* and *Interaction Quality*, an indirect linear relationship ( $B=-.221$ ,  $\beta=-.131$ ) is found. And yet, with an initial negative relationship (from *Cell Phone Use* to *Information Sharing*) and subsequent positive relationships from the moderating variables to *Reciprocity* it is not surprising that this indirect relationship was not found to be significant. Despite this non-significance, the weak effect size does still exist, which tells us that there is some small negative effect of greater levels of cell phone use on perceived reciprocity in experimental groups. These results are not enough to give us support for the second hypothesis, but there is certainly more which can be explored with observational data, as to the interactions among groups members which may help to further illustrate this relationship.

The third hypothesis holds that when cell phones are used, the levels of trust which are felt by group members will be lower than when cell phones are not used. An initial t-test appears to show the exact opposite of this predicted relationship however.

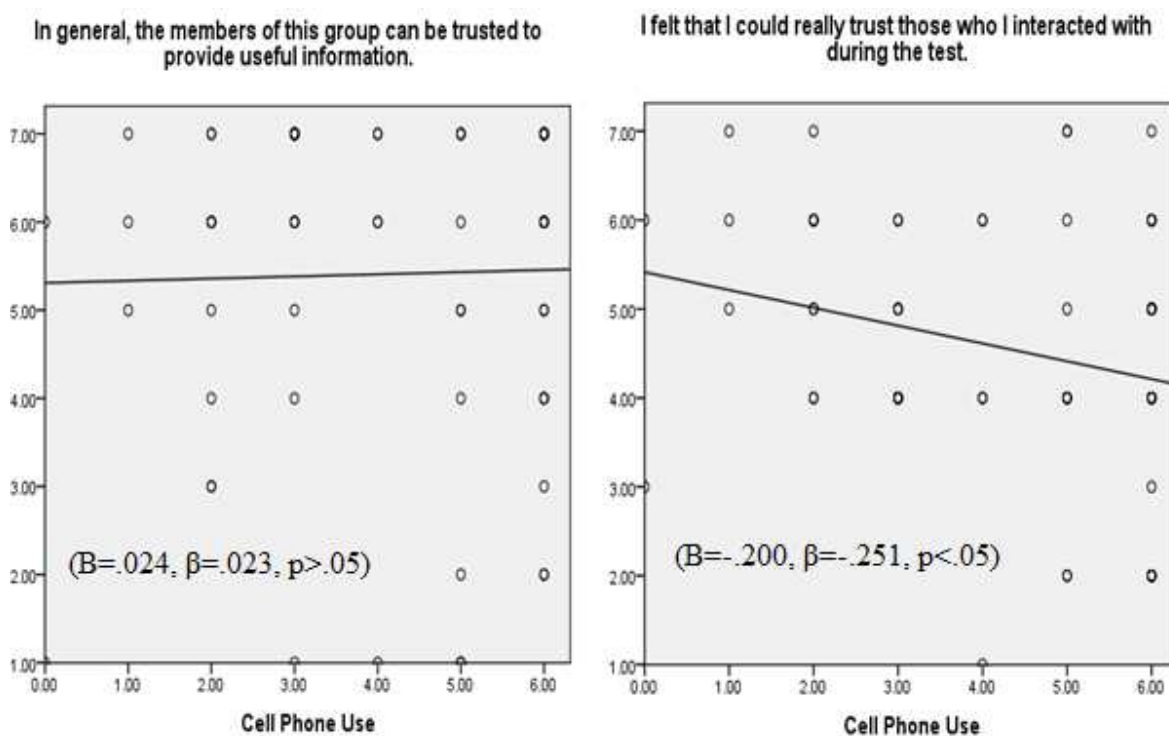
When tested, the means of 8.89 for control groups and 10.00 for experimental groups were found to be significantly different ( $t=-2.29$ ,  $p<.05$ ), indicating that those who were able to use cell phones reported higher levels of *Trust*. Interestingly, when *Trust* is broken down into its individual indicators (the possibility of which was noted earlier in this results section), only the indicator “in general the members of this group can be trusted to provide useful information” was found to be significantly different ( $t=-2.29$ ,  $df=121$ ,  $p<.05$ ), with experimental group members reporting higher levels. No significant differences were found for the indicator which focused more on trust in the fellow group members themselves. What this may indicate, is that experimental group members were finding more trust in the information which was coming from the phones of their fellow group members, as opposed to having higher levels of trust in the people using the phones. And so, it would seem that while differences of trust did occur in opposition to the predicted relationship, there could be more at play in the relationship between cell phone use and perceived trust.

The regression model predicting *Trust* based on *Cell Phone Use* in experimental groups was found to be non-significant, only accounting for 1.4% of the variance in the dependent variable. A weak negative trend does appear however ( $B=-.176$ ,  $\beta=-.116$ ,  $p>.05$ ), which seems to hint at the possibility of a negative impact of higher levels of cell phone use on perceived trust among group members. This same pattern plays out in the path analysis as well, with no direct effect being found between *Cell Phone Use* and *Reciprocity* in the best fitting model, but a weak indirect effect ( $\beta=-.186$ ) does occur through the two mediating variables (though the unstandardized coefficient is found to be non-significant,  $p>.05$ ). Much like the findings with reciprocity above, this would seem

to suggest that there is a mild negative effect of cell phone use on perceived trust, but the current results must be explored further.

Figure 4.3.

Comparison of Linear Regression Models for Indicators of *Trust* and *Cell Phone Use*.



As was noted above, the individual indicators of *Trust* may help to explain some of the findings discussed thus far. As the variable was a combination of two indicators (one looking at trust in group members, the other in the information provided), it is possible that two different effects from cell phone use may be at play. To explore this possibility, two regressions were calculated, one for each individual indicator based on *Cell Phone Use*. These regressions, depicted in Figure 4.3 above, find a very weak non-significant positive trend between *Cell Phone Use* and the indicator dealing with trust in group members providing useful information; and find a significant, weak and negative

effect of *Cell Phone Use* on the indicator related to trust in the group members themselves. As such, for every one-unit increase in *Cell Phone Use*, we can expect to find a .200 unit decrease in the response to this trust indicator.

Overall, these results for the relationship between cell phone use and perceived trust appear to suggest that the elevated levels of trust among experimental group members are not what they appear to be at first glance. Instead, the negative trends found in the regression models and path analysis, along with the negative relationship found when looking at the individual indicators of trust, suggest that trust in fellow group members actually went down as cell phone use increased in experimental groups. The findings of elevated trust in the information from cell phones appears to warrant further examination later on in this analysis. And so, while the overall test between experimental and control groups does not lend support to the third hypothesis, the regression results offer partial support to the predicted relationship.

#### Cell Phone Use and Information Sharing

The second set of hypotheses (4-6) deal with the impact of cell phone use on the factors which have been shown to influence information sharing in groups: togetherness, willingness to engage and accessibility of members. The t-test and regression results used to test these hypotheses are summarized in Table 4.15 and Table 4.16 below.

Hypothesis 4: When cell phones are used in a group, members will report feeling that they have less access to other group members. **Partially Supported**

Hypothesis 5: When cell phones are used in a group, members will report feeling that other group members are less willing to engage in problem solving. **Partially Supported**

Hypothesis 6: When cell phones are used in a group, members will report feeling less of a sense of togetherness with other group members. **Partially Supported**

The fourth hypothesis to be tested looks at the relationship between cell phone use, and the first of three aspects dealing with information sharing: accessibility of group members. When compared between experimental and control groups, the mean difference of .14 units was not found to be significant ( $t=.39$ ,  $p>.05$ ). This suggests that the ability to use cell phones in experimental groups did not greatly influence the feeling that other group members were accessible to help with problem solving during the testing period. Despite the non-significant t-test, when regressed against *Cell Phone Use* the indicator of accessibility is found to have a significant relationship among experimental group members. The regression model which fit the data best was a cubic model, and as such the cubic terms (DEV2 and DEV3) were included in the model which had been mean-centered (by subtracting the mean value of *Cell Phone Use* from the linear variable).

As we can see in Table 4.16 below, there is a significant and moderate negative direction to the relationship between the linear mean-centered term for *Cell Phone Use* (DEV) and feelings of accessibility ( $B=-.633$ ,  $\beta=-.540$ ,  $p<.01$ ), such that for every one-unit increase in *Cell Phone Use* we can expect to find a decrease in feelings of accessibility of around .63 units. Given the cubic terms in the model, we can also see that along this negative trend there are significant turns in the cubic relationship, getting steeper after the first leg and then falling off to a less steep direction on the third leg of the cubic relationship. Ultimately, this regression model indicates a generally negative

trend between *Cell Phone Use* and feelings of accessibility, with fluctuations around this linear trend as the values of accessibility increase. Given these results, which find a

Table 4.15.

T-test Results for Information Sharing Variables, Experimental and Control Groups.

	Control Mean	Experimental Mean	t (df)
Accessibility	5.70	5.56	0.39 (121)
Willingness	5.67	5.45	0.57 (121)
Togetherness	11.19	10.88	0.46 (121)
Information Sharing	22.56	21.89	0.49 (121)

Table 4.16.

Summary of Standardized and Unstandardized Regression Coefficients, Cell Phone Use Predicting Information Sharing.

	Accessibility R <sup>2</sup> = .062			Willingness R <sup>2</sup> = .144			Togetherness R <sup>2</sup> = .091			Information Sharing R <sup>2</sup> = .104		
	B	Std. Err	β	B	Std. Err	β	B	Std. Err	β	B	Std. Err	β
Constant	4.994**	.490	---	4.517**	.485	---	9.855**	.893	---	19.367**	1.764	---
Cell Phone Use	---	---	---	---	---	---	---	---	---	---	---	---
DEV	-.633*	.285	-.540	-1.033**	.281	-.853	-1.590**	.518	-.735	-3.256**	1.024	-.756
DEV2	.290	.168	.444	.441*	.166	.655	.529	.305	.439	1.260*	.603	.525
DEV3	.140*	.055	.966	.184**	.054	1.229	.260*	.100	.972	.585**	.197	1.097

\* p<.05, two-tailed

\*\*p<.01, two-tailed

Note: Coefficients represent only experimental group members, N=66

negative relationship (though not purely linear), and the lack of difference between experimental and control groups, there is some support for the fourth hypothesis.

The fifth hypothesis looks at the element of information sharing which deals with feelings of willingness among group members to engage with one another. As with accessibility in hypothesis 4 above, no significant difference was found between control

and experimental groups with a t-test ( $t=.57, p>.05$ ), although the average response from control group members was slightly higher (.22 units). This result suggests that the ability to use cell phones during a group task did not significantly impact how group members felt in regard to the willingness of their fellow members to engage in problem solving during the test. When regressed on *Cell Phone Use* among experimental group members, feelings of willingness to engage were also found to relate in a cubic fashion. As we can see from Table 4.16 above, the general trend in this cubic relationship is negative and strong ( $B=-1.033, \beta=-.853, p<.01$ ), such that for every one-unit increase in *Cell Phone Use*, we can expect to find a 1.03 unit decrease in feelings of willingness to engage (when the cubic terms are included in the model). Looking at the cubic terms, we can see that along this negative linear trend, there is an increasingly positive second leg, followed by a slightly less increasingly positive third leg. Given this generally negative relationship with cell phone use among experimental group members, and the lack of difference in feelings of willingness to engage between control and experimental group members, there is only partial support for hypothesis five.

The final aspect of information sharing, feelings of togetherness, demonstrates a nearly identical set of results with the first two indicators from hypotheses four and five. No significant difference was found between experimental and control groups ( $t=.46, p>.05$ ), though again control group members reported slightly higher levels of feelings of togetherness on average (.31 units). This result suggests that when the ability to use cell phones was present, group members did not feel as high of a level of “togetherness” in the group (a sense of a shared focus and feelings of cooperation). As with the other two aspects, when regressed upon *Cell Phone Use*, feelings of togetherness were also found



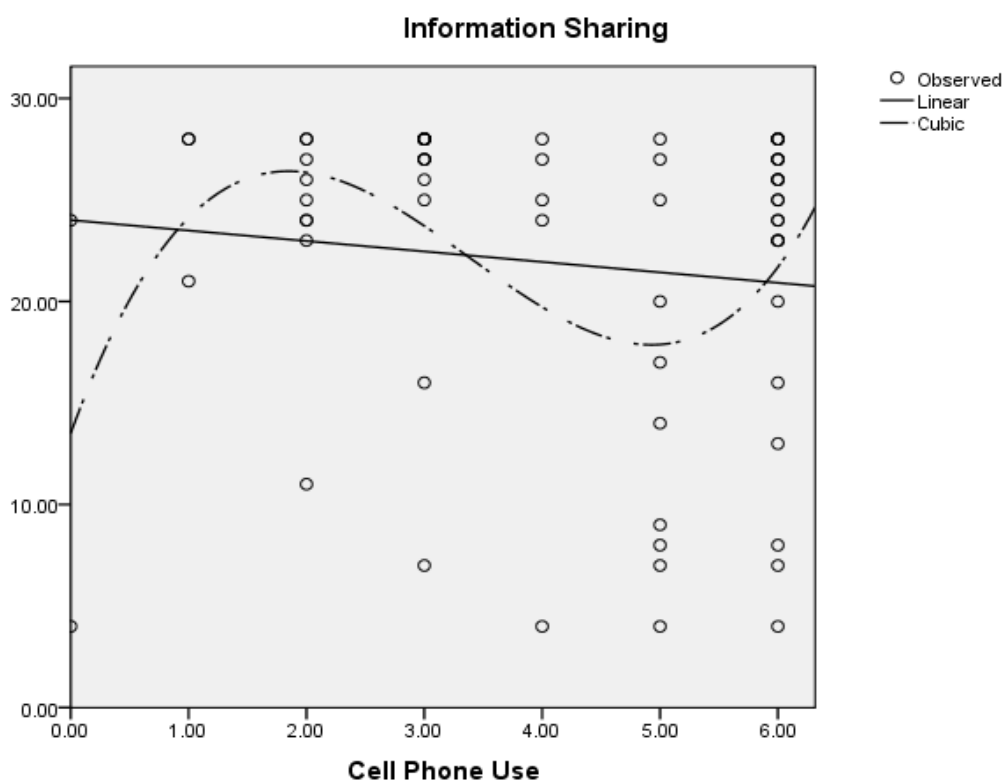
to relate in a cubic fashion with a generally negative trend. This moderate, negative linear trend ( $B=-1.590$ ,  $\beta=-.735$ ,  $p<.01$ ) predicts that for every one-unit increase in *Cell Phone Use*, we can expect to find a 1.59 unit decrease in feelings of togetherness in experimental groups. As with the cubic models discussed for the other elements of information sharing, increasingly positive slopes (to greater and lesser degrees) are found along this linear trend line. As such, the results from this set of tests find partial support for the sixth hypothesis, with no difference found between groups, but a negative impact found for increasing levels of cell phone use among experimental group members.

In the tests above, there is a striking similarity between the three elements of information sharing, as they relate between groups and with cell phone use among experimental group members. As was discussed earlier in the univariate results section, these three factors were strongly interrelated and as such were combined into the compound variable *Information Sharing*. When this variable was compared between groups, the .67 unit mean difference was not found to be significant ( $t=.49$ ,  $p>.05$ ), continuing the pattern found with the three factors tested individually. Likewise, the regression of *Information Sharing* on *Cell Phone Use* found a cubic relationship between the variables. This relationship, illustrated in Figure 4.4 below, has a significant, moderate, negative trend, such that for every one-unit increase in *Cell Phone Use*, we can expect to find a 3.26 unit decrease in *Information Sharing* ( $B=-3.256$ ,  $\beta=-.756$ ,  $p<.01$ ). As we can see from this model, from the initial intercept of 19.37 (out of a possible 28 units), the cubic relationship rises to its highest point around “2.00”, or 3-4 times using a cell phone, then falls off to its lowest point, “5.00” (8-9 times) and then rises again, though it does not appear that this second rise gets the values of *Information Sharing* to

as high as the initial intercept. As such, this negatively trending cubic relationship of *Information Sharing* has the majority of its negative trend in the moderate levels of *Cell Phone Use*.

Figure 4.4.

Regression Model, Information Sharing on Cell Phone Use



Perhaps the most important finding related to the relationship between *Information Sharing* and *Cell Phone Use*, comes when we consider these variables as a part of the path model in Figure 4.1 above. As we can see in Table 4.12, when considering all of the predictors of social capital formation, the direct effect of *Cell Phone Use* on *Information Sharing* is reduced to a weak effect size ( $\beta = -.224$ ), and the

two cubic terms (DEV2 and DEV3) are no longer found to be significant ( $p > .05$ ).<sup>14</sup>

Therefore, we can see a generally negative (though weaker) linear relationship between *Cell Phone Use* and *Information Sharing*, such that for every one unit increase in *Cell Phone Use*, we can expect to find a .94 unit decrease in *Information Sharing*.

The results from this path analysis, as well as from the regression predicting *Information Sharing* offer more partial support for hypothesis four, five and six, indicating that major differences do not exist between experimental and control groups, but are present for increasing levels of cell phone use among experimental group members. It is likely that more support for these hypotheses can be found in the observational and focus group data, especially in regards to a willingness of group members to engage and make themselves available for interaction due to their views of the task at hand (individual or group focus). Prior to calling these hypotheses not fully supported, it will therefore be necessary to explore these patterns in the qualitative data.

#### Test Accuracy, Feelings of Accomplishment, and Cell Phone Use

The next set of hypotheses dealt with the relationship between cell phone use and both the accuracy of test answers and how group members felt about the test after completing it. The t-test results for these hypotheses are found in Table 4.17 below.

Hypothesis 7: When cell phones are used in a group, members will complete their task to a higher degree of accuracy. **Partially Supported**

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<sup>14</sup> When constructing the path model, using only the linear term for *Cell Phone Use* was considered, however this reduced the effect of *Cell Phone Use* to non-significance. As such, the cubic terms were kept in the model, but their lack of significance suggests that the turns in the cubic relationship are not different from the linear model. As such, the linear effects of cell phone use can be interpreted for the path model.

Hypothesis 8: When cell phones are used in a group, members will feel less accomplished in regards to completing their task. **Not Supported**

When it comes to the accuracy of test responses, the average test score (out of 15) for experimental group members (13.89) is greater than that from control group members (8.90). A t-test confirms the significance of this difference ( $t=-14.19$ ,  $p<.01$ ), indicating that when groups members are working on a task such as the one presented in this study, the ability to use cell phones may significantly affect the accuracy of task completion. When test accuracy was regressed on *Cell Phone Use* among experimental group members, no significant model was found, indicating that there is no significant relationship between higher levels of *Cell Phone Use* and test accuracy ( $B=-.116$ ,  $\beta=-.195$ ,  $p>.05$ ). This lack of a significant relationship is interesting, as it would appear that regardless of how much group members used their cell phones, their accuracy on the test was not significantly different.

This lack of a significant difference may suggest that the presence of cell phones played a larger role for experimental group members than actually using them as part of completing the task. Perhaps the presence of cell phones, or the lack thereof in control groups, affected the confidence or ability of group members to complete the task, a possibility which will be explored further with the qualitative observations and discussions with control and experimental group members. The lack of a significant effect from increasing levels of *Cell Phone Use* may also be due to differences between experimental and control groups due sampling error (i.e. the randomization of group type could have resulted in populating experimental groups with those more able to answer the questions on the test). Likewise, as the “test” was arbitrarily constructed for this

research project (favoring the background and experiences of the researcher, not intended to be a valid measure of “knowledge”), it is possible that the test could have been easier for the experimental groups members regardless of how much they used their cell phones. Given these results, which suggest a significant impact of the ability to use cell phones on test accuracy, but the lack of a significant effect on test accuracy from higher levels of cell phone use, there is some support for hypothesis seven.

Table 4.17.

T-test Results for Accuracy and Accomplishment, Experimental and Control Groups.

	Control Mean	Experimental Mean	t (df)
Test Accuracy	8.90	13.89	-14.19** (74.13)
Accomplishment	4.60	5.30	-2.19* (121)

\* $p < .05$ , two-tailed

\*\* $p < .01$ , two-tailed

The eighth hypothesis predicted that when cell phones were used, feelings of accomplishment related to the task would be at a lower level. The average response from control group members (4.60) and experimental group members (5.30) for the indicator of accomplishment appear to run counter to this predicted relationship. A t-test confirms that the difference between the groups is significant ( $t = -2.19$ ,  $p < .05$ ), and with higher levels among experimental group members, it is in opposition to the hypothesis. When regressed on *Cell Phone Use*, no significant relationship (or model) was found to predict the sense of accomplishment among experimental group members ( $B = -.134$ ,  $\beta = -.133$ ,  $p > .05$ ). This lack of a significant relationship is perhaps unsurprising, especially given the higher scores on the test among experimental groups members to begin with, and thus higher levels of “accomplishment” among those who used cell phones. And yet, when

holding test scores constant for experimental group members the relationship between *Cell Phone Use* and a sense of accomplishment was still found to be non-significant (for both those scoring higher and lower on the test).

Given these results, there is no support for hypothesis eight. However, there may be some issues of measurement which have confounded the relationship being tested for this hypothesis. When group members were instructed not to use their phones, this could have caused a degree of frustration with the test or the experiment itself among control group members. If this was the case, as we shall explore later in the analysis with observations and focus group responses, then the experimental method itself could have affected the responses which were given. Likewise, the question utilized to assess accomplishment could have been interpreted in regards to these potential feelings of frustration, and not in regards to the accomplishment of working together as was intended with the hypothesis. Given these possibilities of bias in the responses given by group members, while this hypothesis was not supported, there may still be more at play in regards to feelings of accomplishment and cell phone use in group settings which can be explored in future studies.

#### Information Sharing and Social Capital Formation

Hypotheses nine through eleven deal with the relationship between the factors affecting information sharing, and the formation of social capital (aid given and received, reciprocity, and trust). These relationships were tested using regression models and path analysis, looking at the relationship between these variables in both experimental and

control groups.<sup>15</sup> The results for these tests are summarized in Table 4.18 below, and the path analysis tables and figures above.

Hypothesis 9: Group members who report feeling more of the determinates of information sharing will also report calling upon others for aid more. **Supported**

Hypothesis 10: Group members who report feeling more of the determinates of information sharing will also report higher levels of perceived reciprocity.

**Supported**

Hypothesis 11: Group members who report feeling more of the determinates of information sharing will also report higher levels of perceived trust in other group members. **Supported**

When regressed on *Aid Given and Received*, the independent variable *Information Sharing* was found to relate in a quadratic fashion in both experimental and control groups. For control group members, a moderate positive (though non-significant) relationship was found for the linear term in the regression model ( $B=3.14$ ,  $\beta=.501$ ,  $p>.05$ ), suggesting a generally positive trend in the relationship between these two variables. The quadratic relationship is illustrated in Figure 4.5 below. The significant quadratic term ( $B=.031$ ,  $p<.05$ ) indicates that as the generally positive trend increases, so too does the slope of the relationship. Some of this quadratic relationship may be explained by the gulf between responses on the low end and high end of *Information Sharing*, with fewer respondents falling in the middle range, and those who do reporting lower levels of *Aid Given and Received*. However, despite this dip in the middle of the

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<sup>15</sup> The variable *Information Sharing* was used to test these hypotheses, as opposed to the three separate elements of information sharing determinates. This decision was made in the interest of parsimony, after initial tests with the three determinates were not found to be greatly different from the regression using only the compound variable *Information Sharing*.

Table 4.18.

Summary of Standardized and Unstandardized Regression Coefficients, Information Sharing Predicting Social Capital Formation.

	Aid Given and Received						Reciprocity						Trust								
	Control			Experimental†			Control			Experimental†			Control			Experimental†					
	B	Std. Err	β	B	Std. Err	β	B	Std. Err	β	B	Std. Err	β	B	Std. Err	β	B	Std. Err	β			
Constant	12.186**	.967	---	6.527**	.524	---	1.030**	.117	---	.946**	.396	---	4.214**	.945	---	.517*	.242	---			
Information Sharing	---	---	---	---	---	---	.428**	↓	.038	.834	.439**	↓	.122	.409	.207**	.040	.574	.583**	↓	.075	.699
DEV	.314	.162	.501	.599**	.103	.782	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
DEV2	.031*	.013	.617	.043**	.011	.529	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

\*p<.05, two-tailed

\*\*p<.01, two-tailed

† Model Weighted by 1/Predicted Values from White's Regression

↓ Independent variable is logged



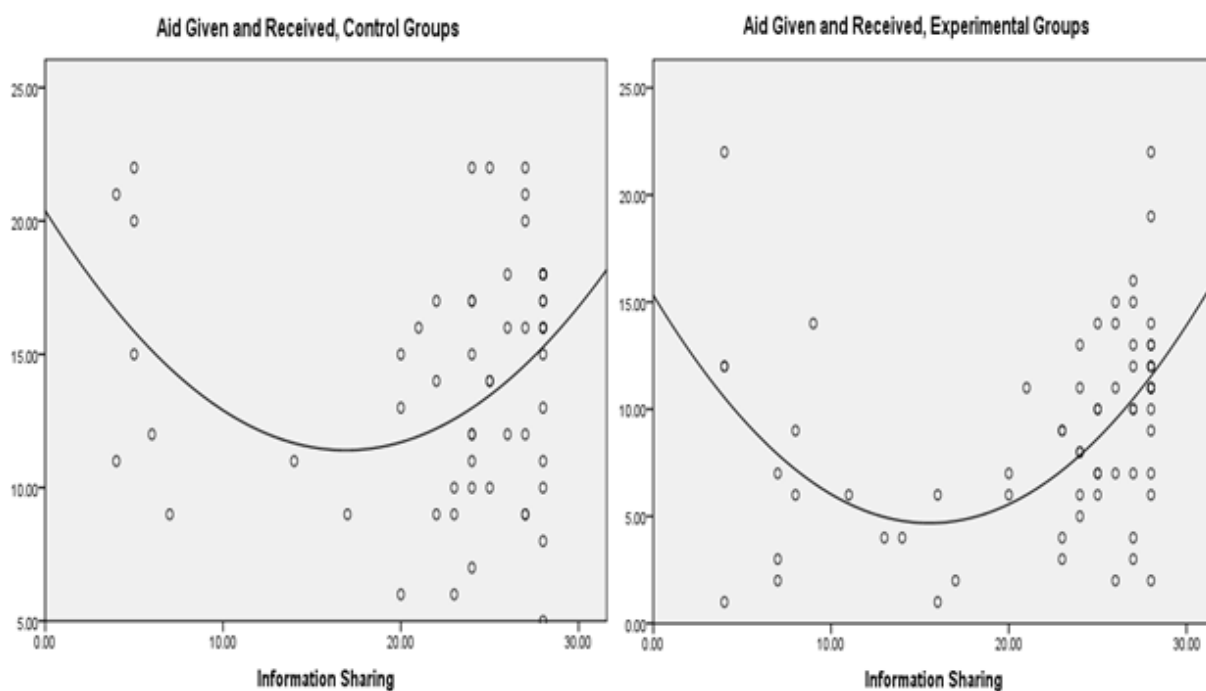
distribution, the moderate positive trend still indicates that at higher levels of *Information Sharing*, we are likely to find higher levels of *Aid Given and Received* for control group members.

As for experimental groups, a similar relationship was found between *Information Sharing* and *Aid Given and Received*. With a positive, moderate linear term ( $B=.599$ ,  $\beta=.782$ ,  $p<.01$ ) we can see a general linear trend to the quadratic model such that for every one-unit increase in *Information Sharing*, we can expect to find a .599 unit increase in *Aid Given and Received* for experimental group members. As we can see in Figure 4.5 below, the quadratic term in this model also indicates a positive turn in the relationship, with the slope between the variables becoming steeper as values of *Information Sharing* increase. The linear term does have a larger standardized coefficient (and thus effect size) than was found for the same term in the control groups, which would seem to indicate that the elements of togetherness, accessibility and willingness to engage, had a slightly stronger effect on the giving and receiving of aid in experimental groups than in control groups.

Looking at the path models which were constructed for experimental and control groups, in Figures 4.1 and 4.2 above, we can see that these same differences are found when accounting for the rest of the variables in the models. With positive effects from both the linear and quadratic terms of *Information Sharing* in the path models, the results from the regressions discussed above appear to be replicated. However, when taking into account the other variables in the model, and thus the potential for indirect effects from *Information Sharing*, we find that the total linear standardized effects of this variable on

Figure 4.5

Quadratic Relationship Between Information Sharing Predictors and Aid Given and Received, Experimental and Control Groups.



Aid Given and Received are found to be strong ( $\beta=.835$ ) for experimental groups (due to the indirect effects through Interaction Quality) and remain only moderate, though now significant, for control groups ( $\beta=.550$ ), perhaps due to the lack of an indirect route through Information Sharing in the control model. Given these results, we can see that when it comes to giving and receiving aid within groups, there appears to be a mostly positive effect from the aspects which contribute to information sharing, and thus we find support for the ninth hypothesis. However, the differing effects from this relationship in experimental and control groups will require more exploration in order to uncover if these differences might actually be due to the use of cell phones in experimental groups.

The tenth hypothesis also predicted a positive relationship between information

sharing determinates and perceived reciprocity among groups members. Regression analysis for both experimental and control groups found very similar patterns in the relationship between *Information Sharing* and *Reciprocity*. Both regressions were best predicted with a power model (logging both independent and dependent variables), and as we can see in Table 4.18 above with unstandardized coefficients of .428 for control group members and .439 for experimental group members ( $p < .01$ ) the direction of the relationship is positive. For control groups, for every one percent change in *Information Sharing* we can expect to find a .428% change in *Reciprocity*, while in experimental groups a .439% change in *Reciprocity* is expected for every one percent change in the independent variable. There is some difference between groups when it comes to the strength of these relationships however. With a standardized coefficient of .834 for control groups, we can see that the strong relationship between *Information Sharing* and *Reciprocity* is more than twice as great as the moderate relationship found for experimental group members ( $\beta = .409$ ). The prediction of *Reciprocity* by *Information Sharing* also accounts for more variance in the dependent variable in control groups than experimental groups as well (69.5% vs. 16.7% respectively). These results suggest that the aspects of togetherness, accessibility and willingness to engage had more of an effect on group members' feelings of reciprocity within control groups, in which cell phone use was not a possibility.

Looking at this relationship between *Information Sharing* and *Reciprocity* when accounting for other variables in the path analysis, we find a similar pattern.<sup>16</sup> From

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<sup>16</sup> In the path analysis, power model for the relationship between *Information Sharing* and *Reciprocity* were not included, despite the fact that this was the best way to predict this relationship in the individual regressions. This decision was made given that

Table 4.13 and Table 4.14 above, we can see that the total effects of *Information Sharing* (both direct and indirect through *Interaction Quality*) were still greater for control groups than those from experimental groups (.788 and .583 respectively), though both now are in the moderate range in terms of their effect size. This may suggest that when the perceived quality of interactions is taken into account (as a moderating variable), the effects from *Information Sharing* on *Reciprocity* become more similar for those in both control and experimental groups. The reason behind this remains unclear, however, and will need to be examined further in the remainder of the qualitative analysis. Given the results from these analyses however, which find a significant positive relationship between the determinates of information sharing and perceived reciprocity, we are able to offer support for the tenth hypothesis.

The final hypothesis in this set, which predicts higher levels of trust among group members when higher levels of the determinates of information sharing are reported, was also found to have similar directionality in both control and experimental groups. For control group members ( $B=.207$ ,  $\beta=.574$ ,  $p<.01$ ), for every one-unit increase in *Information Sharing*, we can expect to find a .207 unit increase in *Trust*. As for experimental groups, for which a power model was found to be the best model ( $B=.583$ ,  $\beta=.699$ ,  $p<.01$ ), for every one percent increase in *Information Sharing* we can expect to find a .699 percent increase in *Trust*. As we can see, both of these regressions find a positive relationship between the variables. However, there does appear to be a slightly

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these variables were not logged for every relationship which was predicted in the individual regressions, and because the basic linear relationships for these power models were also found to be significant (see Appendix C for discussions of the regression assumptions).

strong (yet still moderate) effect size in the regression for experimental groups than for control groups.<sup>17</sup>

When looking at the path analysis, an interesting change appears in these effects found in the two different group types. For experimental groups, the effect size becomes strong ( $\beta = .832$ ) with the addition of a weak indirect effect (through *Interaction Quality*) to the moderate direct effect on *Trust*. For control groups however, taking into account the rest of the variables in the model seems to diminish the direct effect from *Information Sharing* on *Trust* to very weak and non-significant ( $\beta = .099$ ), while a moderate indirect effect through *Interaction Quality* brings the significant total effect size back up to where it was in the original regression model discussed above ( $\beta = .568$ ). This is an interesting change, as it seems to suggest that the role of interaction quality in control groups may play a bigger role than in experimental groups when it comes to *Information Sharing*, a possibility which will be developed in the qualitative analysis and discussion later in this paper. Despite these differences in the effects of *Information Sharing* on *Trust*, the general pattern of positive relationships does remain for both experimental and control groups, which gives support to the eleventh hypothesis.

#### Cell Phone Use and Interaction Quality

The next hypothesis focuses on the effects of cell phone use on the quality of

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<sup>17</sup> When looked at individually, the indicators of trust (which have been found to have different levels in experimental and control groups) held with this positive pattern with the compound variable *Trust*. Given the similarities, it does not appear as though an examination of the trust in individuals vs. trust in information is necessitated when it comes to the effects of *Information Sharing*.

interactions between group members. This hypothesis was tested with both t-tests (summarized in Table 4.19 below) and regression analysis.

Hypothesis 12: When cell phones are used in a group, members will report lower quality interactions with other members. **Not Supported**

As was discussed in the univariate results section above, there was not a large difference in the responses of control and experimental groups members when it came to the compound variable *Interaction Quality*. Though the mean value for control group members (28.51 out of 42 possible units) was slightly higher than for experimental groups (27.82), the difference was not found to be significant ( $t=.48$ ,  $p>.05$ ). This result seems to suggest that there was no difference in perceived interaction quality among group members due to the presence or absence of cell phones. In order to more fully explore *Interaction Quality*, t-tests were conducted to compare group types for each of the individual indicators of the compound variable. Of the six indicators, only one significant difference was found. The indicator statement “I felt close to those who I interacted with during the test” was found to have a significantly higher mean value ( $t=1.95$ ,  $p<.05$ ) among control group members (4.61) than for experimental group members (4.03). Overall then, no major difference is found between the presence and absence of cell phone use when it comes to perceived quality of interactions, though the significantly higher feelings of closeness between control group members would appear to suggest that some effect (though likely weak) may be at play.

Table 4.19.

T-test Results for Interaction Quality, Experimental and Control Groups.

	Control Mean	Experimental Mean	t (df)
Interaction Quality	28.51	27.82	0.48 (121)
I felt close to those who I interacted with during the test.	4.61	4.03	1.95* (121)

\* $p < .05$ , two-tailed<sup>18</sup>

When regressed on *Cell Phone Use* among experimental group members, no significant model was found predicting *Interaction Quality*. Because of this, the weak negative relationship which was found ( $B = -.603$ ,  $\beta = -.131$ ,  $p > .05$ ) does not suggest the relationship between *Cell Phone Use* and *Interaction Quality* was significantly different from zero. When looking at the path model in Figure 4.1 and Table 4.13 above, we can see that there was no direct effect found from *Cell Phone Use* on *Interaction Quality*, but that there was a weak, negative indirect effect ( $\beta = -.119$ ) found through the mediating variable *Information Sharing*. This finding seems to indicate the potential for weak negative impacts of higher levels of cell phone use on the perceived quality of interactions among control group members. This finding, along with the lack of significant difference between experimental and control groups regarding *Interaction Quality* (save for the one indicator) indicates that there is no definite support for the twelfth hypothesis, though further qualitative analysis may help to shed some light on differences between the experimental and control groups when it comes to the quality of interactions between members.

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<sup>18</sup> This difference is significant when equal variances are not assumed for the t-test, though it is borderline significant with equal variances assumed as well ( $p = .054$ ).

## Interaction Quality and Social Capital Formation

The final set of hypotheses focuses on the relationship between perceived interaction quality and the potential for social capital formation. The results from the regression analyses are summarized in Table 4.20 below, and the path analysis results can be found in Figures 4.1 and 4.2 and Tables 4.13 and 4.14 above.

Hypothesis 13: Higher levels of interaction quality will relate positively with the quantity of group members calling upon one another for aid. **Partially Supported**

Hypothesis 14: Higher levels of interaction quality will relate positively with reported levels of perceived reciprocity. **Supported**

Hypothesis 15: Higher levels of interaction quality will relate positively with levels of perceived trust in fellow group members. **Supported**

The thirteenth hypothesis predicted higher levels of *Aid Given and Received* to be found along with higher levels of *Interaction Quality*. When regressed on *Interaction Quality*, the dependent variable *Aid Given and Received* was found to relate positively, though there were some major differences between experimental and control groups in this regard. For experimental group members, a moderate positive relationship was found between these two variables ( $B=.185$ ,  $\beta=.325$ ,  $p<.01$ ). As such, for every one-unit increase in *Interaction Quality*, we can expect to find a .185 unit increase in *Aid Given and Received* when the ability to use cell phones is present. When included in the path model, we find that the total effect size for this relationship is much the same,



Table 4.20.

Summary of Standardized and Unstandardized Regression Coefficients, Interaction Quality Predicting Social Capital Formation

	Aid Given and Received						Reciprocity						Trust					
	Control			Experimental			Control			Experimental			Control			Experimental		
	B	Std. Err	$\beta$	B	Std. Err	$\beta$	R <sup>2</sup> =	B	Std. Err	$\beta$	R <sup>2</sup> =	B	Std. Err	$\beta$	R <sup>2</sup> =	B	Std. Err	$\beta$
Constant	12.007**	2.347	---	3.918*	1.956	---	4.009**	.970	---	3.907**	1.067	---	1.178	.838	---	.053	.380	---
Interaction Quality	.071	.080	.119	.185**	.067	.325	.229**	.033	.684	.224**	.037	.606	.271**	.028	.789	.672**	.108	.621

\*p<.05, two-tailed

\*\*p<.01, two-tailed

† Model Weighted by 1/Predicted Values from White's Regression

└ Independent variable is logged

though slightly weaker ( $\beta=.278$ ). For control group members, no significant relationship was found between these two variables ( $B=.071$ ,  $\beta=.119$ ,  $p>.05$ ).

These results appear to indicate that the quality of interactions was more important in experimental groups when it came to the quantity of interactions between group members. In control groups then, when cell phones were not used, variance in interaction quality did not have an effect (positive or negative) on the quantity of interactions which took place. Interestingly, when tested in reverse in the path analysis (i.e. *Aid Given and Received* predicting *Interaction Quality*), a possibility which seems likely (in other words the more interactions which take place, the higher the perceived quality), no significant relationship was found. Taken together, these results which find that for roughly half of the sample there was a positive relationship between *Interaction Quality* and *Information Sharing*, offer partial support for the thirteenth hypothesis. Given this partial relationship, more investigation of interaction quality is necessary in order to place these interactions in context. For instance, while interaction quality was found to relate positive with giving and receiving aid in experimental groups, observations of the brevity and frequency of these interactions (as we know already from our discussions above, there was significantly less interaction among experimental group members) may call into question the reported quality of these interactions.

The fourteenth hypothesis predicted higher levels of perceived reciprocity among group members along with higher levels of reported interaction quality. Regression analyses for both experimental and control groups returned positive relationships between these two variables which were very similar in both slope and effect size. For control groups, a positive moderate relationship was found ( $B=.229$ ,  $\beta=.684$ ,  $p<.01$ ), indicating

that for every one-unit increase in *Interaction Quality* we can expect to find a .229 unit increase in *Reciprocity* among control group members. As for experimental group members, a positive moderate relationship was found ( $B=.224$ ,  $\beta=.606$ ,  $p<.01$ ), such that for every one-unit increase in *Interaction Quality* we can expect to find a .224 unit increase in *Reciprocity* among experimental group members. The similarity between these two regression models indicates that the effect of *interaction Quality* on *Reciprocity* was much the same for both experimental and control group members.

Along these same lines, when examined in the path models, the total effects from *Interaction Quality* on *Reciprocity* for both experimental and control groups are moderate ( $\beta=.404$  and  $.302$  respectively). It would appear that accounting for the rest of the variables takes some of the strength away from the effect in control groups, and as such the impact of *Interaction Quality* is slightly higher in experimental groups when it comes to perceived reciprocity. Given these results, it is apparent that there is support for hypothesis fourteen.

The final hypothesis, which predicts higher levels of trust among group members associated with higher levels of perceived interaction quality. Regressing the dependent variable *Trust* on *Interaction Quality* finds a significant positive relationship in both experimental and control groups. For control group members, a moderate positive relationship was found ( $B=.271$ ,  $\beta=.789$ ,  $p<.01$ ), such that for every one-unit increase in *Interaction Quality* we can expect to find a .271 unit increase in *Trust* among control group members. For experimental group members, a moderate positive relationship (in a power model) was also found ( $B=.672$ ,  $\beta=.621$ ,  $p<.01$ ) with a .672 percent increase in *Trust* expected for every one percent increase in *Interaction Quality*. These findings

indicate a slightly stronger effect size in this relationship among control group members. This is a pattern which continues in the path model, with the standardized coefficient from the control group model ( $\beta=.731$ ) is more than two times higher than from the experimental group model ( $\beta=.324$ ) when accounting for the other variables in the study. Given these results, it would seem that when cell phones are present the impact of *Interaction Quality* on perceived trust among group members is lower than when phones are not in use.

This interaction between cell phone use, interaction quality and trust may be brought to light with further consideration and qualitative analysis. For example, given our discussion of levels of trust in experimental and control groups in the first set of hypotheses above, we found that control group members tended to have less trust in the information given by their fellow group members, but these tests seem to suggest that when interactions among group members are of a higher quality, this aspect of trust may be mitigated. Observations of group members collaborating, bouncing ideas off of one another and the emergence of “leaders” in control groups with higher levels of reported trust seem to indicate that more trust arises out of higher quality interactions. These are possibilities which will be explored further in the analyses to come; for now, given the significant positive relationship found between *Interaction Quality* and *Trust* for both experimental and control groups, there is support for the fifteenth hypothesis.

## Demographic Considerations

With the hypothesis testing illustrating the relationships between the variables in this study, we turn now to the demographic factors which, as discussed in Chapter 3, may play a role in these relationships. In order to test for the influence of demographic variables (gender, race/ethnicity, grade level and social capital)<sup>19</sup> a series of means comparisons, regression analyses and group comparisons in the path analysis were utilized.

### Gender

An ANOVA test for differences in means between the different gender groups was found to be insignificant for experimental group members when it came to *Cell Phone Use* during testing sessions. These results suggest that no major differences were found between men and women in the groups for amount of cell phone use, despite the literature which suggest differing rates of cell phone use among men and women (Lenhart, 2010; Lenhart, 2015; Smith, 2012). As for social capital formation, similar tests for *Aid Given and Received*, *Trust* and *Reciprocity* were also found to be insignificant between men and women in both experimental and control groups. Again, given the literature which suggests potential differences between men and women when it comes to social capital formation (Putnam, 2000; Stelfox & Catts, 2012), these results would seem to run counter for the groups in this study.

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<sup>19</sup> Given the lack of variation found among the student sample used in this study, tests for the effect of age were not conducted. However, should this work be replicated with a general population sample, the possibility for differences between age groups should be accounted for.

Another way that gender might affect the findings in this study is in the relationships discussed in the hypothesis testing section above. In order to test for the presence of these effects, both the experimental and control group path models were calculated using only male and only female members. These models seem to maintain, for the most part, the relationships (in terms of directionality) which were found when both genders were in the single model, and using z-tests between unstandardized coefficients, no significant differences were found between the male and female models.<sup>20</sup> However, in the relationship between *Interaction Quality* and *Reciprocity*, a significant coefficient is found in the male model, but not the female model. Despite the lack of difference in the slopes of the two models for this relationship, this finding may suggest that for males the quality of interactions is more important in the development of a sense of reciprocity when phones are not used. These relationships are laid out in Table 4.21 below.

Perhaps the most interesting finding from this comparison is that a significant coefficient is found for *Cell Phone Use* and *Aid Given and Received* in the male model and not in the female model. It is also interesting that when considering alternate calculations of coefficient significance (percentile-based and bias-corrected), the relationships between *Cell Phone Use* and both *Trust* and *Reciprocity* are found to be significant in the male model as well. As noted earlier in this chapter (and illustrated in Table 4.13) the overall path model did not find significant effects from *Cell Phone Use*

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<sup>20</sup> As recommended by Paternoster, Brame, Mazerolle and Piquero (1998), comparing unstandardized coefficients utilizing a z-test is the correct method, allowing for the most confidence in subsequent results for hypothesis testing (in this case, that there are significant differences between models).

Table 4.21.

Summary of Total Effects in Male and Female Path Models: Unstandardized, (Standard Error), and *Standardized* Estimates.

		Control Model		Experimental Model	
		Males (n=15)	Females (n=42)	Males (n=27)	Females (n=39)
Information Sharing DEV	← Cell Phone Use DEV	---	---	-1.929 (1.197) -.478	.519 (1.424) .120
Information Sharing DEV	← Cell Phone Use DEV2	---	---	.336 (.580) .197	-.332 (.535) -.091
Information Sharing DEV	← Cell Phone Use DEV3	---	---	.224 (.283) .590	-.191 (.362) -.226
Interaction Quality	← Information Sharing DEV	.618** (.171) .649	.876** (.214) .631	.740** (.271) .646	.478** (.126) .458
Aid Given and Received	← Information Sharing DEV	.431 (.197) .518	.341 (.287) .430	.743** (.265) 1.101	.453* (.201) .773
Aid Given and Received	← Information Sharing DEV2	.042 (.016) .958	.038 (.050) .026	.044* (.022) .877	.050* (.027) -.070
Reciprocity	← Information Sharing DEV	.281** (.034) .869	.281** (.044) .730	.277** (.091) .625	.209** (.050) .561
Trust	← Information Sharing DEV	.198** (.034) .648	.246** (.118) .560	.298** (.051) .842	.296** (.023) .832
Trust	← Interaction Quality	.273** (.073) .710	.236** (.070) .730	.149** (.044) .484	.079* (.042) .231
Aid Given and Received	← Interaction Quality	---	---	.199 (.176) .339	.086 (.090) .153
Reciprocity	← Interaction Quality	.179** (.036) .469	.015 (.047) .227	.226** (.092) .585	.095 (.064) .266
Aid Given and Received	← Cell Phone Use DEV	---	---	-2.023* (1.044) -.743	-.422 (.880) -.167
Reciprocity	← Cell Phone Use DEV	---	---	-.534 (.396) -.299	.108 (.328) .067
Trust	← Cell Phone Use DEV	---	---	-.575 (.364) -.403	.153 (.410) .100

\*p<.05, two-tailed

\*\*p<.01, two-tailed<sup>21</sup>

<sup>21</sup> A note on tables in this demographic section: Significance tests for coefficients were calculated using maximum likelihood bootstrap coefficients and standard error estimates. There are several different ways in which to calculate significance with bootstrapping in the AMOS program used in this analysis (bootstrap S.E., which was used here, percentile-based, and bias-corrected). An examination of the results indicates that there is quite a bit of variation between the significance tests for the coefficients in the gender model and others in this section, a pattern which appears to be common in bootstrapped significance tests (Moony & Duval, 1993). The bootstrap standard error approach was chosen, given that these estimates were utilized for model comparisons throughout. However, it is possible that some of the relationships reported here are found

on either *Reciprocity* or *Trust*, and did find a significant relationship between *Cell Phone Use* and *Aid Given and Received* for the entire experimental group sample. However, when separated by gender, we find these relationships to be significant (or potentially significant depending on which test is used) and negative for males only. While there was no significant difference found between the slopes of these relationships in male and female models, these results seem to indicate that for males who used cell phones at higher levels in experimental sessions, lower levels of interaction were reported (and potentially feelings of trust and reciprocity). For females there was no significant impact of cell phone use on the social capital formation variables.

It would seem then, that the significant relationship between *Cell Phone Use* and *Aid Given and Received* in the overall model is reduced in effect size when both genders are included (it is moderate in the male model, and weak in the overall model). It is also possible that the relationships with *Trust* and *Reciprocity* for males are obfuscated by the non-significant positive relationships found among females in the experimental groups. As with the control group, there is also a significant relationship found between *Interaction Quality* and *Reciprocity* in the male model but not in the female model. Despite no significant difference between the male and female models in regards to the slope of this relationship, the significance for males seems to suggest that the quality of interactions may be more important in the development of a sense of reciprocity for males regardless of whether cell phones are used or not. The explanation for these differences between males and females in experimental groups may deal with factors

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to be significant (or non-significant) with other approaches to calculating p values. These exceptions will be noted as they arise.



such as power or gendered norms within the groups, or even feelings of comfort when it came to interacting with other group members. We will explore and discuss these possibilities further in regards to the qualitative observational data later in this paper.

### Race and Ethnicity

As with gender, differences in cell phone usage and ownership rates have been found for different racial and ethnic groups (Lenhart, 2015; Horst & Miller, 2006; Katz, 2008; Portus, 2008). A t-test for differences between whites and non-whites (majority and minority racial group members) in *Cell Phone Use* was not found to be significant ( $t=-.291$ ,  $df=64$ ,  $p>.05$ ). As such, it would appear that the amount of cell phone usage in experimental groups did not vary greatly along racial lines. Looking at the comparison of white and non-white group members for the elements of social capital formation, one significant difference was found when it came to feelings of *Trust* ( $t=1.84$ ,  $df=55$ ,  $p<.05$ ), with higher levels of *Trust* reported by racial minorities in control groups (mean=9.65 for non-whites and 8.38 for whites). Further tests indicate that among control group members, this significant difference in *Trust* was found in the indicator related to trust in fellow group members (and not in the indicator related to information provided).

Looking at the comparison of effects sizes for white and non-white group members in the path models, the results from which are summarized in Table 4.22 below, some interesting differences emerge. As we can see, while the standardized effect sizes between white and non-white group members appears to differ, the tests between models found these differences to be non-significant for all of the relationships in the control model.

Table 4.22.

Summary of Total Effects in White and Non-White Path Models: Unstandardized, (Standard Error), and *Standardized* Estimates.

	Control Model		Experimental Model	
	White (n=34)	Non-White (n=23)	White (n=48)	Non-White (n=18)
Information Sharing DEV ← Cell Phone Use DEV	---	---	-.861 (.880)	-3.048 (2.174)
			-.208	-.660
Information Sharing DEV ← Cell Phone Use DEV2	---	---	.014 (.448)	.060 (.979)
			.007	.013
Information Sharing DEV ← Cell Phone Use DEV3	---	---	.069 (.173)	.782 (.604)
			.147	.605
Interaction Quality ← Information Sharing DEV	.582** (.195)	.872** (.187)	.587** (.180)	.551* (.276)
	.623	.685	.546	.498
Aid Given and Received ← Information Sharing DEV	.206 (.242)	.529 (.938)	.597** (.154)	.230 (.689)
	.332	.803	.954	.406
Aid Given and Received ← Information Sharing DEV2	.031* (.018)	.029 (.126)	.048** (.018)	.008 (.080)
	.660	.488	.919	.139
Reciprocity ← Information Sharing DEV	.286** (.035)	.273* (.042)	.286**† (.061)	.077† (.071)
	.805	.764	.691	.226
Trust ← Information Sharing DEV	.206** (.044)	.186** (.070)	.299** (.033)	.284** (.077)
	.613	.478	.850	.795
Trust ← Interaction Quality	.260** (.043)	.256** (.095)	.105** (.028)	.103 (.066)
	.724	.837	.322	.319
Aid Given and Received ← Interaction Quality	---	---	.103 (.081)	.243 (.210)
			.178	.474
Reciprocity ← Interaction Quality	.130** (.039)	.073 (.047)	.185** (.058)	.034 (.094)
	.343	.261	.482	.111
Aid Given and Received ← Cell Phone Use DEV	---	---	-.913 (.574)	-1.603 (1.184)
			-.353	-.611
Reciprocity ← Cell Phone Use DEV	---	---	-.246 (.259)	-.235 (.292)
			-.144	-.149
Trust ← Cell Phone Use DEV	---	---	-.257 (.268)	-.866 (.538)
			-.177	-.524

\*p<.05, two-tailed

\*\*p<.01, two-tailed

† Unstandardized coefficients are significantly different between white and non-white group members.

As for experimental groups, looking at the comparisons in the table above, the majority of relationships were not found to be different between the models. However, it appears that for white experimental group members, stronger effects were found in the relationships between *Information Sharing* and *Reciprocity*. The slope of the relationship

was found to be significantly greater for whites than for non-whites in experimental groups ( $z=2.23$ ,  $p<.05$ ). These results appear to indicate that higher levels of cell phone use have more of a negative impact on social capital formation among minority groups members, while the elements of information sharing and interaction quality have more of an effect on social capital formation for white group members.

As with the gender model comparisons, there were differences between the white and non-white models when it came to the significance level of relationships. For both control and experimental groups, there was a significant relationship between *Interaction Quality* and *Reciprocity* in the white models while the relationship was non-significant in the non-white models. This is interesting, coupled with the results from the gender comparisons above, as it seems that this relationship is significant only for members of a majority group (both with and without cell phone use). In experimental groups, significant relationships were also found between *Information sharing* and both *Aid Given and Received* and *Reciprocity*, and between *Interaction Quality* and *Trust* in the white model and not in the non-white model. While the slopes of these relationships do not differ significantly between the white and non-white models, they are significant in one and not the other does seem to suggest a difference in the importance of these relationships along racial lines.

### Social Class

Several measures of social class were included on the survey instrument, as discussed in the univariate analysis above. When compared using one-way ANOVA tests, only a few significant differences were found, notably between levels of reported

household income and *Cell Phone Use* for experimental members, with a subsequent regression analysis finding a weak effect from household income on *Cell Phone Use* ( $\beta=.243$ ) such that for every ten thousand dollar increase in household income we can expect a .07 unit increase in *Cell Phone Use*. Another notable effect was found in regards to parents' highest education level and *Trust*, which an initial ANOVA found to be significant. A regression analysis (using a logarithmic model) found a weak relationship such that for every one percent increase in parental education level we can expect to find a .012 unit decrease in *Trust* for control group members. These results seem to suggest that these elements of social class may have an effect on social capital formation and cell phone use, though these differences aren't very large and would be difficult (if not impossible) to expand upon with qualitative observational data as no observations were made which would directly relate to social class standing of group members.

When compared by level of parental education (split into "associates degree or below" and "bachelor's degree or above")<sup>22</sup>, some interesting patterns do appear to emerge in the significance levels of relationships in experimental and control groups. As we can see in Table 4.23 below, for control group members, those with lower levels of parental education were found to have a significant relationship between *Information Sharing* and *Aid Given and Received*, though z-tests for differences in unstandardized coefficients yielded no significant results for control group members along the lines of parental education. As for experimental groups, for those with lower parental education,

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<sup>22</sup> This split in the parental education indicator was made in order to demonstrate a social difference between two groups (i.e. higher and lower education levels) while still maintaining subgroups which were large enough for the analysis.

significant relationships were found between *Cell Phone Use* and *Information Sharing*, as well as between *Information Sharing* and *Interaction Quality* (the strength of which was found to be significantly higher for those whose parents have a lower levels of education,  $z=1.89$ ,  $p<.05$ ). These relationships were not found to be significant for those participants with higher levels of parental education.

Along these same lines, the relationship between *Cell Phone Use* and all three of the social capital formation variables (*Aid Given and Received*, *Trust* and *Reciprocity*) were found to be significant.<sup>23</sup> As such, it would appear that cell phones may play a more important negative role in the development of these factors among those with lower levels of parental education. Interestingly, the only significant difference in the strength of these relationships is found between *Cell Phone Use* and *Aid Given and Received*, with a steeper negative relationship found between these variables for those whose parents have a lower level of education ( $z=1.86$ ,  $p<.05$ ). With *Cell Phone Use*, it was also found that the effect on *Information Sharing* was significant for lower levels of parental education, but not for the higher level model (though the slope of this relationship between the two models was not found to be significant). A z-test between male and female experimental models also revealed a significant difference for the relationship between the cubic term of *Cell Phone Use* and *Information Sharing* ( $z=1.99$ ,  $p<.05$ ).

Perhaps the most interesting finding in this set of comparisons, however, is the significant relationship between *Interaction Quality* and *Reciprocity* for those with higher

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<sup>23</sup> As with these relationships in the gender models discussed above, there was variance in the significance of the coefficients between different calculations of p values. As such, we cannot be fully certain of the significance of these relationships between models, though it is possible that larger samples in future research may be able to more fully parse out this uncertainty.

Table 4.23.

Summary of Total Effects in Higher and Lower Parental Education Path Models:  
Unstandardized, (Standard Error), and *Standardized* Estimates.

	Parental Education Level:	Control Model		Experimental Model	
		Higher (n=27)	Lower (n=30)	Higher (n=27)	Lower (n=39)
Information Sharing DEV	← Cell Phone Use DEV	---	---	-.331 (.187) -.091	-3.193* (1.546) -.652
Information Sharing DEV	← Cell Phone Use DEV2	---	---	-.348 (.564) -.202	.552 (.496) .114
Information Sharing DEV	← Cell Phone Use DEV3	---	---	-.076† (.224) -.210	.865*† (.414) .634
Interaction Quality	← Information Sharing DEV	.658** (.169) .695	.684** (.220) .616	.278† (.245) .304	.799**† (.125) .678
Aid Given and Received	← Information Sharing DEV	.110 (.309) .160	.421* (.212) .740	.512** (.141) 1.140	.760** (.195) 1.027
Aid Given and Received	← Information Sharing DEV2	.024 (.034) .468	.033* (.020) .659	.039** (.013) 1.054	.066** (.026) .975
Reciprocity	← Information Sharing DEV	.308** (.036) .812	.253** (.036) .770	.228** (.086) .610	.258** (.049) .625
Trust	← Information Sharing DEV	.178** (.093) .514	.227* (.044) .620	.238**† (.045) .763	.333**† (.024) .882
Trust	← Interaction Quality	.268** (.069) .733	.237** (.058) .718	.120** (.039) .352	.083* (.039) .258
Aid Given and Received	← Interaction Quality	---	---	.020 (.075) .041	.289* (.149) .460
Reciprocity	← Interaction Quality	.112** (.046) .279	.098** (.040) .330	.188** (.061) .460	.113 (.072) .322
Aid Given and Received	← Cell Phone Use DEV	---	---	-.532† (.638) -.327	-3.094**† (1.240) -.854
Reciprocity	← Cell Phone Use DEV	---	---	-.075 (.267) -.056	-.824* (.431) -.407
Trust	← Cell Phone Use DEV	---	---	-.079 (.279) -.070	-1.064* (.497) -.575

\* $p < .05$ , two-tailed

\*\* $p < .01$ , two-tailed

† Unstandardized coefficients are significantly different between group members with higher and lower parental education levels.

levels of parental education, and the non-significance of this relationship among those with lower parental education levels. This continues the pattern we have seen up to this point, with a significant coefficient for this relationship among those in a majority group

(i.e., higher social class). The reasons behind this pattern are unclear at this point in the analysis, though further examination with qualitative observations is certainly warranted.

#### Grade Level

The next demographic factor, grade level, was not found to relate significantly with either *Cell Phone Use* in experimental groups or the elements of social capital formation in both experimental and control groups when tested with a one-way ANOVA. As such, it does not appear that there are any direct effects from university standing on variables of interest in this study. However, when looking at the comparison of upper and under classmen in the path models, summarized in Table 4.24 below, differences are found. For control groups, under classmen were found to have stronger relationships between *Interaction Quality* and *Reciprocity* (a difference which was found to be significant when comparing unstandardized coefficients,  $z=2.81$ ,  $p<.05$ ). A second relationship, between *Information Sharing* and *Aid Given and Received*, was found to be significant in the under classmen model and not the upper classmen model, though the slope of the relationship was not found to be significantly different between upper and under classmen.

In experimental groups, none of the relationships were found to be significantly different (between models) when the unstandardized coefficients were compared. However, for upper classmen the relationship between *Interaction Quality* and *Reciprocity* was found to be significant, while the same relationship was non-significant for under classmen. Once again, we find that for majority group members this relationship is significant (in this case the pattern only repeats in the experimental

Table 4.24.

Summary of Total Effects in Upper and Under Classmen Path Models: Unstandardized, (Standard Error), and *Standardized* Estimates.

	Classmen Level:	Control Model		Experimental Model	
		Upper (n=26)	Under (n=31)	Upper (n=28)	Under (n=38)
Information Sharing DEV	← Cell Phone Use DEV	---	---	-2.338* (1.185) .573	-.175 (1.365) .039
Information Sharing DEV	← Cell Phone Use DEV2	---	---	.994* (.558) .462	-.397 (.511) .151
Information Sharing DEV	← Cell Phone Use DEV3	---	---	-.075 (.259) .794	-.075 (.355) .127
Interaction Quality	← Information Sharing DEV	.876** (.214) .671	.618** (.171) .681	.588** (.193) .542	.574** (.200) .540
Aid Given and Received	← Information Sharing DEV	.341 (.287) .457	.431* (.197) .753	.802** (.272) 1.006	.401** (.111) .881
Aid Given and Received	← Information Sharing DEV2	.038 (.050) .596	.042* (.016) .928	.060* (.027) .896	.033** (.010) .778
Reciprocity	← Information Sharing DEV	.281** (.044) .748	.281** (.034) .819	.263** (.076) .641	.221** (.063) .585
Trust	← Information Sharing DEV	.246* (.118) .603	.198** (.034) .575	.325** (.035) .869	.274** (.034) .821
Trust	← Interaction Quality	.236** (.070) .754	.273** (.073) .718	.117** (.043) .338	.095** (.035) .302
Aid Given and Received	← Interaction Quality	---	---	.275* (.166) .374	.105* (.063) .245
Reciprocity	← Interaction Quality	.015† (.046) .052	.179**† (.036) .473	.220** (.051) .582	.091 (.078) .257
Aid Given and Received	← Cell Phone Use DEV	---	---	-1.890* (.941) .582	-.901 (.714) .442
Reciprocity	← Cell Phone Use DEV	---	---	-.615* (.353) .367	-.039 (.300) .023
Trust	← Cell Phone Use DEV	---	---	-.759* (.382) .498	-.048 (.363) .032

\*p<.05, two-tailed

\*\*p<.01, two-tailed

† Unstandardized coefficients are significantly different between upper and under classmen group members.

groups). As such, this pattern of significant relationships needs to be further examined in order to understand what is behind it.



For the effects of *Cell Phone Use*, there are differences in significance levels between the upper and under classmen models. For both the linear and quadratic terms, a significant relationship is found between *Cell Phone Use* and *Information Sharing* in the upper classmen model but not the lower classmen model. No significant difference is found between these models however when it comes to the slope coefficients of these relationships. We can also see that the relationships between *Cell Phone Use* and the three social capital formation variables are significant for upper classmen and not for lower classmen<sup>24</sup> (though again, no significant difference is found in the unstandardized coefficients for the two models). Overall, this seems to suggest that the negative effects of cell phone use are more meaningful among those in a higher grade level in experimental groups.

#### Prior Associations

The final factor which must be examined in terms of demographic characteristics is the number of prior acquaintances which existed in both experimental and control groups. Given the fact that subjects for this study were recruited from a university campus, it was possible that members in the groups may have known one another from classes or other social activities. Indeed, observations indicate that in several of the experimental sessions group members were familiar with one another prior to engaging in the study. This presence of existing associations could potentially impact the use of cell phones and even reported elements of social capital formation.

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<sup>24</sup> Once again, there is variance here when it comes to the different calculations of p values for these relationships.

When cell phone use and social capital formation variables were regressed on the amount of prior acquaintances, several significant relationships were found. Both of the significant relationships were found among experimental group members. A weak negative relationship ( $B=-.602$ ,  $\beta=-.223$ ,  $p<.05$ ) was found between the number of prior acquaintances and *Cell Phone Use*, such that for every one-unit increase in prior acquaintances, we can expect to find a .602 unit decrease in *Cell Phone Use*. Likewise, a weak negative relationship ( $B=-1.178$ ,  $\beta=-.257$ ) is found between prior acquaintances and *Reciprocity*, such that for every one-unit increase in prior acquaintances we can expect to find a 1.18 unit decrease in perceived reciprocity among experimental group members. These findings appear to indicate that with more prior acquaintances, there may be less use of cell phones, a pattern which is backed up by observations of such members, and thus less need to turn to cell phones for information. At the same time, there is a potential for lower feelings of reciprocity when more acquaintances are present, which seems contradictory, though if these are not even weak-ties (i.e. just someone who one sees on the other side of a classroom a few times a week) then it is possible that mutual feeling of “helping out” were not reciprocated and therefore led to lower ratings all around. Given these significant relationships, and the fact that similar averages were found for the number of prior acquaintances in both group types, accounting for these relationships with observational data may help in the interpretation of the relationships already examined in this analysis of quantitative data.

### Summary

Having considered all of the hypotheses with this quantitative analysis, as well as the potential implications of demographic factors, we are left with findings that appear to

support, fail to support, and only partially support our initial predictions. While the tests conducted in this chapter have given us a good picture of how the variables in this study are related, it is too soon to draw any definite conclusions as to what these relationships actually looked like among both experimental and control groups in this study. We have seen that there are still holes which exist in our understanding of the statistical analyses discussed in this chapter, such as the reasons for differences in the significance and magnitude of relationships in experimental and control groups. Therefore, in order to gain more insight into these relationships, and to put into context the relationships which have been demonstrated in this chapter, we need to shift our focus to the qualitative data (derived from observations and focus groups). In the next chapter, we will both discuss what our quantitative findings appear to mean, and present qualitative results which help to fill in the gaps in this analysis as well as bring to light new possibilities when it comes to the impact of cell phones on the formation of social capital.

## CHAPTER V

### QUALITATIVE DISCUSSION

In order to better understand and interpret the quantitative results presented in the previous chapter, we must consider the hypothetical relationships which are the focus of this study in the experimental context in which they occurred. Using the qualitative data collected from observations and focus group responses, the current chapter focuses on contextualizing the quantitative findings and presenting the patterns that were found in these observational data. Each hypothesis is addressed in turn, discussing the quantitative findings and using the qualitative data to help interpret their meaning and significance in the experimental setting. The interactions of demographic factors as they play out in the relationships under study is also discussed. The goal of this section is further illuminate the hypothesis tests, and relationships therein, by illustrating them with qualitative findings. For each hypothesis, these further analyses offer more (or less) support to the original determinations. A summary of the hypothesis determinations (quantitative, qualitative and overall) can be found in Table 5.1 at the end of this section.

#### Cell Phone Use and Social Capital formation

##### Awkward Silence and Ice Breakers, Cell Phones and Group Interactions (Hypothesis 1)

When looking at the effects of cell phone use on the formation of social capital, we have focused primarily on three dimensions of social capital: network creation (i.e.,

calling upon others for aid and making new connections), as well as feelings of trust and reciprocity. The quantitative results suggest that the most consistent effect that cell phones have is on the dimension of calling upon others for aid within groups, with higher levels of interaction and aid giving found within groups that did not use cell phones, as well as a moderate negative impact from levels of cell phone use on this dimension among experimental group members. These results seem to indicate that when cell phones are used in group settings, there is a negative effect on the quantity of interactions among group members (including asking for and giving help), and thus on the potential to create those new network connections and weak ties which are of vital importance when it comes to social capital.

#### Demographic Implications

We also found that the negative relationship between cell phone use and the giving/receiving of aid was found to be negative across all demographic controls, though there were differences in regards to the significance of this relationship for the demographic groups. For males, a significant negative relationship between levels of cell phone use and the amount of aid given and received was found (while the relationship was not significant for females in experimental groups). In both control and experimental groups, both males and females were involved in the interactions, though when it came to those who were doing the majority of talking, and even taking on “leadership” roles (doing a majority of the talking, organizing the group’s focus on questions, etc.) once the groups started interacting, it was females who took this role more so than males. Of the eight groups in which a leader was identified (both experimental and control), five of the

leaders were female and three were male (3 out of 4 in control groups and 2 out of 4 in experimental groups). This may not be surprising, especially since a majority of participants (74% in control groups and 59% in experimental) were female.

This higher proportion of females made it more likely that a female would take on a leadership position by sheer numbers, but may also have served to potentially alienate male members and making them less likely to interact with the rest of the group. As demonstrated in social interaction theory, there is a tendency for those in groups to interact with and identify more with those who are similar to them in some way (Cragan, Wright & Kasch, 2008); as such, it is possible that males in the groups felt less connected and thus interacted less with the rest of the groups along gender lines. It is interesting that females were more likely to become leaders in the groups, especially in light of western gender roles and the tendency towards male leadership and power. However, previous research has found that females tend to emerge as leaders in student work groups (though they may not be perceived as such by fellow group members), and that males are more likely to withdraw from group participation in general (Morgan, 1994). It has also been found that when women emerge as leaders in group settings, males are even more likely to withdraw (Morgan, 1994; Borman, Pratt & Putnam, 1978). Given these patterns, it is possible that males were less likely to interact with other group members in general. However, looking at interactions in experimental and control groups, we find that males and females did not have significant differences in the amount of *Aid Given and Received*, though for one of the indicators (the number of times help was received from a fellow group member), males in control groups reported significantly lower levels than their female counterparts ( $t=-2.02$ ,  $df=55$ ,  $p<.05$ ). This may indicate that the

presence of cell phones had an effect on the comfort of males group members interacting with the rest of the group, though the patterns in overall interaction still indicate that less interaction took place among group members when cell phones were used.

We do find another difference between demographic groups when looking at levels of parental education. For those with lower levels of parental education, there was a significant negative relationship between cell phone use and the amount of aid given and received. This may suggest that cell phones played a more important role in negatively influencing interactions between group members for those who were in a lower social class position. Observations of group member interactions fail to suggest an explanation as to the cause of this difference between group members with higher and lower levels of parental education. Perhaps it has something to do with norms for interactions among those in higher or lower levels of social class, or perhaps differing degrees of how individuals of different classes utilize cell phones in their daily lives. As no observations of this class difference were made, it is beyond the scope of the current study to arrive at conclusions of the cause, though future research into this relationship should keep this interaction in mind in order to better understand the impacts of social class on cell phone use and social capital formation.

The final difference between demographic groups was found in the comparison of upper and under classmen in experimental groups. For those in upper classmen standing (Junior and Seniors), there was a significant negative relationship between levels of cell phone use and the amount of aid given and received, while for underclassmen this relationship was found to be non-significant. This seems to suggest that the negative effects of cell phone use on the formation of social capital were more important for those

who had been at the university longer. It is interesting, that for both males and upper classmen (what we might consider to be “majority groups”<sup>25</sup>) there is a significant negative effect of cell phone use on one of the core tenants of social capital formation. While it may be that these differences are due to the smaller sub-group sample sizes (and thus may or may not be found with larger sample sizes in future studies), it may also be due to other factors as well. For instance, it could be that those in a majority group feel a greater sense of individualism and thus less need to interact with others in the completion of a task. Observations of experimental groups suggest a more individual focus overall (as we will discuss more in this section), though male group members were less likely to start the first interactions, or to break the ice among group members. This was the case in control groups as well, so it may be that majority group membership itself has something to do with both interaction (desire of lack of desire to interact) and also with cell phone use, and thus the relationship between these two variables was found to be significant. These findings offer an initial hint that there were differences in the interactions which took place among group members, which leaves us with the question of what these interactions look like, and what they can tell us about the formation of social capital?

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<sup>25</sup> For upper classmen, the classification as majority group members stems from perceived power and experience on the college campus. For instance, the “freshmen” who is new to the school may be perceived as less experienced and knowledgeable than those who have been at the school for several years. While the actual levels of power may not differ, the perception as such among the students has been demonstrated time and again in popular culture (and even linguistically in “upper” and “under” as descriptors), and may therefore affect the interactions between group members at different level in the university setting.



## Group Interactions

The silence was absolute, the only sound in the room was that of pencils writing on paper. After nearly ten minutes of silence in the experimental group session, a participant asks me how much time is left on the test. I responded that there were ten minutes left to complete the test. Once the silence was broken by this question, there is a notable change in the demeanor of the group, with general questions being addressed to the rest of the group inquiring about answers on the test. Perhaps in this case, reaching out to ask how much time was left (which others may have wanted to know as well) may have spurred on interaction due to both a feeling of need to complete the test and also with a sense of “we’re all in this together.” This observation of an experimental group is a representative summary of the amount of interaction among group members during the experimental sessions. In most cases, both experimental and control, there was an initial period of silence as group members worked through and looked at the tests which were distributed. As described by respondents in the focus group sessions, this was a period of “awkward silence,” when group members were unsure as to whether or not they should interact with one another. One experimental group described this feeling during the focus group: “...there was no like ‘hey do you know this one,’ no it was dead silence... yeah... it felt kind of awkward you didn’t want to be the one to break the silence.”

This awkward silence was present in many of the sessions when cell phones were able to be used, as well as when they were not. In both group types, participants expressed a sense of relief when the “ice” was finally broken and conversations/interactions began within the group. As described by one participant:

...As soon as that one person chimed in I think that's when everything... like a sigh of relief, to break the awkward silence, I was gonna try to do something like that, but I was like thank god someone else did it first.

While both experimental and control groups appeared to go through a similar pattern in terms of the awkward silence and breaking the ice, the length of this period of silence differed between the group types. As the first group members began interacting, I made note of the time at which this occurred for both experimental and control groups. For the 16 control groups for which these observations were made, the average time to the ice-breaker was 1.75 minutes, with the longest period being 6 minutes, and many of the groups initiating interaction right away (at time zero). As for the 17 experimental groups, the average time to the ice-breaker was 5.47 minutes, with times ranging from a low of zero to a high of 20 (no interaction between group members for the entire testing period). These observations help to offer some explanation for why control group members reported more giving and receiving of aid than experimental groups, with interactions simply taking place for more of the testing period when cell phones were not used. However, the reason for this extended period of silence in experimental groups needs to be explained as well.

The easiest explanation for the differences in the length of the silence period between group types might be to focus on the individuals within the groups themselves. Perhaps due to random chance during the random assignment of experimental and control groups, there were just more "shy" people in experimental groups or more "outgoing" participants in control groups. There were indeed a multitude of different personality types and dispositions represented among participants in experimental and control groups. Prior to the start of the testing periods for instance, while participants were

arriving at the session, some participants were observed to strike up conversations with others, while others sat in silence, read books or even used their cell phones. This would seem to suggest that both shy and outgoing individual were present in the sample. Likewise, responses from focus groups suggest that those who did not speak up may have been shy about doing so in front of the group - "when we first started I was like I didn't want to be the guy that's asking questions" - while those who broke the ice in their groups tended to be more outgoing, as one experimental group member put it: "luckily I don't care about awkwardness." However, given observations of group members who appeared to be both shy and more outgoing in both experimental and control groups<sup>26</sup>, there does not appear to be a pattern among the group types which would seem to suggest that control groups had more outgoing members, or that experimental groups had members less disposed to interactions with others. And even if there were more shy people in experimental groups, this would seem to suggest that the presence of cell phone in such a setting would influence lower degrees of interaction, while those who may have been shy in control groups were able to benefit from the positive aspects of interaction as it relates to the formation of social capital in groups.

Along these same lines, members from both experimental and control groups faced much the same barriers and motivations to interaction (and to the test itself) during

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<sup>26</sup> "Outgoing" members were those who talked more, asked questions of other group members or even led groups through the test. Those who we might consider to be "shy" were those who worked on the test alone (even when the rest of the group was interacting), did not ask questions of other group members or generally did not interact to a high degree. These observations are backed up by the quantitative data as well, with both high and low levels of interaction in both experimental and control groups. These variations within group types would seem to suggest that overall differences between experimental and control groups were not necessarily due to the individual attributes of those members in the groups themselves.

experimental sessions. Participants from both types of groups reported (in focus groups) that they felt a lack of knowledge regarding the questions on the test, which would seem to suggest a positive influence towards giving and receiving aid among group members. As was discussed in Chapter 4, the majority of group members in both experimental and control groups were not acquainted with any of the other members, which would seem to be a potential barrier to interaction and calling on others for aid. It was also found that in experimental groups, those who had more prior acquaintances were less likely to use their cell phones (though this is a weak relationship), which would seem to suggest higher potential for interactions among experimental groups. Given that no significant relationship was found between these prior acquaintances and giving and receiving aid in either experimental or control groups, there may be an indirect effect from knowing more people on giving and receiving aid through the lower use of cell phones in experimental groups. It appears then, that despite facing similar barriers (and even having somewhat less of a barrier to interaction in experimental groups) there was still a longer period of time to the first interaction among experimental groups and an overall lower level of interaction quantity.

The only major difference between groups, then, is the presence of cell phones, and therefore having phones in experimental groups (and not having them in control groups) seems to have had an impact on the period of silence and initial interactions between group members. As we saw above, there were feelings of trepidation among participants when it came to breaking the ice. This is not surprising, as stepping out to make new connections, in other words sticking your neck out to ask for help, is often felt to be a “dangerous activity” (Cross and Borgatti, 2004). It is possible, then, that turning

to cell phones instead of other group members served as a “safety” device in experimental groups, offering participants a sense of comfort in an otherwise “new” situation. This possibility was suggested, with the “digital umbilical cord,” which keeps cell phone users connected to their existing networks wherever they go, thus limiting the necessity of making new connections in the first place (Ling, 2004; Paragas, 2009; Geser, 2005). This possibility is actually illustrated by looking at control groups, in which participants were observed to feel uneasy with not being able to use their cell phones. In one case, which was actually removed from the quantitative analysis because of this contamination, control group members actually used their cell phones, and when asked to stop made further requests to use their phones in other ways (“what if I don’t use data”?, “what if we don’t use the Internet”?). The only major interaction between group members which was observed in this case involved one group member asking another which version of the iPhone they owned. This illustrates a sense of uncertainty when phones were removed, and subsequently a sense of security which would appear to come along with use of cell phones in experimental groups.

The digital umbilical cord argument suggests that cell phones are used to connect with existing social networks. However, this does not appear to be the case in the experimental groups in this study. For example, not one instance of reaching out to existing networks was observed, such as calling a friend or texting a family member who might know the information on the test. In one of the experimental groups, a participant mentioned after the test ended that she had a family member who would have known answers to a few of the questions, but she was not observed to have reached out during the test. And so in these groups, instead of using phones to connect to other network

members, they were used as conduits for information from the Internet (all of the observed phones were smart phones, and most of the observed use involved looking up answers on search engines). This may suggest that as a part of networks and social capital, the cell phone itself may be an important member, allowing users to connect with “known” sources of information when in need. As such, instead of being an umbilical cord, cell phones appear to be more of a “security blanket”, which helps to quell the uncertainty which exists in new situations and gives users access to various resources outside of their physical location. That cell phones may play this role suggests that the extended periods of silence and lack of interactions between experimental group members may have been due to the presence of cell phones in the first place.

To say that there was a lower level of interaction, and that the initial interaction tended to take longer, among experimental group members is not to say that there was no interest in interacting with others when cell phones were present. Indeed, during the focus group sessions, participants were asked about their work together as a group, and in many cases they responded that this was a major aspect in getting the test completed effectively. Another question asked participants whether they framed the test as an individual pursuit or a group pursuit right off the bat.<sup>27</sup> The responses from both experimental and control groups seems to suggest that there was an individual-level focus initially, with participants looking over the test and answering the questions they knew on their own. This individual focus period seems to align with the “awkward silence.”

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<sup>27</sup> This question was added to the focus group schedule about half way through the experimental sessions. A pattern of observations, the extended periods of silence in particular, seemed to suggest that participants might be approaching the test differently. As group members were not instructed to work as a group (or alone), this question seemed like a good way to understand how they were framing the test to begin with.

However, when the ice was broken in the groups, the focus also changed to one which was more group oriented. As one control group participant put it: "I initially thought of it as an individual but once someone started talking, then a group." Responses also indicate that there was more of a group focus right away for control groups than for experimental groups, which fits with the shorter periods of silence in groups without cell phones reported a group focus initially, but for the most part they started individually focused and shifted to the group orientation after conversations began.

There may have been factors which set participants up to view the test as more of an individual pursuit initially. For instance, the fact that the task was called a "test" in the first place, and given that it was administered on a college campus, could have put participants in the mindset of an actual test (where working as a group is usually frowned upon). One experimental group member (from a group which had a very long period of silence) noted this as a factor of the individual focus in his response: "[the] atmosphere of taking a test, we have been taught throughout our whole like socialization process that we're supposed to not talk or use resources for tests or anything." This is actually a very interesting statement, as it seems there would be an avoidance to both group interaction and using outside resources. And yet, despite this, there was little hesitation in this group (and others) to use a cell phone for looking up answers almost immediately. It may be that use of phones was seen as a somehow "lesser" violations of the test taking norm, or it could be that it was easier for group members to use their phones instead of breaking the awkward silence and somehow "admitting" that they did not know an answer. In this way, using a cell phone would appear to be a barrier to interactions through the process

of making users feel safer in some regard, a pattern which we will see emerge later on in this discussion as well.

There were also factors which may have contributed to more of a group approach to the test initially. The invitation to the study, the introduction at the session and the consent form all discussed the project in reference to “group settings,” and made mention of a “group task.” Responses from both experimental and control groups suggest that this may have played a role in some of the initial group work in both group types.

Experimental group members, as noted above, also made mention of the importance of working as a group. However, the amount of group interaction that actually took place in these groups, and the later onset of such interaction on average, suggest that when cell phones are present during a group task the group aspect takes a backseat to individual work. Furthermore, the consistency of initial silence and late-onset group interactions among experimental groups seems to indicate that cell phones play a role in setting up an individual focus over and above the factors present in the experimental setup itself.

As we have seen thus far, the presence and use of cell phones (or the lack thereof) in a group setting appears to affect the amount of interaction which takes place as well as the lag time before the interactions occur. But once the ice was broken and the interactions began, there were further difference between groups when it came to what the interactions looked like when cell phones were used and when they were not. Among control groups, interactions were focused on generating answers to the tests. Perhaps unsurprisingly, as control group participants did not have access to their cell phones, these interactions (and the sharing of information therein) appeared to be the main resource which was utilized in order to complete the test. As such, these interactions



tended to involve asking questions, giving a potential answer (or answers), and then a discussion among group members as to what the right answer was. There was variation to this pattern, and to the extent of each step therein among the various control groups. For instance, in some groups there were a few key individuals who led the conversations, offering up potential answers and even setting which question would be discussed next; while in other groups there was less direction to the interactions and group members were not as engaged in discussing potential answers and accepted what was stated without question.

When it came to the interactions that took place in experimental groups, there was also variation among participants. In some experimental groups, there was delegation of the task, with groups members taking several questions to look up and then sharing the answers with the rest of the group, while in others (particularly those with lower levels of interaction overall) the interactions amounted to double checking answers which were already looked up, or simply calling out answers when asked. While this in and of itself does not separate these interactions from those which took place in control groups, the nature of the interactions, and the ways in which they were carried out gives us some definite differences. The majority of interactions among experimental group members were of the double-checking variety. As we have already seen, the individual focus and silent periods were used to look up answers using cell phones. As such, when the interaction started, many of the questions were usually answered, and the remaining conversations dealt with filling in the blanks or checking the answers that were already looked up.

In some groups, members came back with different answers for the same question and in these cases the focus of the interaction turned more to finding which answer was correct. For the most part, these interactions were short and efficient, without a great depth of discussion. As one experimental group member put it, in response to a question about effectiveness at working together on the test:

I mean we didn't really work as a group, we just like checked our answers. Let's say like you got the same thing, so it's right, but if we didn't get the same answer then its right back to Google instead of... acting as a group.

This quote illustrates a major difference in the interaction between experimental and control group members. With control groups there was more discussion and consideration, even questioning and challenging answers that were offered to the group; in other words, control group members tended to act more like group members. With experimental group members, the purpose of interactions appears to be to confirm what had already been ascertained using cell phones, and thus the interactions as a group working together and giving each other aid were less important. This matches up with our discussion of group and individual focus in experimental groups above, with the cell phone seeming to limit the necessity of interactions with other group members. One experimental group member summed up this point in response to a question about the group focus: "I forgot right away there was even a group."

This difference in interactions between experimental and control groups suggests that there was a greater depth and group focus in the interactions between control group members. This is not to say that control group members were sipping brandy and having deep intellectual conversations about the answers to the test questions. Given the brief time period in which participants were able to interact (a 20-minute testing period), the depth of these interactions and the formation of group ties was never "strong" by any

means. However, control groups tended to have a higher degree of interaction quantity and appeared to be more engaged in discussions surrounding test answers as opposed to quickly checking the answers in brief interactions.

When it comes to actually calling upon others for aid, as was found in survey responses, control group members were more likely to have asked for help and received help during the testing period. And as was discussed in Chapter 4, there appeared to be more unsolicited help (i.e. help without asking for it) in control groups than in experimental groups. Observations of the groups found that actually asking for help was not as direct of an act as we might be led to believe given the survey responses. Seldom did groups members (in either experimental or control groups) outright ask for help from one another. When it did occur, these were typically questions addressed to the whole group such as “what did you get for questions four” or “does anyone have number 10”? More often than not, a group member would read off one of the questions and then answers would be given by other group members. As for the unsolicited help, many of the interactions involved a group member saying their answer aloud without anyone asking them to do so. Given these similar calls for, and offerings of, help in experimental and control groups, it seems as though the nature of asking for or giving help was the same between the group types. However, the efficiency and brevity of the interactions surrounding these calls for help in experimental groups suggests that when cell phones were used there was less importance attached to the act of helping others out. In other words, if everyone in the group has a cell phone, they should all be able to look up their own answers, so why help out? As one experimental group member put it: “once the cell phones were out it was like ‘oh I can just do it on my own.’”

But how much of this difference in interactions between experimental and control groups is due to the experimental method itself? One might look at these results and conclude that control group members interacted more simply because they had to (as they had fewer resources to draw on in the completion of the test). This may be true to some extent and, as we already discussed, there were other factors which may have contributed to higher levels of interaction in general. However, in order to understand the effects of cell phones (and not just the experimental design), it might be more useful to look at the lower levels of interaction among experimental groups as opposed to higher levels of interaction in control groups. As we have already discussed, there were similar barriers to interactions, as well as an individual focus going into the test for both experimental and control groups. It seems that the experimental groups were less likely to get past these hurdles to interpersonal interactions, and that cell phones played a key role in making this happen. For example, in one experimental group, there was a participant who started off the session by asking aloud if anyone knew how to do the calculations for the first question on the test. In response to this question there was a single “no” from another group member while everyone else was focused on their own tests. This group member raised a second question a short while later and again received only an “I’m not sure.” None of the other group members looked up at her when she asked the questions, and after the second lack of a response she looked down at her own phone, and her own test, and began to work on it.

This example shows several important aspects of the effects of cell phones on group interaction. First, it suggests a definite individual focus and lack of willingness to interact among group members when cell phones are being used. Second, when this

group member was totally shut down by the lack of help, she turned inwards to her own phone and became much more individually-focused on the test. This is perhaps the most interesting aspect, as there was a definite attempt at group interaction, but the presence and use of cell phones appears to have discouraged its fruition. In control groups, the answers to the questions weren't always known when first asked either, and yet such a question almost always yielded more interaction than a single "no," and tended to lead to more interactions down the line. And so, if this same group member had been in a control group (with similar focus and motivation to interact), she likely would have been able to call upon other for aid more successfully (not necessarily in getting the right answer, but at least having others give the time of day to help in the first place). All of the observations and results thus far related to help and interactions would seem to indicate that there is a definite impact of cell phone use on these interactions, over and above any interactional effects that may be remnants of the experimental design.

As we saw in Chapter 4, there was quantitative support for the first hypothesis, that cell phone use would be related negatively with calling upon others for aid. Given our discussion of what the interactions looked like between members, and how cell phones were used, there appears to be additional support for the first hypothesis. Overall, it appears that when cell phones are used in groups, there is more silence, less interaction, and more of an individual focus on the task at hand. As it relates to the formation of social capital, these findings suggest that may play a large and negative role. As Coleman (1990) stated, "the more extensively persons call on one another for aid, the greater will be the quantity of social capital generated" (p. 321). In other words, without meaningful and diverse interactions among individuals there can be no formation of

social capital. If, as we have found, the overall amount of interaction between group members is less when cell phones are used, and that the interactions which do take place are more task oriented and less discursive, it would seem hard to imagine meaningful and lasting network connections emerging from these types and patterns of interactions.

### Trust, Reciprocity and Cell Phone Use (Hypotheses 2 and 3)

#### Reciprocity

Given that use of cell phones appears to have an effect on the amount of interaction and calling for aid which took place between group members, it is surprising that the quantitative results indicated no overall significant relationship found with the second aspect of social capital formation, reciprocity. The difference in levels of reciprocity between control and experimental groups was not found to be significant overall. As such, it does not appear that the presence of cell phones in a group has a major effect (positively or negatively) on feelings of reciprocity among group members. However, looking back to the univariate results, we do find the highest level of reciprocity in a control group, and the lowest level in an experimental group. Similarly, we found that, among experimental group members, there was no direct (or indirect) significant relationship between cell phone use and feeling of reciprocity, though the relationship did have a negative trend. These results suggest that cell phone use therefore has no major impact on reciprocity among group members, which runs counter to previous research, especially when considering the indirect effects through *Information Sharing* aspects such as feelings of togetherness, willingness to engage and connection

among group members (Nath & Inoue, 2009; Van den Hooff, De Ridder & Aukema, 2004).

Comparing these results to the observations, and control group feedback, from the experimental sessions reveals that there may be more going on in the relationship between cell phone use and reciprocity than is suggested by the quantitative findings. Given our discussion of the quantity and type of interactions which took place in control and experimental groups, it is possible that - along with a limited number of interactions which were short, efficient and did not involve a high degree of discussion - there would also be limited amounts of reciprocity (feelings of being helped down the line when help is given) which were experienced among those in experimental groups. In other words, how likely is it that there would be a feeling of mutual help in a setting in which help was not given or received at a very high level, and what help did exist was more superficial in its application? Looking back at the example given above, of the experimental group member who was not helped by her fellow group members, and who then turned back to cell phone use and individual work, there does appear to be a lack of reciprocity at play. In another experimental group, a participant verbally expressed that her phone was not working, and it was noted by a participant observer that no one appeared to offer consolation or help for this member to overcome this barrier. While these types of occurrences didn't happen in every group, at least to a visible extent, it is possible that a similar lack of help (or perceived help) among those using cell phones could have an impact on asking for help or returning it in the first place. An experimental group member, speaking about working as a group illustrates a lack of reciprocity, said this:

I didn't need the help of anyone else to get the information or to verify it...I think that everybody here was like 'yeah what's number eight or what's number 10,' or whatever, but that's more of an issue with efficiency because you didn't answer the questions... you didn't really need the group to get the answers because you had access to your cell phones.

As we can see, the use of cell phones, which made the interactions more efficient (as opposed to more in depth discussion) appears to have the effect of making group members less interested in interacting with one another in the first place, and therefore potentially less likely to reciprocate help among the group. Again, this doesn't mean that there was a direct wall put up to reciprocity when cell phones were used, but rather more of a subtle effect, with members feeling like they wouldn't necessarily be helped out in return for their own efforts, at least for the initial period of silence.

The reason that experimental group members answered the questions related to reciprocity at a level similar to those in control groups, may be due to the interactions they had towards the end of the testing period. It may be that the help which was received from other group members, and the ease and brevity by which it occurred ("what did you get for number one"? ... "I got 7.5"), made experimental group members feel as though they would be helped out, or that helping out others in the group would not require as much effort, thus inflating aspects of reciprocity. This seems to suggest that these feelings of reciprocity may be somewhat superficial (not much beyond the surface interaction of sharing an answer), and thus experimental groups could have lower levels of reciprocity even though members did not feel that this was the case. The results from such a possibility on the formation of social capital could be rather interesting. For example, if one feels that there is reciprocity within a group or community based on help which was quickly and efficiently given and received, they may overestimate the ability or even willingness of other group members to actually help them out in more serious



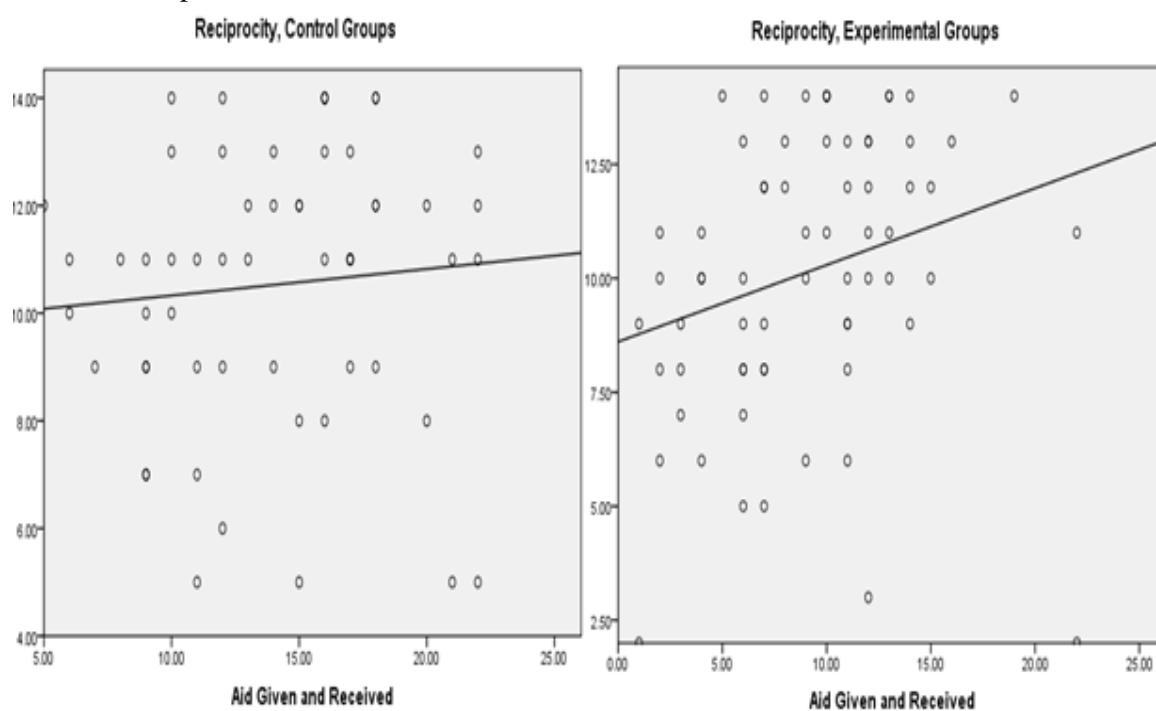
situations (such as having a car break down or repairing a roof). Given the nature of this experimental design, working on a test and not something more “involved,” and the brief period in which members had to build such a feeling of mutual reciprocity, this possibility of a more superficial reciprocity can only be speculated. In order to understand the type of reciprocity at play when cell phones are used, we must look to the reciprocity which took place in control groups as well.

The earlier onset of a group focus among those in control groups, and thus the extended length and scope of interactions in control groups, would seem to suggest that there was a greater likelihood that a feeling of reciprocity would emerge among control group members. To see if the amount of interaction among group members (*Aid Given and Received*) had an influence on reciprocity, regressions were calculated for control and experimental groups (illustrated in Figure 5.1 below). No significant relationship was found between these variables for control groups ( $B=.049$ ,  $\beta=.088$ ,  $p>.05$ ), while for experimental groups a significant, weak positive relationship was found ( $B=.168$ ,  $\beta=.260$ ,  $p<.05$ ) such that for every one-unit increase in *Aid Given and Received* we can expect to find a .168 unit increase in *Reciprocity* among experimental group members. This suggests that the amount of interaction within groups led to slightly higher feelings of reciprocity when cell phones were used, but not when they were absent. Looking at the path of these relationships, we see that levels of reciprocity vary (but remain fairly high) for all levels of interaction among control group members, and climb to their highest point at around a value of 14.00 on the scale of *Aid Given and Received* among experimental group members. Given the consistency of reciprocity for different amounts of interaction, it is possible that the lack of cell phones had something to do with

regulating reciprocity. In other words, the difficulty of working through the test without cell phones (and the more involved interactions and group focus therein) may have led to somewhat higher feelings of reciprocity among control group members regardless of how much they interacted, whereas the ease of interaction made for higher levels of perceived reciprocity among experimental group members.

Figure 5.1

Relationship Between Reciprocity and Aid Given and Received, Experimental and Control Groups.



However, as we have seen in the survey responses and subsequent analysis, the levels of reciprocity reported by control group members is not significantly different from those in experimental groups. If this is the case, and if the responses given by experimental group members were possibly due to a more superficial reciprocity, then it could be that the reciprocity experienced by control group members is of a different kind.

Observations of the interactions in control groups suggest that when members did not know the answers to the test questions (i.e. they face a barrier), in most cases they still interacted with one another in an attempt to complete the test. For instance, it was observed in one control group that members were actually waiting until a consensus was reached on one question before the entire group moved on to the next one on the test. This indicates both a group focus and a commitment to helping out all group members (i.e., reciprocity and what is good for all is good for one). Even a control group which at first appeared to be going with different answers for a question (“we just put whatever we felt like or we felt individually was the answer”) had a group focus in the process of going with individual answers instead of a group consensus. As one group member put it: “if it were wrong then we’d have different answers instead of we all got that one wrong.” This seems to suggest that the group members were more concerned about how the group scored on the test as opposed to how each one of the group members individually scored, an aspect which would seem to indicate a sense of reciprocity.

A similar focus on getting all of the questions answered did exist in experimental groups, with a division of tasks and having members report back to the group with the answers they looked up. And yet, there were instances in experimental groups of the test being completed by several of the group members while others worked on in silence. In one case, I observed an experimental group member who had not yet completed the test, sitting at the end of the table while the rest of the group which had completed their tests looked at him without offering assistance on the test’s completion. And so, despite the fact that perceived levels of reciprocity were not different between groups, when group members are not left hanging, and when there is a more prolonged group focus it is clear

that control groups likely had more actual reciprocity taking place during the testing period.

In the discussion of reciprocity as it relates to social capital, it is mostly mentioned as a norm of reciprocity which accompanies networks (Putnam, 2000). As such, differentiating between reciprocity which appears to be more “surface level” and reciprocity which is based on more in depth interactions, might be greatly important. Because if two different types of reciprocity appear to exist in the presence and absence of cell phone use, they are still norms of reciprocity, different types but reciprocity none the less. The question becomes, how does the reciprocity which is formed alongside the use of cell phones pan out in the long-run? Though it is beyond the scope the current study to speculate (given a lack of longitudinal data), the effects of these different types of reciprocity are surely something to consider when conceptualizing and discussing social capital and its formation in the modern day. Given these findings, and given what reciprocity looked like in experimental and control groups, we find no support for hypothesis two as written, as reciprocity did exist (though in different forms) with and without the use of cell phones.

### Trust

This discussion of reciprocity, and the ways in which group members worked together and interacted with one another touches on the third aspect of social capital formation, trust. The quantitative analysis found that for overall trust there were significantly higher levels when cell phones were used in experimental groups. A further breakdown of the trust indicators revealed that this difference was primarily due to a

significantly higher level of trust in experimental group members to provide useful information, while the group types did not differ significantly in regards to trust in the group members themselves. As for levels of cell phone use, a significant negative relationship was found between levels of cell phone use and the indicator for trust in other group members themselves, such that for higher levels of cell phone use there were more likely to be lower levels of this type of trust.

While no significant relationship was found between cell phone use levels and the overall variable *Trust*, significant relationships were found among those with lower levels of parental education, and those in upper classmen standing. As was discussed in Chapter 4, there may have also been a significant relationship between these variables among males as well (though due to differing significance tests this decision of significance or lack thereof is still unclear). This might come back to something along the lines of social identity theory (as mentioned earlier in this section), with those in different demographic groups not identifying with their fellow experimental group members, and therefore less likely to interact with them and more likely to turn to their cell phones for individual work. It seems then, that the presence of cell phones has a positive influence on trust in the information gained from other group members, but has negative effects on trust in other group members themselves (at least in some cases). These results led to partial support for the third hypothesis, but leave questions about what trust looked like when cell phones were used and when they weren't.

The main pattern which is pointed out by the quantitative results is types of trust which appear to differ between experimental and control groups. Given the test that participants were assigned in the experimental sessions, it would appear that trust which

was developed (or felt) in groups dealt with the generation of answers on the test. For experimental groups, the interactions which took place appeared to be primarily focused on confirming answers that were already generated, or getting answers which another group member was able to look up using their phone. Along with the lower amount of interactions which took place in experimental groups, it is not surprising that trust in these instances dealt more with the information that was being shared. Group members who used their cell phones reported a trust in information in their responses to questions in the focus groups. For example, one experimental group, in response to a question about positive aspects of working as a group said that:

we broke it up... got it done faster... tried to do it on our own, but I didn't know what was right... we trusted the group members to come up with the other answers... we weren't arguing about what was the right answer, I mean we were all on our cell phones too so it made it pretty solid, it made it easy knowing that you were getting an accurate answer.

This response demonstrates that the trust among group members was in their ability to get the right answers, and not because they necessarily because of any trait they possessed, but because of the tool which they held in their hands. We can also see that this example shows a lack of critical dialogue between group members (i.e. not arguing about the answers) may be an indicator of trust in the information. Experimental group members were observed to be less critical of the answers provided by their fellow participants, with fewer questions being raised as to their accuracy than what was observed in control group. Focus group feedback also suggests that there was a confidence among experimental group members in the answers which were generated via cell phone use, whereas control group members had less confidence in the answers which they settled upon for the test.

This is not to say that there was complete confidence in the answers which were generated with cell phone use (from the Internet). In several cases, group members who were able to use cell phones stated that they came up with multiple possible answers (one website finds the Beatles to be the top billboard artist of all time, another says Michael Jackson), and were therefore more skeptical of the answers which came from their fellow group members. In several experimental groups, there were arguments (though perhaps this is too strong of a word) about what the right answer was, and in some cases members ended up going with their own answer as opposed to that given by someone else, and, as one participant observer noted, turning back to their cell phones to double check the answer they had originally looked up. This would seem to suggest that there was also less trust in the other group members, as the individual focus beat out a collaborative effort between group members. And so, despite these instances of reduced trust in the information provided, it would seem that the main focus of trust in the presence and use of cell phones (at least in this experimental design) is on the use of cell phones and not on the person using it.

When it comes to trust in the information provided by fellow group members, observations of group interactions provide support for the lower average levels among those in control groups. In general, there was much more discussion in these groups as to which answer was correct, or even whether the single answer that was given had merit. Control group members made note of this in their focus group responses, with mentions of uncertainty and lack of confidence in both the answers given by others and the answers arrived at through subsequent interactions. However, with levels of trust in fellow group members not significantly different in control groups and experimental groups, it would

appear that this lack of trust is mainly focused on the information itself, as opposed to those delivering it.

Trust comes up in control group interactions in another way as well, which may not have been picked up on and reflected in the survey responses. Early on in the data collection period, I made note that control group members appeared to be sharing their personal experiences as part of their interactions. For instance, when listing the states which border Tennessee, participants in several control groups told the rest of the group that they had traveled through some of the states; or when talking about the number of keys on a piano, two group members who had experience with different musical instruments worked to count the notes in the scales, and another made mention of her grandmother's piano, to arrive at the answer based on their past experiences. This sharing of information, in the presence of new acquaintances, would seem to indicate that control group members were opening themselves up to the rest of the group, an act which would seem to require a degree of trust in the others present in the group. Similarly, the act of engaging in discussions and debating answers would also seem to require a degree of trust to be present among group members (i.e., if you didn't trust someone, then actively engaging them in problem solving might take a back seat to doing the task yourself).

All together, these observations of trust appear to fall in line with the quantitative responses from the initial hypothesis test. With different kinds of trust existing in the presence and absence of cell phone use, as well as the potential for decreased levels of trust in fellow group members when cell phones are used, the qualitative findings suggest further partial support for the third hypothesis. It may seem that engaging in these



interactions, and doing things like drawing on past experiences, was simply a necessity of working without the use of a cell phone, in other words using those resources with which one was equipped. Therefore, this effect may have been a product of the experimental design itself. And yet, despite this possibility, there is still an important take away when it comes to the effects of cell phones on social capital formation. When cell phones are being used, drawing on past experiences and engaging in discussions to arrive at the answers on a test (or some other task) is no longer a necessity, as information can be looked up quickly and easily by an individual. And even when interactions do occur, we have already found they are more likely to be quick and efficient, with less sharing of personal experiences. In such a setting, it might be difficult to imagine meaningful levels of trust, reciprocity and network connections being formed or sustained. And so, it would appear that the presence and use of cell phones in groups had an overall negative effect on the three dimensions of social capital formation.

### Information Sharing and Interaction Quality

#### Effects of Cell Phone Use (Hypotheses 4, 5, 6 and 12)

As conceptualized earlier in this study, the quality of group interaction and the factors which contribute to information sharing (feelings of togetherness, willingness to engage and accessibility) were seen as important aspects in the formation of social capital in group settings. Looking at the indicators of both of these factors, such as a sense of connectedness (an indicator of *Interaction Quality*) and a sense of cooperation (an indicator of *Information Sharing*), it would appear that these factors are closely interrelated. And yet, based on previous literature, as well as the univariate results and

factor analyses from Chapter 4, both the quality of interactions, and aspects of information sharing among group members are distinct concepts in the formation of social capital. This relationship played out in the quantitative analysis, in which a significant positive relationship was found between *Information Sharing* and *Interaction Quality* (both when cell phones were present and absent in groups). Interestingly, the overall path models did not find this to be a two directional relationship, which suggests that greater feelings of togetherness, willingness to engage and accessibility are related to higher feelings of interaction quality. This is in line with the time-order we might expect given the literature, as feeling that there is togetherness in groups, that other members are more willing to engage and that they are accessible to engage in the first place might make a group member more likely to have interactions that they felt were of a higher quality (Misra, et al., 2014; Przybylski & Weinstein, 2013; Ling, 2008). The quantitative analysis also revealed definite difference in the way that interaction quality and the predictors of information sharing relate to the other factors in the study, further demonstrating the importance of considering both in an examination of cell phone use and social capital formation.

### Information Sharing

The hypothesized relationships for these factors were both as dependent variables to cell phone use (negative effects predicted) and as independent variables to the dimensions of social capital formation (negative effects predicted). When it came to how *Information Sharing* related to cell phone use, no significant differences were found in reported levels between experimental and control groups for the compound variable or its

individual indicators. And so it would seem that the presence of absence of cell phone use does not have an impact (positive or negative) on feelings of togetherness, willingness to engage, or accessibility of other group members, which tend to influence more successful information sharing. However, when looking only at experimental groups, we found that higher levels of cell phone use related negatively (though in cubic form) with these predictors of information sharing. The cubic relationship suggests that for different levels of cell phone use there are changes in the slope of the negative relationship, though as we have seen the negative trend persists through the cubic form.<sup>28</sup> Taking all of the other variables into consideration, the path analysis revealed that the relationship between cell phone use and these predictors of information sharing is negative, though non-significant.

Some of the lack of difference between experimental and control groups may have been due to the experimental design itself. With a group of individuals who were (for the most part) strangers to one another, there may have been hesitation to feelings of such things as accessibility of other group members, or even connection among the group. This pattern was observed in nearly every group, with few interactions between group members prior to the start of the experimental session. Indeed, after the first few sessions I began making note of the interactions between participants as they arrived, and aside from a few exceptions where introductions and conversations of such things as

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<sup>28</sup> Ultimately, this cubic relationship may be due to the smaller sample size (n=66) of experimental group members. While the negative trend is visually apparent, the trend line which best fits the data could be an example of “over-fitting”, a possibility that will need to be explored with future research and replication of this study (Boslaugh & Watters, 2008). However, a bootstrapped analysis of the linear regression model (using 30 samples from the dataset) suggests that the original predictions (and thus the cubic relationship) is the best fit for the data.

class schedules, holiday plans, and the weather broke the silence, there appeared to be a hesitation among group members to engage with one another right off the bat. This pattern, as discussed above, was also observed at the beginning of the testing period (i.e., the awkward silence), and therefore the extended silence of experimental groups might have also been due to a lack of willingness of the group members to engage one another as their cell phones provided the means which they needed to complete the task at hand.

If this is the case, then why did those participants who used cell phones report levels of *Information Sharing* that were not significantly different from those reported by control group members? Some of this similarity might be due to a “superficial” sense of the predictors of information sharing, as we suggested with reciprocity and trust above, given the ease of interaction which existed within experimental groups. For instance, if asked for the answer to a question, a cell phone user could simply read off the answer they had looked up (or quickly look up the answer on the spot) instead of engaging in a back-and-forth discussion of the answer. Thus, a participant may view this interaction as one in which the other was willing to participate, was accessible and thus formed a sense of togetherness (in the cooperation of supplying a quick answer). Responses in the focus group sessions did suggest that those who used cell phones (and their groups) felt a sense of cooperation, especially in regards to the expediency of completing the task. For example, a very common response to the questions related to working together as a group (and the positive aspects therein) dealt with completing the test at a fast rate. Furthermore, when asked what the barriers were in completing the test, many experimental groups responded that had they worked together sooner they “would have been faster” in the task. This seems to suggest that the ease of interactions, and the

success which came from these interactions, may have been interpreted as higher levels of togetherness, willingness and accessibility when cell phones were in use.

In control group, a similar pattern may have served to limit these feelings among participants. As we have already seen, observations of the interaction between group members indicated a greater degree of effort being involved, with discussions about potential answers, and members being required to give potential answers of their own creation/recollection. As such, it may have been that members felt less of the predictors of information sharing due to a shared feeling of difficulty in regards to the task at hand (i.e., 'I know how hard this is, so maybe other won't want to engage with me on it'). There were expressions of difficulty in the focus group responses (as well as audible projections during the test such as laughter upon seeing the test instrument, or complaints about not knowing the answers), such as one control group member who felt that "...the hardest part for me was just not being able to look it up on a computer or something, because usually you know when everyone has a question we just look it up really quick." This response suggests that a lack of "quick and easy" means to finding an answer may have caused feelings of difficulty on the test itself, and thus a lack of knowledge among group members which may have cut down on those things which would predict information sharing. As one control group member put it: "I don't think any of us knew the answers, so [there was] not much to talk about."

These results seem to suggest that the feelings of accessibility, togetherness and willingness to engage which existed among control group members may have been of a different classification than those from experimental group members (one tempered by the difficulty of the task at hand, and the other by its ease with the use of cell phones). It

is interesting however, that with higher levels of cell phone use (and thus lower levels of interaction), these feelings tended to be lower. Therefore, there may be limits to the degree of these predictors of information sharing when considered alongside cell phone use. As such, we cannot say that there is full support for hypotheses four, five and six, but neither is there a lack of support. The initial results are therefore maintained, in the decision to partially support these three hypotheses dealing with the predictors of information sharing.

#### Interaction Quality

As with the predictors of information sharing, no significant difference was found between experimental and control groups when it came to the reported quality of interactions which took place. Only one of the individual indicators of *Interaction Quality*, “I felt close to those who I interacted with during the test,” was found to be significantly different between groups, with higher levels reported by control group members. This seems to suggest that control group members had a slightly higher feeling of familiarity with one another during the testing period than those in experimental groups. This would seem to make sense, especially given the higher amount and intensity of interaction, and the quicker arrival at a group focus, which took place among control group members during the testing period. In other words, there may have been more “bonding” time for those member who were working more closely in the absence of cell phones. However, the difference between experimental and control groups was not that large (only about half a point on the 7-point scale for this indicator); and given that none of the other indicators showed significant differences between groups, it does not

seem that this single significant difference is enough to break the pattern found with the rest of the indicators and the overall compound variable. Likewise, despite a negative relationship between levels of cell phone use and the quality of interactions, the direct effects (and indirect effects as noted in the path model) were not found to be significant. This lack of significant findings led to an initial decision of “not supported” to the twelfth hypothesis. However, there may be more to the influence of cell phones on interaction quality than what was reported by respondents; what did interaction quality look like in the presence and absence of cell phones?

Past research has found that the mere presence of a cell phone (placed on a table next to two conversational partners) has the effect of reducing empathy and interaction quality (Misra, et al., 2014; Przybylski & Weinstein, 2013). As we have already seen in this section, there was a marked difference in the types of interactions which took place between members in experimental and control groups (with brief and efficient interactions in the former and more in-depth discussions taking place in the later). It would seem logical then, that there would also be a difference in regards to the quality of these interactions. Gauging the quality of interactions based on observations during the experimental sessions is a tricky task, and there are plenty of possibilities for confounding other factors (such as the amount of interaction) for quality. However, looking at the interactions themselves, we can see some differences between the group types. From inside of the groups, participant observers noted that there was a general lack of eye contact during the testing period among experimental group members, and that group members gave off a feeling of being closed off to interactions (with arms crossed and voices low and timid approaches to giving possible answers).

Even when group members were formerly acquainted, interaction quality did not appear to be what we might consider to be “high.” For example, in one experimental group, two members who appeared to know one another were talking off to one side and seemed to shut down attempts to interact with other group members when asked. While this is an isolated instance, it is interesting that the only observation of prior acquaintances not contributing to a higher quality interaction was when cell phones were being used; perhaps this is an extension of the individual focus limiting the group interactions, a factor which may have actually cut down on the quality of interactions in this case, even going so far as to making the participant observer feel as though it was intimidating to have these two in the group. In one control group, two prior acquaintances were noted (they were talking on the way in and I recognized them as two students who were sitting next to one another in the class from which they were recruited) and despite the fact that they talked to one another during the testing period, they also engaged to the rest of the group and contributed to the conversation.

There were also observations that seem to speak to differences between the two group in regards to the individual indicators of interaction quality. For example, two of the indicator questions for interaction quality asked respondents how much they would like to interact with their fellow group members in the future, and how likely they would be to become friends if they interacted more together. While the responses to these questions did not bear a significant difference in the presence or absence of cell phones, the behaviors of group members after the completion of the experimental sessions may have. After the test was called to an end, and the debriefing session was completed, participants were released to go on their way. After one experimental group, a participant



observer noted that participants went straight to their cell phones as they filed out of the room. Likewise, the participant observers and I also observed on several occasions that experimental group members would turn their attention to their phones after completing the test (and while waiting for others to finish or for me to get set up for the debriefing session). This was not the case in control groups however, with the members of these groups being much more likely to engage in conversations after the test and even when walking out of the door at the end of the session.

This is not to say that such interaction did not take place after experimental groups, or that all control groups were particularly chatty, just that there was more conversation which carried on after the testing period in control groups. Similarly, some of these conversations may have been due to other factors such as having prior acquaintances in the same group, or that control group members had just “gone through the gauntlet” together and were thus more likely to have a sense of comradery after the fact. However, even if this were the case, there is still interaction quality which would appear to be at play, especially in the case of a shared experience. If group members go through a task, and don’t come out of it talking to one another, then it is likely that their interactions were not at a very high level of quality, and if cell phones are the only difference between groups, then it would appear that cell phones may indeed have a negative effect on the quality of interactions.

As far as why participants in both experimental and control groups reported similar levels of interaction quality, there may be other factors at play as well. It is possible that the participants conflated interaction quality with successful completion on the test. If participants felt that they did not do well on the test, or that they did very well

on the test, they may have reflected this feeling on their assessment of interaction quality (i.e., I did not do well on the test therefore my interaction must not have been high quality). A regression predicting interaction quality based on feelings of accomplishment after completing the test appears to support this possibility, with a moderate, positive significant relationship found in both experimental ( $B=2.565$ ,  $\beta=.559$ ,  $p<.01$ ) and control ( $B=2.836$ ,  $\beta=.657$ ,  $p<.01$ ) groups. These results would appear to indicate that for higher levels of perceived accomplishment, there is likely to be a higher level of perceived interaction quality. Given that experimental group members had a significantly higher level of perceived accomplishment on the test, it is possible that when cell phones were used interaction quality was inflated and when cell phones were not used it was deflated due to higher and lower levels of perceived accomplishment. This also seems to suggest that for experimental group members, the same type of pattern as was found when it came to trust in information, is at play. When group members are able to obtain information or help quickly and easily, it is possible that they assign a higher degree of quality to those relationships which generated the help they needed. Likewise, if group members had to work harder for the information, and were unsure as to whether or not the results were valid, it seems likely that they would assign a lower level of quality to the interactions from which the information came. This seems to suggest a different kind of quality at play when cell phones are used and when they are absent from a group task.

Looking to the responses from focus groups, we find that a higher degree of importance was placed on the group interactions by members of both experimental and control groups. When asked about their work as a group during the test, as well as the barriers that they faced and what helped to overcome them, a common response from

both group types involved mentions of having worked together as a group and that more collaboration and group work would have helped to overcome the difficulties on the test. For experimental group members, there were several responses which indicated that more group work would have been beneficial to the completion of the test. As one group member said in regards to working together as a group: "I guess we would have been more effective if we had just... like broke it down by questions." This example demonstrates both a desire to interact more as a group, as well as to do so in such a way as to expedite the process of completing the test (delegating the task at hand more efficiently). As such, it would appear that the quality of the interactions which were desired by, and which took place within, experimental groups was more along the lines of efficiency and getting things over with as quickly as possible.

This pattern is further evidenced by the fact that some of those in experimental groups which had limited amounts of interaction, in the final few minutes of the testing period, rated their interactions at the highest levels of quality. Control group members may have also felt that they got more out of the interactions they had with one another as they were more substantial, though the lack of difference in their responses may be due to confounding the ease of interactions with an actual quality interaction. While quick and efficient might not be what we would expect when thinking about interaction quality, it is indeed perceived to be that way by those in experimental groups, and thus we see what may well be another form of interaction quality which arises out of group work along with the use of cell phones. As such, and despite the quantitative findings of no significant relationships, there does appear to be partial support for the twelfth hypothesis in this study. Given these results, the question becomes, how does the interaction quality

from both experimental and control groups relate with and influence the formation of social capital.

#### Effects on Social Capital Formation (Hypotheses 9, 10, 11, 13, 14 and 15)

##### Information Sharing

When it comes to Interaction quality and the predictors of information sharing, the quantitative results yielded at least partial support for all of the hypothesis regarding their relationships with giving and receiving aid, trust and reciprocity (the dimensions of social capital formation). As predicted, for higher levels of the predictors of information sharing, we also find higher levels of perceived reciprocity and trust. As for giving and receiving aid, a quadratic relationship was found, such that a positive trend in the regression slope becomes increasingly steeper beginning near the moderate levels of information sharing predictors (with a small number of individuals at the lower end of *Information Sharing* reporting higher levels of giving and receiving aid as well). The direction of all of these relationships is similar in both experimental and control groups. Overall, these results appear to suggest a positive influence on the formation of social capital when participants feel a greater sense of togetherness, willingness to engage, and accessibility among the members of their group, regardless of cell phone use.

Observations of both experimental and control groups also seem to suggest a positive relationship between the predictors of information sharing and the dimensions of social capital formation. For example, those groups whose members expressed a willingness to engage with one another prior to the beginning of the test (greetings at the door, small talk before hand, etc.) appeared to be more likely to break the ice and begin

working together as a group early on in the testing period. This earlier group focus, and its implications for trust and reciprocity as discussed above, would seem to suggest a positive impact of the predictors of information sharing on the three dimensions of social capital in both experimental and control groups. One experimental group member made note of such an impact when asked about how effective the group was at working together on the test:

I feel like the more one person asked questions, or asked to be helped, or volunteered information, the more we become willing to actually ask [because] sometimes you don't know if they actually want to work together... but then once they start saying something you feel encouraged to interact with them more.

As we can see then, participants themselves did feel that having others who were willing to engage, and who were accessible to interact in the first place, had a positive impact on the amount of interactions which took place inside the groups.

The quadratic relationships between the predictors of information sharing and giving and receiving aid are interesting, as they seem to suggest that at lower levels of these predictors, there is still the tendency for higher levels of interaction among group members (slightly more so in control groups, but in experimental groups as well). This may actually shed some light on the discussion of the quantity of interactions earlier in this section. As we noted, the higher levels of interactions in control groups may have been due to the experimental design (i.e., interacting out of necessity). If that was the case, then a quadratic relationship such as this, with those who didn't feel a very high degree of togetherness, willingness to engage, or accessibility in their groups still engaging in higher levels of interaction when cell phones are not present. However, that this relationship also exists among experimental group members suggests that there might not be more of a motivation to participate among experimental group members. As such,

any differences between experimental and control groups, when it comes to the amount of interactions, is more likely due to the presence or absence of cell phones as opposed to some influence from the experimental design itself.

Another important aspect to look at when it comes to the effects of information sharing predictors on social capital formation, is the difference in effects sizes that exists between experimental and control groups. For the most part, the total effects (from *Information Sharing* on the three dimensions of social capital formation) in both experimental and control groups are similar in terms of their standardized sizes, moderate to strong. The only notable difference appears when it comes to the effect of *Information Sharing* on trust. In experimental groups, it was found that a moderate direct effect ( $\beta=.660$ ) and a weak indirect effect through interaction quality ( $\beta=.172$ ) summed to a strong overall effect on perceived trust among group members. For control groups however, when accounting for all of the variables in the model, the relationship which was found to be moderately strong in the regression analysis drops to weak and non-significant in the path model. And yet, the path model also revealed a moderate indirect effect ( $\beta=.470$ ) through interaction quality that brought the overall effect right back in line with the initial regression model ( $\beta=.568$ ).

These differences seem to suggest that feelings of togetherness, willingness to engage, and accessibility had a stronger and more direct impact on the feelings of trust when cell phones were used, and a weaker indirect impact when cell phones were not used. Given our discussion of the different types of trust which appeared in the two group types (trust in information and trust in others), these findings would appear to suggest that the effects of the predictors of information sharing on trust is slightly

stronger when the focus of trust within groups tended towards a trust in the information given by fellow group members. And though the differences between experimental and control groups are by no means large, they continue to indicate a pattern in the experiences of participants, such that when cell phones were used there is a feeling of higher levels (of such things as trust) despite an observed lower degree of “substance” in these aspects. For instance, as we have already seen, the onset of interactions (in which feelings of willingness, togetherness and accessibility are intertwined) takes longer when cell phones are present; therefore, in this study, these feelings would have had less time to develop and thus have an impact on social capital formation. Therefore, when similar relationships are found, we must wonder as to the substance of these factors/feelings, especially in the presence of quick and efficient communications among participants who used cell phones. And so, though these qualitative results appear to offer further support for hypotheses nine, ten and eleven, when considering the effects of the predictors of information sharing on social capital formation it is important to consider the experiences of those engaged in the interactions under study.

#### Interaction Quality.

When it comes to interaction quality, the predicted relationships with social capital formation also ran in the positive direction, with higher levels of trust, reciprocity, and calling upon others for aid expected with greater feelings of quality in the group interactions. Unlike with the predictors of information sharing, however, there are more distinct differences in terms of the significance and strength of these relationships between experimental and control group members. In the quantitative analysis, we found

that the relationship between interaction quality and calling upon others for aid was weak and positive among experimental group members and non-significant in control groups. This finding may indicate that for control group members, the quality of the interaction which took place was not a major factor in the quantity of the interactions, perhaps due to the necessity of these interactions and the sharing of information between group members in order to complete the task at hand. As one control group member put it, “we figured out pretty quickly that we had to work together to get the answers.” However, given our discussions of what interaction quality looked like in experimental and control groups, it is possible that a focus on the quality of the information which was generated via cell phone use was found to be a significant predictor of higher frequencies of calling upon others for aid (which was brief and efficient, and lacked depth of discussion); whereas in control groups, where members may have had a lower feeling of interaction quality due to not getting information that was as useful to them, there was still a group focus, greater number of interactions and more depth of discussion. In other words, if interaction quality meant something different to experimental and control group members, then its effects on the quantity of interactions may reflect this difference.

It should be mentioned here, that the relationship between the quality of interactions and the quantity of interactions (giving and receiving aid) does not appear to be a two-way street. On first glance, it might seem that quantity and quality of interactions should have an influence on one another, with a higher frequency of interactions making it more likely that interaction quality might arise. However, during the path analysis, no path was found in either direction between these factors for control group members, and for experimental groups the addition of a feedback loop between



interaction quality and giving and receiving aid was not found to be significant (nor was it a good fit for the data). As such, it appears that when group members found the initial interaction to be of a higher quality, they were more likely to engage in more interactions over the course of the testing period. As we have seen, however, this relationship is only found to be significant for those in experimental groups.

The example given earlier in this chapter regarding the group member who did not receive help in regards to initial inquiries (and who then turned to a cell phone on a more individual focus) would seem to illustrate this pattern. As the group member did not perceive the initial interaction as of a high quality (“I was like yeah I don’t really need them”), it was less likely that further interactions were to take place. On the flip side, when group members asked for help later on in the testing period (after answers had been looked up via cell phone) the initial interaction was likely interpreted as of a higher quality, as an answer was more likely to be quickly and easily given, and thus further interactions between group members was more likely to occur. And indeed the frequency of interactions towards the end of the testing period in experimental groups, with members throwing around answers, reading through tests one question at a time, or even a flurry of questions being asked all at once, would appear to suggest that when cell phones were used there was more likely to be an impact of interaction quality as a precursor to calling upon other for aid, and not the other way around. This might also help to explain why members form those groups which had a short span of interactions (for example the last two minutes of the testing period) were reporting some of the highest levels of interaction quality, with the quality not necessarily dependent on the quantity of interactions which took place. Given the apparent importance of interaction

quality on calling upon others for aid when cell phones are used, and a decreased importance when cell phones were not used, these results suggest a second round of partial support for the thirteenth hypothesis.

As for the fourteenth and fifteenth hypotheses, dealing with the reciprocity and trust, a positive relationship was predicted with the quality of interaction among group members. The quantitative results found significant positive relationships between interaction quality and both reciprocity and trust in experimental and control groups. A slightly weaker standardized effect was found for the relationship between interaction quality and reciprocity in control groups ( $\beta=.404$  for experimental,  $\beta=.302$  for control), though for the most part the relationship looks nearly identical between group types. It is interesting that no major difference was found for this relationship, between experimental and control groups, especially given the observations which appear to suggest a different type of reciprocity in experimental and control groups. There were, however, differences in the significance of this effect when it came to demographic comparisons. As was noted in Chapter 4, the positive relationship between the quality of interactions and perceived reciprocity was found to be significant for those in “majority” groups (whites, males, higher levels of parental education and upper classmen), and not for those in “minority” groups when cell phones were used. When cell phones were not used, this pattern of majority and minority group differences was not present. For instance, when it came to under classmen, the effect was significant in control groups. This pattern may indicate that cell phones have an effect of benefitting majority group members when it comes to perceived reciprocity. Observations of group interactions do not appear to shed

light on the reason behind this pattern, which leaves these demographic differences as fertile grounds for further examination and study.

As was discussed above, a more surface-level reciprocity appears to be at play in experimental groups (with limited mutual help and group focus) and a more traditional view of reciprocity appeared to be present in control groups, involving a more developed group focus and feelings of mutual help despite the extra effort required. If there are two different types of reciprocity, and if both appear to be affected by interaction quality in the same way, there would seem to be support for the existence of two different types of interaction quality in these groups as well, or that the perceptions of both interaction quality and reciprocity were the same despite differing compositions. These results would seem to offer additional support for the fourteenth hypothesis, as interaction quality (whatever its form) seems to play a positive role in the generation of reciprocity.

When it comes to the relationship between interaction quality and trust, a significant, positive relationship was found in both experimental and control groups. This suggests that when groups members felt that the interactions they were having were higher quality, there was more likely to be a higher degree of trust which resulted. And yet, the standardized effects sizes indicate that the strength of the relationship between interaction quality and trust was almost twice as much when cell phones were not used as when they were ( $\beta=.324$  for experimental,  $\beta=.731$  for control). As we have already noted, observations of group interactions seem to suggest that there were different types of trust in experimental and control groups, the former focusing on trust in the information that was shared and the later dealing more with trust in the other members of the group themselves. This could mean that interaction quality which took place in

control groups had more of an effect on trust in fellow group members, while for experimental group members the interaction quality does not have as much of an effect on trust in the information received. This is perhaps unsurprising, as the information which is generated from cell phone use is unlikely to change regardless of the quality of the interactions which were involved in sharing the information. Such a relationship would seem to suggest that there is indeed a higher quality of interactions which take place in control groups (which subsequently has a stronger effect on the formation of trust among group members).

We see this pattern in effect when it comes to the formation of leadership roles in experimental and control groups. Observations of group interactions reveal that in some cases a definite leader emerged, with one member reading through the questions aloud, directing group discussions and in some ways facilitating the help which was given and received among the group. For example, in one experimental group a member distributed the questions to other members in a delegation of the work. In one control group, a leader emerged who kept the group focus on one question at a time, and ensured that the group waited until an agreement was reached before moving on. As was mentioned in Chapter 4, the emergence of leaders appeared to be related to the trust among group members. There were four control groups which had high levels of trust (above 10.00 on the fourteen-point scale), and of those four three had a leader emerge (out of a total of four groups in which a leader emerged). In other words, seventy-five percent of those control groups which had a leader emerge also had high levels of trust. As with the control, there were four instances of a leader emerging in experimental groups. However, only two of these groups had levels of trust above 10.00 (or 50% of groups in which

leaders emerged had high levels of trust). The difference is even more dramatic, when we consider the higher levels of trust which were found among experimental group members (9 groups above 10.00 as opposed to 4 control). This means that only thirty-three percent of those experimental groups which had high levels of trust also had a leader emerge, compared to seventy-five percent of control group with high levels of trust.

This would seem to suggest that when group members trusted one another more, they had trust enough to let a leader take charge of the task and call the shots, but more so when cell phones were not used. This pattern is in line with previous research, which suggests that leaders (especially those who are charismatic) are more likely to emerge in an adaptive setting, a major component of which is a higher level of trust among group members (Shamir & Howell, 1999). Given the positive relationship between interaction quality and trust, it may be that all three of these factors are interrelated, such that with higher levels of interaction quality there is more trust and also more of a likelihood that a leader will emerge. Also, given that cell phones allowed individual group members to look up the “correct” answers, the necessity of having a leader to guide the process may not have been felt despite higher levels of trust and interaction quality. Overall then, we see a positive relationship between the quality of interactions and perceived trust, though it may take different forms and have differing effects in experimental and control groups. These findings appear to offer more support for the fifteenth hypothesis.

#### Interaction Quality and Information Sharing as Moderating Variables

One final aspect of interaction quality and the predictors of information sharing

must be considered as it relates both to cell phone use and social capital formation: their role as moderating variables between cell phone use and the dimensions of social capital formation. As we saw in the path analysis, there were some changes in the relationship between cell phones and social capital formation when taking into account the indirect relationships through these two variables. First, accounting for all of the variables in the model decreased the effects of cell phones on *Information Sharing* to non-significance, though they were still weak, negative and cubic. As this negative relationship went through both *Information Sharing* and *Interaction Quality*, which subsequently had positive relationships with the three dimensions of social capital formation, the overall effect of cell phone use remained non-significant across the board. And so it would seem that these factors cancel out the negative effects of cell phones among experimental group members (except for giving and receiving aid, for which no indirect effects were found). This suggests that when group members have higher feelings of interactions quality, willingness to engage, accessibility, and togetherness, cell phone use does not have a major impact on the formation of social capital. However, given that cell phone use is still cutting down on the predictors of information sharing (albeit, by only a little), this negative effect may still play a role in limiting the formation of trust and reciprocity in experimental groups. Perhaps this points to the importance of finding a balance between cell phone use and interactions between members of a group, such that quality and the predictors of information sharing can still be established.

We can see this possibility at play when it comes to the comparison of demographic path models for experimental group members. As was noted earlier in this section, and in Chapter 4, the negative effects of cell phone use are significant in regards

to all of the social capital formation variables among those in upper classmen standing, those with lower levels of parental education, and potentially males. It would appear that the mitigating effect of interaction quality and the predictors of information sharing are not as important for these sub-groups, especially since in most cases the direct negative effects of cell phone use were moderate and significant on *Information Sharing*<sup>29</sup>. This significant direct effect on the initial moderating variable may have served to override the positive impact of both *Interaction Quality* and *Information Sharing* when it came to impact on the dimensions of social capital formation.

Looking at the interactions which were engaged in during experimental sessions, there were some differences along the lines of these demographics. As was noted earlier in this chapter, females were more likely to take on leadership roles within groups (both experimental and control), and as such may have experienced quality and information sharing differently from their male counterparts. An examination of field notes and participant observations also indicates that female group members were more likely to break the ice and initiate conversation and even to hold conversations with other group members prior to the start of the experimental sessions. All of this may indicate that females had a higher degree of willingness to engage, feelings of togetherness, accessibility to other members and even higher quality interactions. Even though this was not reflected in the quantitative survey responses, it may just be that our measures of information sharing predictors and interaction quality did not pick up on these subtleties. When it comes to the other demographic factors, parental education and class standing,

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<sup>29</sup> Upper Classmen:  $\beta = -.573$ ,  $p < .05$ ; Lower Levels of Parental Education:  $\beta = -.652$ ,  $p < .05$ ; Males:  $\beta = -.478$  (though given different results in the calculations of p values, for males this relationship may not be significant).

observations were less evident as to differences in these relationships. Given that observations of parental education levels (and social class in general) were not clear, and that in a group of college students it can be difficult to differentiate between upper and under classmen, no definite observations can be pointed to when it comes to the moderating effects of interaction quality or the predictors of information sharing.

“Wikipedia has let me down”: Cell Phone Use, Test Accuracy and Accomplishment

Test Accuracy (Hypothesis 7)

The final set of hypotheses to discuss deal with how participants did on the test during the experimental session, and how they felt about their work. In perhaps the least surprising result of this entire project, when cell phones were used participants were significantly better able to answer the questions on the test instrument (a difference of about five points on the fifteen-point test). The most observed (and seemingly only) use of cell phones during experimental sessions was using the Internet, and search engines, to look up the answers to questions. Given that the test was designed in order to make it difficult for any one individual to answer all of the questions, being able to reach out and quickly look up the answers (and thus to use resources outside of the immediate group of minds) was likely a major benefit to a quick and more accurate completion of the test. And indeed, many of the experimental groups completed the test well under the twenty-minute time limit, while control groups tended to use the entire period and some had not answered all of the questions once time was up. Despite the higher average scores for experimental group members, there were instances in which the correct answers were not generated with the use of cell phones, and observations related to these instances (and of



the generation of answers in both experimental and control groups) which may help to shed more light on the effects of cell phone use on social capital formation.

The week before the experimental sessions began (in November of 2015), the speaker of the U.S. house of representatives, John Boehner, resigned from his position. While this doesn't have any bearing on social capital formation, this current event did have an impact on the course of the experiment. One of the questions on the test which participants worked on during the sessions, asked who the current speaker of the U.S. house of representatives was. As it turns out, this was the one question on the test which caused the most trouble for participants. In many experimental groups, when the answer was looked up via search engine, John Boehner was listed as the speaker of the house. While no formal question was asked in focus groups regarding how respondents answered, through conversations with participants and participant observers, it would appear that the Internet had not yet caught up with the change. As it turns out, when looking up this answer on a cell phone, one would be required to scroll down the page in order to find mention of the new speaker of the house (Paul Ryan). Given the observations of expediency in experimental groups, it makes sense that cell phone users weren't scrolling down past the first line of search engine results page which had the name of the prior speaker listed.<sup>30</sup> This was not the only question that was answered incorrectly in experimental groups, which suggests a fallibility of using cell phones for accurate information gathering. In one instance, an experimental group member who had

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<sup>30</sup> This may actually be a criticism of search algorithms, which rely on things such as the popularity of pages and one's past search history in order to predict and personalize the information that is presented. As such, if a recent event has not yet reached the top tier of the algorithm, it is possible that the most up to date information will not be found and thus not relayed to other group members.

suggested that Dubai was the country in which the tallest building in the world was located (having looked it up online) was told that Dubai was a city and not a country, to which he replied “Wikipedia has let me down.” Subsequently, looking at the Wikipedia entry for the tallest building in the world, one would be hard pressed to tell whether Dubai is a city or a country if they were not aware of this in the first place. Experimental groups found multiple potential answers for nearly every other question on the test as well (with different group members using different webpages). And while a single wrong answer does not seem to buck the trend of mostly correct answers on the test for experimental group members, the discussions and interactions which surrounded (or did not surround) such answers may have implications for the formation of social capital.

Seeing as both control and experimental groups arrived at the wrong answers to some of the test questions, it behooves us to examine the ways in which the different groups dealt with generating their answers and dealing with multiple possibilities. As we have already seen, the main course of action for completing the test among experimental members was to look up the answers to most of the questions (in the period of silence) and then turn to the rest of the group for any incomplete answers or to double check those answers which were generated individually. As for control groups, the interactions with other group members were the main form of knowledge generation which took place in completion of the test. The apparent accuracy of those answers which were looked up on cell phones, and those which were arrived at solely through group discussion was different as well. In our discussion of trust above, we noted that there was a higher degree of trust in the information given by others when cell phones were used. This seems to suggest a higher degree of confidence in those answers which were arrived at

via cell phone use. This confidence was reflected in the responses of experimental group members during focus groups, with frequent responses of “getting all of the answers right” to the question of how effective group members felt they were at completing the test individually. Furthermore, in both experimental and control groups, when asked about what the experience would have been like if phones were (or were not) used, issues of confidence in the answers were given. One experimental group members said that “[we] probably wouldn’t have answered some, and wouldn’t have been as confident in the answers we did come up with” had cell phones not been used on the test. Control group members also mentioned that if they had been able to use cell phones they would have been more sure of the answers which they arrived at. Observations of control group members also indicate that they felt a desire to use cell phones in order to accurately complete their tests, saying for instance that “if I had the Internet I could get all this stuff.” All of this suggests that cell phones made arriving at the answers easier and that when cell phone were used in a group there was more confidence in the answers which were given by others. When it comes to levels of cell phone use, we see that those who used cell phones more in experimental groups did not tend to have significantly higher scores on their tests. This seems to suggest that the confidence in answers which arose out of cell phone use was present at both high and low levels of cell phone use, which is more like the “iPhone effect” (Misra, et al., 2014; Przybylski & Weinstein, 2013), in which the mere presence of a phone affects interactions (except in this case, the presence of a phone may have reassured group members of their answers, even when they didn’t look up all of them individually). If this is the case, then it is possible that the presence

and use of cell phones, through feelings of confidence on the test, contributed to decreasing the amount of interaction between group members to some degree.

When we look at the interactions which took place among experimental group members, the majority of the time the purpose appeared to be to double check the answers which one had already looked up on their own, or to quickly get the answer which someone else had looked up using their phone. Given the apparent higher feelings of confidence in the results which were obtained using a cell phone, this may help to explain why so little critical discussion actually took place in this double checking process, and why so few experimental group members asked for a second opinion when given an answer arrived at via cell phone use. Basically, if someone looks an answer up using their phone, you are more likely to be confident in its accuracy (because as one participant put it, “everything is online”). Because you are more confident that the answer is correct, you are also less likely to engage in a discussion around the answer. And while in most cases this proved to be a useful pattern for getting accurate results, there were other instances (such as the speaker of the house questions discussed above) in which a critical discussion of the answer given would have helped a great deal in getting the right answer.<sup>31</sup>

This is not to say that it was just the confidence in the answer which led to this pattern of decreased critical discussion. Indeed, in several control groups, there were

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<sup>31</sup> It should be noted here that in one experimental group, a participant observer mentioned that the speaker of the hose had changed, which led to a discussion regarding the “truth” of the answer, and after more searching and discussion the correct answer was arrived at. This would seem to suggest that when a critical discussion was engaged in it did prove to be effective in experimental groups. However, had the participant observer not made the statement, it is very possible that no one would have, in which case the wrong answer derived from a cell phone search would have very likely remained.

members who were very confident in the answers they gave (based on past experiences such as being a musician for instance) and yet there was still a critical assessment of the answer in order to ensure its validity.<sup>32</sup> This would seem to suggest that it is not so much confidence, but use of cell phones which gives more confidence, that led to a pattern of less critical discussion in experimental groups. If we couple this pattern with the additional trust and confidence that was gained by the double-checking of answers in these brief interactions (and thus even less necessity of discussing the answers in depth), it would appear that cell phone use offers a concoction which is lethal to critical discourse in groups. In other words, why does one need to engage in a discussion if the right answer can be arrived at in a quick and easy manner without it? If this pattern of less critical discussion in the presence of cell phones were applied to other situations and settings (such as a newly formed work group for a class project), it is possible that accurate completion of a group task might not fare well when cell phones are used in the process. Given these results, there is still partial support for the seventh hypothesis, with more accurate responses with the presence of cell phones, no difference in accuracy for higher levels of phone use, and a lack of critical dialogue which may have helped arrive at the correct answers when cell phones were used during the testing period.

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<sup>32</sup> Again, not in all cases. There were instances of control group members simply accepting what was given by those more confident in their answers. Experimental group members also noted in several cases that they needed to double check the answers which were looked up online initially, either with other group members or using a second online source. However, the pattern of more discussion when cell phones were not used, and less discussion when they were, still remained, with fewer questions being asked as to the accuracy of the answers derived in experimental groups.

### Feelings of Accomplishment (Hypothesis 8)

A significant difference was found between experimental and control group members when it came to feelings of accomplishment on the test, with experimental group members reporting significantly higher levels. It was also found that the amount of cell phone use which took place did not have a relationship with feelings of accomplishment, which would seem to suggest that, much like test accuracy, it was the presence of phones, rather than their use, which had a greater effect overall. This finding of higher levels among experimental group members runs counter to the predicted negative relationship, which held that more in depth discussion between group members would leave group members with a greater feeling of accomplishment. It is possible that the single item used to assess this feeling of accomplishment was not an accurate reflection of how group members felt overall (for instance, accomplishment in getting the right answers vs. accomplishment of having worked well as a group was not teased out). Indeed, the finding that even those group members who had very little interaction with others during the testing period tended to report a higher feeling of accomplishment.

This seems to suggest that accomplishment was interpreted as having generated answers which group members felt confident were correct. A positive relationship was found between answers correct on the test and feelings of accomplishment among experimental group members ( $B = .471$ ,  $\beta = .280$ ,  $p < .05$ ), which suggests that for every one-unit increase in test accuracy, we can expect to find a .471 unit increase in feelings of accomplishment. Interestingly, no significant relationship between these two variables was found in control groups (where neither test accuracy nor feelings of accomplishment

had very high levels). Given the observations and responses which seem to suggest that control group members had less confidence in their answers, as well as a stated desire to use cell phones in many cases, it would indeed seem that accomplishment was interpreted as accurate completion of the test.

There are several observations which may help to shed light on why control group members and experimental group members had different feelings of accomplishment on the test. In control groups, there were several instances in which participants mentioned feeling “stupid” (to some degree) after finishing the test.<sup>33</sup> This would seem to suggest that control group members felt more challenged by the test, and thus had lower feelings of accomplishment (or higher feelings of discouragement) upon its completion. Another aspect that may have driven down the feelings of accomplishment among control group members, and simultaneously raised them among experimental group members, is the ability (or lack thereof) to use cell phones during the test. In one control group (the one in which group members ended up using their phones), it was clear that participants felt uncomfortable with not being able to use their cell phones. When reminded that cell phones were not to be used during the test, there was a visible “uneasiness” among the group members, with one appearing to be “lost” and looking around the room as though to grasp at anything that could help to answer the questions. This group also made repeated attempts to use their phones, and it was clear that they were uncomfortable with not being able to use their phones. This would seem to suggest that cell phones can

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<sup>33</sup> As part of the debriefing process, I made a point to assure these participants that they were not stupid, and that the test was designed such that no one person would know all of the answers. This process, along with the reveal of the study’s true purpose seemed to ameliorate these negative self-assessments.

operate not only as an “umbilical cord,” which can be used to access outside information, but also as a security blanket which helps to make individuals feel comfortable when placed in a new setting.

This finding would appear to be supported by prior research on separation anxiety related to cell phones. For instance, a recent study found that separation from one’s cell phone has definite physiological effects in terms of anxiety and stress during the performance of a cognitive test, and that separation from a ringing cell phone results in poorer performance on the task (Clayton, Leshner & Almond, 2015). If participants in control groups experienced negative impacts due to a separation from their phones (when they would have been useful tools to use), it is possible that their feelings of accomplishment on the test itself were lower as a result. This is interesting, as interaction quality, information sharing predictors and the dimensions of social capital did not appear to suffer to a significant degree in the absence of cell phones. This may mean that interactions with other group members helped to fill in for the void left by the loss of one’s phone. On the other hand, when group members were able to use their cell phones, these feelings of stress and anxiety may have remained abated. This may have ultimately served as a deterrent to interacting with others in the group who, to paraphrase an experimental group member, were not necessary in order to complete the exam. Given that interactions (calling upon others for aid, etc.) are necessary for the formation of meaningful norms of trust and reciprocity, having a digital sidekick always at the ready therefore appear to be an overall negative force when it comes to the formation of social capital. Ultimately, these findings do not offer support to the eighth hypothesis, though they do offer some insight into the effects of cell phone use on social capital formation.



## Summary

In the end, most of the original hypothesis decisions, as established with quantitative results, were upheld after consideration of the qualitative data (see Table 5.1 below for a summary of these decisions). The sole exception to this pattern is the twelfth hypothesis, regarding the effects of cell phone use on interaction quality, which moved from unsupported to partially supported. As we have seen throughout this chapter, however, the qualitative results have done more than just reaffirm the quantitative findings. The qualitative findings have allowed us to understand what the relationships under study looked like, and thus to illuminate the processes at play in the formation of social capital. For instance, we have identified what appear to be different norms/types of trust and reciprocity which are associated with the presence and absence of cell phone use, factors which were not reflected in the quantitative analysis. Likewise, having looked at the interactions between group members it appears that different types of interaction took place, along with different amounts, in experimental and control groups; and that both interaction quality and the predictors of information sharing may play different roles in the formation of social capital in experimental and control groups (especially in their role as moderating variables when cell phones are used). These findings, and the patterns which appear to exist, must now be looked at and interpreted through a larger theoretical lens, in order to better understand their implications on social capital formation and the effects of cell phones in our social lives. And it is to this purpose that we turn our attention in the final chapter.

Table 5.1

Summary of Hypothesis decisions: Quantitative, Qualitative and Overall

Hypothesis	Quantitative Results	Qualitative Results	Overall Decision
1 When cell phones are used in a group, members will be less likely to call upon others for aid.	Supported	Supported	Supported
2 When cell phones are used in a group, members will report lower levels of perceived reciprocity.	Not Supported	Not Supported	Not Supported
3 When cell phones are used in a group, members will report lower levels of perceived trust in fellow group members.	Partially Supported	Partially Supported	Partially Supported
4 When cell phones are used in a group, members will report feeling that they have less access to other group members.	Partially Supported	Partially Supported	Partially Supported
5 When cell phones are used in a group, members will report feeling that other group members are less willing to engage in problem solving.	Partially Supported	Partially Supported	Partially Supported
6 When cell phones are used in a group, members will report feeling less of a sense of togetherness with other group members.	Partially Supported	Partially Supported	Partially Supported
7 When cell phones are used in a group, members will complete their task to a higher degree of accuracy.	Partially Supported	Partially Supported	Partially Supported
8 When cell phones are used in a group, members will feel less accomplished in regards to completing their task.	Not Supported	Not Supported	Not Supported
9 Group members who report feeling more of the determinates of information sharing will also report calling upon others for aid more.	Supported	Supported	Supported

Table 5.1 - Continued

Hypothesis	Quantitative Results	Qualitative Results	Overall Decision
10 Group members who report feeling more of the determinates of information sharing will also report higher levels of perceived reciprocity.	Supported	Supported	Supported
11 Group members who report feeling more of the determinates of information sharing will also report higher levels of perceived trust in other group members.	Supported	Supported	Supported
12 When cell phones are used in a group, members will report lower quality interactions with other members.	Not Supported	Partially Supported	Partially Supported
13 Higher levels of interaction quality will relate positively with the quantity of group members calling upon one another for aid.	Partially Supported	Partially Supported	Partially Supported
14 Higher levels of interaction quality will relate positively with reported levels of perceived reciprocity.	Supported	Supported	Supported
15 Higher levels of interaction quality will relate positively with levels of perceived trust in fellow group members.	Supported	Supported	Supported

## CHAPTER VI

### THEORETICAL DISCUSSION AND CONCLUSION

Now that we have discussed the findings of this study, and the ways in which the variables of interest are interrelated, it behooves us to examine the implications of these findings in regards to the theoretical framework of cell phone use and social capital formation, as well as the larger social picture in general. In this chapter, we will look at the results once again, in an attempt to understand what they mean in the theoretical context, and what implications they might have for our understanding of the topic of this study and other sociologically relevant areas of interest. We will also look at the limitations of the current study and where these limitations (and results) might point us when it comes to future research on cell phone use and social capital.

#### Theoretical Discussion

##### “There’s an App for That”: Cell Phone Use and Social Interactions

Interaction with others is a key tenant of social capital and its formation. As James Coleman (1990) put it, “the more extensively persons call on one another for aid, the greater will be the quantity of social capital generated” (p. 321). Without interacting with others and calling upon them for aid, social capital cannot be realized. And without these interactions, the relationships that compose networks in which social capital exists cannot be fully formed. Basically, when it comes to the formation of social capital, the

interactions that we have with one another are the most important aspect to focus on. As such, anything that might affect these interactions (positively or negatively) could be looked at as a major factor in the formation of social capital. As we have seen in this study, cell phones do appear to have a negative impact on both the amount and type of interactions which take place in a group setting. When cell phones were used, there was more silence among group members, there was a longer period of time before first contact was made, and once interactions did occur they were relatively brief and consisted primarily of double checking those answers which were already generated via cell phone use. These differences between groups when cell phones were and were not used indicate that cell phone use would appear to have a negative impact on the formation of social capital simply due to the decrease in overall interactions (and thus a decreased likelihood of forming new network connections). As we saw in the previous chapter, these lower levels of interaction were also associated with a greater individual focus within groups, with experimental group members more likely to feel that they did not need help from others and taking longer to develop a group focus during the testing period. And it is this individual focus, along with decreased levels of interaction, in the presence of cell phones which may help us to better understand the effects of this technology on social capital.

An increased sense of individualism (within a population or group) has the potential to negatively affect both the formation and realization of social capital. As was noted by Alexis de Tocqueville (1966), a heightened sense of individualism, or self-focus, can serve to isolate the individual from the others in society. As such, there is less need for interaction among members of a community (Bellah, et al. 1996), and thus a

decreased likelihood of social capital being formed in the interactions between members in the first place. While much of the work on individualism (theoretical and empirical) focuses on large scale structural issues, such as the rise of democracy and increased individualism, others have found that technological changes (like the television and choices of entertainment) can also have an effect on individualism in society (Putnam, 2000). The findings from this study would appear to bring the discussion on individualism to a new level. Whereas de Tocqueville (1966) held that individualism led to a retreat among family and close friends (i.e. nucleation of networks), and Putnam (2000) made a similar claim with the television and staying in instead of going out to interact with others, the cell phone would appear to remove the human element from the equation altogether. As we found among experimental group members, in some cases there was not only an individual focus on the test, but also a feeling that interactions with other group members were unnecessary. Looking at how cell phones were used in experimental groups, mainly for Internet access and no instances of reaching out to existing contacts/network members, it would appear that there is a “hyper-individualism” at play when it comes to cell phone use in group settings. If groups members do not need to have human interactions to complete a task (and feel confident about it), then it would appear that cell phones have the ability to play the role of network members. Therefore, instead of “[withdrawing] into the circle of family and friends...” (de Tocqueville, 1966, p. 506), individuals in a position such as the one in this study would appear to withdraw into the device itself, which is a level of individualism that past theorist may not have anticipated.

The pattern of using a cell phone as a group member, instead of engaging in interactions with new acquaintances, may add to our understanding of group interactions when viewed through the lens of George Simmel's work on dyads and triads. When looking at how groups (especially small groups) interact with one another, the differences between dyads (two people) and triads (three people) boil down to the complexity of relationships and exchanges that can take place. In a dyad, there is only one possible interaction that can occur, which has the tendency to lead to closer and more intimate relationships whose interactions are more intense (Simmel, 1950; Rohall, Milkie & Lucas, 2011). Simmel also suggests that dyads tend to "presuppose a greater individualization of their members than larger groups do" (1950, p. 137), due to the fact that there is no possibility of a majority which could overrule the individual's position, idea, etc. With the formation of a triad, there are more options for interactions, as well as the potential for larger social structures to develop, while at the same time the relationship between the two original dyadic members can be made stronger (Simmel, 1950; Rohall, Milkie & Lucas, 2011). And so, with a dyadic relationship, there is more chance for close interaction and interactions/help which can take place more quickly and easily and also the possibility of more individualism, while in a triad it may be more difficult for interactions to occur but there is also a greater diversity of options and a necessity of working together.

The important aspect of Simmel's work, as it relates to the findings from this study, is the resistance of dyads to the addition of third members. Simmel points to several factors which suggest that having two closely intertwined group members might

make it difficult to develop into a larger structure, or to encounter those situations for which a triad (or larger group) is better suited to handle:

The sociological structure of the dyad is characterized by two phenomena that are absent from it. One is the intensification of relation by a third element, or by a social framework that transcends both members of the dyad. The other is any disturbance and distraction of pure and immediate reciprocity... the feeling of exclusive dependence upon one another and of hopelessness that cohesion might come from anywhere but immediate interaction. Likewise, they carefully avoid many disturbances and dangers into which confidence in a third party and in the triad itself might lead the two. (Simmel, 1950, p. 136).

This passage suggests that the ease of the interactions between two group members, and the immediate gratification which arises from these interactions, make a dyad less likely to reach outside of its borders in order to incorporate new members. The aspect of immediate interaction is very interesting, as this would appear to be the case with cell phones in the experimental groups in the current study.

As we have already seen, there was a higher degree of confidence among experimental group members when it came to the answers which they generated via their cell phones. Furthermore, the speed of being able to generate a “correct” answer relates to feelings of not needing to interact with other group members. As such, it might be that an individual interacting with their cell phone composes a dyad of sorts, with a close and immediately gratifying relationship. If this is the case, then the addition of a second person into the mix would actually be more like the addition of a third group member. This may help to explain some of the difficulty that group members had in breaking the ice when cell phones were used during the testing period. There are many examples from our daily lives that might help to better illustrate the importance of considering a cell phone user as a dyadic relationship. For instance, I was recently waiting for a presentation to start at an academic conference, along with several others in small seating



area. While waiting, one of the group members struck up a conversation with me (just small talk to pass the time), while the other sat in silence tapping on the screen of a smart phone. I was tempted to ask this person a question (where are you from?), but felt as though I would be interrupting whatever it was that he was doing at the time. I am sure that we can all recall some experience like this, where interacting with an individual on a cell phone felt like it would be an interruption. In these cases, it would appear that we are the third members who are having difficulty getting into an interaction with an existing dyadic relationship. Viewed through this lens, it seems that the increased individualism that comes along with the use of cell phones is a deterrent to interaction because those things which one might need from an interaction with another human are already being fulfilled.

This is not to say that this degree of individualism is likely to arise whenever a cell phone is used. Indeed, in this study there was group interaction (and a desire for such interaction) among those who used cell phones, as well as a hesitance towards group interactions (i.e. initial individualism) among many control group members. Despite a desire to work more with others in the group, the fact that interactions were so brief and limited in quantity suggests that cell phones have the tendency to override a group focus. The findings from this study also suggest that using cell phones allows one to sate the hesitance to interact with others, and thus to withdraw into their own individual pursuits at almost any location or occasion (due to the mobile nature of cell phones). The use of cell phones in this regard suggests a “security blanket” instead of an “umbilical cord” to existing network members (Ling, 2008; Paragas, 2009) when it comes to interacting with potential new connections in our daily lives. Whether it’s at the grocery store, in a newly

established work group, or walking down the hallways of a university, we are likely to find the ever present digital companion to be a comfort, allowing us to exist within our own interests and pursuits. Even when we encounter situations in which calling upon others for aid would be beneficial, such as finding directions or answering a question, there is likely “an app for that” (or access to the Internet), which can offer help in a quick and easy manner without requiring an interaction with others in the setting.

The implication of this type of self-reliance and individualization may carry over into the diversity of network connections which are developed in the presence and absence of cell phone use. With the decreased likelihood of engaging in first contact and calling upon unknown others for aid, cell phone would appear to relate negatively with network diversity, due simply to a lower amount of overall interactions. However, there are other aspects of cell phone use and interactions which suggest a reduced possibility of interacting with “unlike” others. As was noted in our discussion of demographics in Chapters 4 and 5, it is possible that those in majority groups (males in particular) may have felt a greater sense of individualism when working on the test along with cell phones, which may have limited their likelihood of interacting with others in general. When we couple this tendency with social interaction theory, which suggests a reduced likelihood of interacting with those who are unlike in some way, as well as the finding that confidence in answers may play the role of a security blanket in the presence of unknown others, it would appear that there is a decreased chance of interacting with a diversity of others when it comes to group settings. When cell phones were not used, this possibility of individualism (or not interacting with others in the group) wasn’t really an option. In this regard, group members had to overcome the barriers to interacting with a

diversity of others out of necessity, whereas their cell phone using counterparts did not have this force at play in their interactions (or lack thereof).

These results seem to suggest that cell phone use relates to a potential decrease in network diversity. This is interesting, especially when considering the literature which indicates that use of cell phones tends to offer a greater potential for interacting with a wide variety network contacts. However, when looking back to the second chapter and our discussion of network diversity, it becomes clear that much of this work is looking at existing social networks. For instance, Campbell and Kwak (2011) suggest that cell phone based discussions have the potential to expand one's public sphere when an existing network is already strong and diverse. What we may be seeing then, is another side to the relationship between cell phone use and network diversity emerging, with potential limits to the diversity of new network members/contacts when interactions are carried out in the presence of cell phone use. This pattern would seem to indicate a benefit of looking at social capital formation, with an experimental design, as opposed to studying existing networks or existing social capital, and further research will surely be needed in order to more fully parse out the differences between the impact of cell phones in both types of approaches.

The large scale implications of cell phone use, individualism, the decreased likelihood of interactions, and limits to the diversity of new network contacts extend into the importance of social capital in society itself. We have seen that social capital plays an important role in the development of community and even when it comes to such actions as social movements, which require the interaction of a diverse coalition of members who bring an array of resources to play in helping achieve shared goals

(Putnam, 2000; Coleman, 2000; McAdam, 1999). If cell phones negatively affect the amount and diversity of interactions which take place among group members, then it is possible that the formation of networks on a larger scale (such as a social movement) might not be as strong as is needed in order to fully realize a collective goal. Add to this the tendency towards individualism that is associated with use of a cell phone, and it becomes difficult to imagine an effective network being created towards some end when cell phone is a major element in group interactions. In a society which tends towards individualism already, such as was argued about the United States and its democratic structure by de Tocqueville in his observations during the 1800s, it would seem that the large scale possibility of cell phones having a negative effect on interactions might be amplified throughout an entire population.

At the same time, it is difficult to fathom an entire network being created based on cell phone use and communication. And, indeed, most of us bring an existing social network to bear on whatever task we may find ourselves involved in. However, if we consider the daily use of cell phones which could serve to limit reaching out and making new and meaningful network connections, then who knows how many opportunities for involvement in things like social movements, or community building interactions, we pass up on a regular basis. In the end then, the negative effects of cell phone use on interactions and calling upon others for aid may compound over time and thus have the potential to impact the formation of social capital and in turn the larger scale social processes which are of interest to a sociological understanding of our world.

Along with the implications for our theoretical understanding of social capital, the patterns of interactions in the presence and absence of cell phones may also help in our

conceptualization of the technology itself. At the beginning of this study, we considered the popular conception of cell phones as a “social” technology, which can allow for a broader range of interactions not tethered by physical location. This view, in which cell phones allow users to be more social, comes up time and again even in sociological considerations of the technology, as Mary Chayko demonstrates in a discussion of the role of digital technology in society:

Mobile media use allows contact and connectedness to occur nearly anytime, any place; people can be available to one another much of the time and engage in frequent interactions that make the relationship harder and more likely to be continued face-to-face (2017, p. 12).

Despite this popular conception, the results of this study suggest that, at least to some degree, cell phones may actually make individuals less social. In this regard, cell phones may have more in common with computers and the view of “anti-social” tendencies which accompany their use, such as the “net-nerd” who shuns interactions with others face-to-face in favor of the virtual world (Gershuny, 2002).

As was observed in experimental groups, the main (and only) use of cell phones during the testing period was to access the Internet in search of answers. As such, this research is as much about the Internet as it is about cell phone use. Mobile access to the Internet encompasses a large amount of what Americans use their phones for, with some 89% of smartphone users accessing the Internet on a regular basis via their phones (Anderson, 2015). This would seem to suggest that cell phones are increasingly utilized as computing platforms, not just as devices for contacting existing network relations (though with Internet based social media, such as Facebook, Twitter, and Snap Chat, this use could indeed involve interpersonal communication). Given this use and its relationship with fewer interactions, it might be advantageous to conceptualize cell

phones, at least in part, as a less than social technology. This may involve re-thinking much of what we “know” about cell phones, from inherently social to potentially anti-social. This approach, which was demonstrated in the research by Misra, Cheng, Genevie and Yuan (2014), and Przybylski and Weinstein (2013), looking at the presence of cell phones and the effects on interactions in small groups, would seem to hold a great deal of promise as an avenue for theory and research. Such a reconceptualization of cell phones then would surely have an impact on how we approach theory and research related to cell phone use, and thus would help to leave the door open for more critical work in regards to the social impact of this technology and others which develop in the future. Along these lines, we also need to explore the larger scale implications of cell phone use on the norms of trust and reciprocity.

#### Lasting Impressions? Cell Phone Use, Trust and Reciprocity

The connections and interactions which compose networks are only one aspect of social capital, and indeed these interactions would be empty endeavors if it were not for the associated norms of trust and reciprocity which help pave the way for meaningful and lasting interactions. The results from this study suggest that both trust and reciprocity are present when cell phones are used and when they are not, though it would appear that there are differences in the types of trust and reciprocity that develop. As such, it is possible that the impacts on social capital formation and other processes in our social lives are of different forms when it comes to the presence and absence of cell phone use.

When it comes to trust, we have found that there were higher levels of trust in the information that came from other group members when phones were used, and what

would appear to be greater trust in other group members themselves when cell phones were not used. We have seen that in the absence of cell phone use, individuals were more likely to open up to the rest of the group, and work together in order to arrive at an answer that everyone could agree upon. And while this high level of trust was not reported in all control groups, perhaps due to less confidence in the answers which were generated as discussed in chapter five, there was clearly a difference when compared to the trust which existed when cell phones were used. Under these circumstances, there may have been an elevated sense of trust in others due to the quick and easy manner by which “correct” answers were generated. In other words, it would appear that trust in cell phone generated information made members feel that they could trust other group members. The interesting aspect here, is that with similar levels of trust in fellow group members reported both when there were higher and lower levels of interaction (i.e. when cell phones were and were not used), it is possible that there were different types of trust at play in experimental and control groups, with a more “surface level” trust at play in the presence of cell phones and perhaps a more in-depth sense of trust in control groups.

Another aspect of trust in the presence of cell phone use, and a reduction in the necessity of interacting with other group members, is that developing a sense of trust might not be necessary. In other words, if one does not need to actually interact with those around them, what is the draw for building a sense of trust in the group, or in other areas of social life? When it comes to the formation of social capital, and the important role of interacting with a diversity of others, it would appear that both the need to interact with others and the desire to form a sense of trust (and thus build meaningful relationships) with strangers is reduced when cell phones are used. As such, cell phone

use seems to have a negative effect on the formation of new network connections and perhaps even the practice of social capital in existing networks. Take for instance the finding that a trust in the answers provided by others via cell phone use, and a confidence in one's own cell phone generated answers, seems to reduce the likelihood of critical discourse among group members. The importance of critical discourse, and even the possibility of argumentation, has been shown to be an important part of building community and the public sphere, as laid out in Habermas's work on communicative action (1987; 1984).

With communicative action, Habermas suggests that deliberation and even arguments among individuals are necessary in order to advance and develop political and social structures. For instance, Habermas (1987; 1984) argues that the discourse which took place in public areas (such as coffee houses) prior to political revolutions in nineteenth century Europe were vital to the movements which resulted. Some have argued that the advent of the digital age has opened up more possibilities for such a public sphere to emerge (Boeder, 2005). However, the results from this study seem to suggest that when cell phones are used alongside interactions, the critical discussion and debate which is vital to the public sphere might be supplanted by quick and easy interactions (the results of which are trusted and are thus less likely to spur on critical discussion). As such, the effects of cell phone use on the trust which accompanies interactions would appear to have implications beyond just work which takes place in small group settings.

As with trust, two different types of reciprocity appear to be at play in the presence and absence of cell phone use. With similar levels of reciprocity being reported,



despite major differences in the type and amount of interaction, there seem to be two ways in which to interpret this findings. First, we could say that cell phones must make it easier for reciprocity to form, without a need for as much interaction, and thus cell phones may be replacing outdated forms of reciprocity creation. Second, we can accept that cell phones make it easier for reciprocity to form (or at least to be felt), but that the help which one can expect might only be “skin deep” and along the lines of quick and easy assistance, as opposed to a more meaningful and enduring sense of reciprocity. The findings from this study seem to suggest this second interpretation, with a tendency towards a more superficial sense of reciprocity when cell phones are used in group interactions. As we saw in our discussion of the one-person/one-cell phone dyad above, the presence of immediate reciprocity via cell phone use could have bled over into immediate and easy reciprocity among experimental group members, leaving them with the feeling that they would be helped quickly (and with little effort) when help was needed.

However, this type of reciprocity, while perhaps effective in the experimental design herein, may not be as effective in other settings and situations. If, for instance, the reciprocity which exists between group members is of the “quick and easy” typology, then what happens when help is needed which goes beyond what can be accomplished in this. We did find instances of this taking place in experimental groups, with group members coming to the table with two different answers for the same question. In these case, there was the tendency to turn back to individual work (looking it up again), which is not surprising given the individual focus of experimental groups and the confidence of those answers which one looked up by themselves. Taken along with tendency towards

less critical discussion, it would appear that when cell phones are used during interactions, then help is less likely to be given in the first place, let alone reciprocated later on.

Another aspect of reciprocity which has been shown to be important in social capital, is the idea of generalized reciprocity, in which help is given but a specific return is not expected. Instead, and this is an element of community building, there is an expectation of a more general help “down the road” (Putnam, 2000). It is this sense of working together that is important in order to develop lasting and meaningful type of social capital. As we have seen thus far, with less of a group focus and a reduced likelihood of working together in an in-depth manner, it is difficult to imagine a sense of generalized reciprocity developing out of group interactions when cell phones are used. Along the lines of reduction in interactions in the first place, these findings also seem to suggest a trend in “passing the buck” of responsibility when it comes to giving aid. For instance, looking back to the example of the young couple whose car had broken down (as discussed at the beginning of this paper), there was a moment when I almost didn’t approach to ask if help was needed, given that they both had cell phones and thus could access help by themselves.

This quick and easy help seems to be the new norm of reciprocity in the digital age. When someone needs help, what do we ask them other than “do you need a cell phone”? The idea here, is that simply being able to offer the quickest and easiest form of help is the norm when cell phone use is a possibility. In other words, when we feel that that everyone should be able to solve the problems themselves, using their existing networks and informational resources, why should we offer them more substantial help in

the first place? This sense of individualism, and expecting others to be able to “do it themselves,” would seem to cut into a more meaningful and lasting form of reciprocity among group members. This is an important revelation, given the importance of generalized reciprocity when it comes to such things as community support and collective action, especially since help is more likely to be given (and thus social capital practiced) when members of a network feel as though help will be returned in some way. If the only help which group members feel will be reciprocated (or are willing to engage in) is that which is quick and easy, then it would seem less likely that individuals will come together in order to solve problems, form movements or even just help one another in their day to day lives. When coupled with the decreased likelihood of interactions, and the trust in technology rather than other people themselves, it appears that cell phones can have an impact on all aspects of the formation of social capital and potentially even its use within networks down the line.

#### Interaction Quality and Information Sharing

The findings from this study appear to support the previous literature in regards to the importance of both interaction quality and the predictors of information sharing when it comes to a positive influence on the formation of social capital. As was demonstrated in past studies, having greater feelings of togetherness, having greater willingness of group members to engage in problem solving, and having accessible group members relate positively with the quantity of interactions as well as the norms of trust and reciprocity among group members (Cross & Borgatti, 2004; Van den Hooff, De Ridder & Aukema, 2004). This pattern held in the presence and absence of cell phone use, thus

these factors would appear to play an important role in social capital formation regardless of the situation in which it occurs. As for interaction quality, a similar pattern was found in this study, with a positive relationship with the elements of social capital formation both in the presence and absence of cell phone use. As predicted by previous literature, it would seem that the quality of interactions which take place does indeed positively affect the formation of social capital (Misra, et al., 2014; Przybylski & Weinstein, 2013). We have also found that the quality of interactions, and the predictors of information sharing, have the tendency to mitigate the negative effects of cell phone use on the formation of social capital. For example, when an individual has a more individual focus within a group, they are less likely to interact with others and to form a meaningful sense of trust and reciprocity. However, if the other group members are actively engaging in interactions which are of a higher quality, and are willing to work with others, then the individual who might otherwise not interact with the group is more likely to be drawn in to the fold.

This mediating effect of interaction quality and the predictors of information sharing would seem to suggest that balance could be found in which cell phones might actually have a positive impact on the formation of social capital. And indeed there were instances in experimental groups in which cell phone use coincided with a delegation of the task and a high degree of deliberation among group members. In these instances, there was interaction between group members right off the bat, and it would seem that cell phones added to the ease and efficiency of completing the test, as opposed to setting the tone of the interactions. There were also instances of control groups which had interactions of lower quality and appeared to get less out of the interactions in general

(which would show the flip side of the positive relationship between these factors and social capital formation). However, these instances would appear to be exceptions to the typical pattern among experimental and control groups, which suggests that finding such a balance between quality interactions, group member engagement, and cell phone is not the norm in a group setting. Indeed, when we consider the extended periods of silence and difficulty in breaking the ice to begin interactions when cell phones were used, it would seem that the individual focus associated with cell phone use sets the scales against findings such a balance. This indicates that cell phones, as a tool, can be used in a fashion which is favorable to the formation of social capital, but that they are more likely to be used in such a way (or perhaps they have a “natural” tendency towards individualism) as to have more of a negative effect, despite other factors which are at play.

The findings of no difference between experimental and control groups when it comes to levels of reported quality and predictors of information sharing could indicate that cell phones have no effect on the formation of these factors. However, as we have seen, it is more likely that there are two different types of these factors at play in the presence and absence of cell phone use, especially when it comes to interaction quality. As a perception, however, we know that interaction quality affects the formation of social capital regardless of cell phone use (though there are differences in the strength and significance of these relationships between groups), and so despite any differences which may exist, the effects are real. This pattern seems to relate with the social construction of reality, in that the quality of interactions appears to be real for those engaged in the interactions and therefore it is real in its effects (Berger & Luckmann, 1991). As such,

we cannot simply dismiss the responses which indicated high levels of trust despite a small amount of limited interaction. Instead, we have to consider that even in these cases (more common along with cell phone use), a sense of quality interactions led to a greater likelihood of social capital formation.

However, if there was not a great deal of interaction, and if some of the reported quality was confounded with confidence and efficiency in the answers provided by others (which seems to be the case when considering experimental groups), then there might not be much substance behind the “quality” of these interactions, or behind the social capital which is formed as a result. As a theoretical implication, this pattern would seem to be yet another instance of cell phones “inflating” the interactions which take place alongside their use. As such, when conceptualizing cell phone use as it affects other social phenomenon, it would seem important to consider that the “actual” effects and “perceived” effects may differ, and that the perceived effects may be greater than the actual effects in regards to real-world outcomes. This possibility will need to be explored further in future research, along with other theoretical patterns and implications which this study brings to light. And it is to these prospects for future research that we turn our attention to now.

### Limitations and Directions for Future Research

#### Limitations

There are several limitations to this study, affecting both its scope and the measurement of concepts, which temper our interpretation of the findings and also offer areas of improvement for future research into this area of interest. The first major

limitation deals with the sample used for the study. As we discussed in the second chapter, the sample was drawn from the undergraduate population of a Midwestern university. As such, there are limits to how much we are able to generalize the findings of the experimental method. For instance, when it comes to the age of respondents, the sample was very homogenous in its composition (all from the “millennial” generation); therefore, we are unable to say with certainty that the patterns which were found in this study could be generalized to other generations or to a population other than college students. This is surely a limitation of the study, though we may actually have findings which suggest what the results could look like if a larger and more representative sample was utilized. We found, for example, that group members may be less likely to interact with “unlike” others, and if we were to have groups which were more diverse in regards to age or generational divides, then perhaps there would be more barriers to interaction right off the bat, and thus a greater potential that participants might turn to cell phones and an individual focus during the group task.

It is also possible, given the makeup of the sample, that the college student participants were somehow less likely to interact with one another in general. I admit that I am less inclined to follow this line of reasoning which places the burden of causality on the younger generation itself (such as “millennials are less likely to interact face-to-face” and so on). And while my reasons for this may be anecdotal, based on my day to day observations of those in other generational groups (Gen-X, Baby Boomers, etc.) suggesting that cell phone use and individualization is likely more widespread across age groups than such an argument would entail. However, differences in interactions and cell phone use across age groups is a possibility and, as such, future

studies on cell phone use and social capital (or other related topics) might want to employ stratified sampling in order to ensure that different age groups are represented. It might also be worthwhile to control for differences in interactions by assigning those of different ages to separate groups, and also groups which are composed of a mix of ages. In this way, the effects of age and group diversity on interactions and cell phone use could be more fully explored. However, this lack of representativeness with the larger population might not be that great of a limitation when we consider that in this study we utilized an original methodology, and as such one of our main goals is to lay the groundwork for future iterations. As such, even if we aren't able to draw conclusions as to the impact of cell phones on social capital formation on the large scale, we have still found interesting patterns and results which can be explored and expanded upon at a later date.

Another limitation of this study comes down to the operationalization of variables in the survey instrument. As we have seen throughout the analysis and discussion, there appear to be differences in the types of trust, reciprocity, interaction quality, and even interactions which took place and developed in experimental and control groups. However, the indicators of these variables on the survey instrument did not seem to fully capture these differences, aside from the trust variable, though even in this case more indicators of the two types of trust would have been beneficial. While it was fortunate that we had qualitative observations with which to better understand these differences, future studies should consider using (and developing) batteries of indicator questions which more accurately tap into the dimensions of these variables.



While the mixed methods approach to this study was beneficial in being able to compensate for the shortcomings of any one method (as we see when it comes to elaborating on the survey responses), there was also a potential limitation to this study with the qualitative observations as well. Given the limits to the literature surrounding cell phone use and its relation to social capital, much of this study was exploratory in nature, with results paving the way for future exploration and empirical research into this relationship. As such, my approach to making observations during the experimental periods was to observe as much as possible right off the bat and focus in on certain aspects that appeared to be of importance during the course of the data collection. As we have seen, there were several unique and interesting patterns which emerged from these observations. However, give the omnibus approach to the observations, it is likely that those patterns which were focused on more towards the end were not as well noted in the beginning, and therefore the evidence for them is limited. For instance, nearly half-way through the data collection period I began asking questions in the focus groups regarding individual and group focus on the test. While we were able to establish a pattern in regards to individual and group focus between the different groups, it is possible that more evidence could have been found in the earlier groups to whom the question was not posed. Despite this shortcoming, the results from this study do appear to indicate several important areas to focus observations in future research, especially when it comes to group/individual focus, initial periods of silence, and different types of trust, reciprocity and interaction quality.

## Future Research

As we have seen, the limitations of this study suggest areas of interest and methodological choices which could be beneficial to future research into the relationship between cell phone use and social capital formation. Along with these suggestions, there are several other suggestions for future research which come out of both the results and the methods which from this study. Approaching this study with a variety of methods (within the experimental framework) was a definite benefit, in terms of triangulation and the strengths from both quantitative and qualitative methods coming to bear on the same research questions and hypotheses. While the quantitative results allow us to gauge the scale of the effects of cell phone use, the qualitative results play a vital role in understanding what the relationships actually looked like and what they may mean in the larger theoretical context. Given the benefits of both the quantitative and qualitative methods, future research should continue to use a mixed methods approach when examining the complex nature of the relationship between cell phone use and social capital. There were also benefits of using an experimental method, an approach which was less than conventional when viewed in the context of modern sociological research. The experimental method has given us the ability to actually discuss cause and effect relationships by eliminating other extraneous variables from the setting in which group interactions took place. Because of this, using an experimental design (or modifying the existing design) in future research would seem to be a good way to uncover more about this relationship and perhaps others which involve the impacts of technology on social processes.

In selecting the best method for this study, there were many options. Many existing studies of social capital have focused on existing networks, and that could have been a possibility in this study as well. In this way, we could have counted network connections or examined the dispersal of existing networks, and compared this to amounts or types of cell phone use among respondents. However, for our purposes here, it was decided that looking at the formation of social capital via an experimental method was the best option. The method as used in this study allows us to see beyond just a count of network connections. As we have seen, the amount and types of interactions which take place among newly formed groups are very important in understanding the impact of cell phones on social capital. Had we utilized a more conventional method to study existing social capital, it is unlikely that we would have been able to gauge the effects of cell phones, and it is possible that the effects would have been more positive in directionality. Overall, then, the results from this study suggest that looking at the formation of social capital (as opposed to existing social capital) is a fruitful ground for further research, especially when it comes to gauging the effects of something like cell phones. As such, future research into the relationship between social capital and cell phone use should consider looking at social capital formation, and doing so with experimental methods so as to be able to gauge the actual effects of cell phone use.

As we saw in the discussion of limitation above, there are some potential changes which should be made to the methods used in this study when it comes to future research. Although selecting a more representative sample and using better developed measures of such factors as trust and reciprocity would have definite benefits, there are other changes which could be made to the experimental method which could help with a larger scale

understanding of cell phones and social capital. For instance, as we have seen in the theoretical discussions in this chapter, there were limits to our ability to say that the social capital which formed (or was likely to form) was meaningful or likely to last down the road. Because of this limitation, it might be beneficial for future studies to take a more longitudinal approach to the experimental design. The task itself could be drawn out over a longer period, perhaps with the same groups meeting several times over the course of the study. In this way, the actual development of things like trust and reciprocity could be assessed among the group members. Future studies could also follow up with research participants in order to see if any of the interactions they had during the testing period had lasting impressions on them or even added to their social networks in some way. In these ways, we might be able to capture any lasting effects (or lack thereof) of the social capital which is formed in the presence or absence of cell phone use. Ultimately, the experimental design used in this study shows promise for future research, and can surely be adapted and used in a number of different permutations in order to tease out various aspects of both cell phone use and social capital formation.

### Conclusion

We set out in this study to better understand how cell phone use affects the formation of social capital among members of small groups, with a focus on three main dimensions of social capital: calling upon others for aid, and the norms of trust and reciprocity among group members. With a rift in the previous research on this subject, as to whether cell phone use has positive or negative effects on social capital formation (and a general lack of research into this relationship), this study aimed to fill in a gap in our

understanding of an important aspect of our social world. Utilizing an experimental research design, with both qualitative and quantitative methods of data collection, the results from this study were able to both lay out the directionality of the relationship between cell phone use and social capital formation, and to build an understanding of the relationship as it took place in the interactions between group members. The results from this study suggest that the impact of cell phone use on the formation of social capital tends to take a negative form, with decreased levels of interaction between group members and differences between the types of interactions which take place in the presence and absence of cell phone use. When cell phones were not used, interactions involved more deliberation among group members, and when cell phones were used the interactions were brief and tended not to involve a critical discussion among group members. Along with an increased level of individualism among those who used cell phones, and a decreased necessity of interacting with other, we see that cell phones appear to have a negative effect on the interactions which take place between group members. In this regard, the question of how cell phone use affects social capital formation would appear to be answered in a rather straight forward manner, especially since interactions (calling upon others for aid) play a central role in the formation of social capital (Coleman, 1990). These findings would seem to fall in line with the theoretical camp which holds that cell phones have a negative impact on interactions and network diversity, and thus a negative effect on the formation of social capital.

When it came to the other two dimensions of social capital - trust and reciprocity - the effects of cell phone use were not as straight forward. With trust, we found a significant difference between groups, though only when it came to trust in the

information supplied by other group members. With higher levels of trust in information among those who used cell phones, but not trust in other group members themselves, it would appear that trust was focused on the technology instead of the individuals who were using the technology. The lack of a significant direct relationship between higher levels of cell phone use and feelings of trust also appears to suggest that the presence of cell phones, rather than how much they are used, has an impact on trust. We also find that this trust in cell phones appears to decrease the necessity of interacting with other group members and, as such, indicates a negative impact on the potential for the formation of social capital. With reciprocity, a similar “different types” pattern was found in experimental and control groups. With no significant differences between the groups, and no significant direct effect of higher levels of cell phones use, there would appear to be no effects from cell phone use on perceived reciprocity. However, with different amounts and types of interactions taking place among group members in the presence and absence of cell phones it would seem unlikely that the reciprocity which results from, and aids in, the interactions is the same in both group types. Overall then, in regards to the main research question, it would appear that cell phones tend to have a negative impact on the formation of social capital. However, while the social capital which is likely to form in the presence of cell phone appears to be more “superficial” and perhaps not as meaningful, it would also appear that those within the groups did not experience this through their own perceptions. As it plays out in the theory of social capital, cell phones as a negative force (and such a widespread force throughout modern society), would appear to suggest that there could be wide spread impacts in many

different aspects of social life, from group work to community building and even social movements.

This study also looked at the impacts of cell phones on the quality of group interactions and the predictors of information sharing in groups (feelings of togetherness, a willingness to engage with others, and accessibility of group members), and the effects of these factors on social capital formation. We find that there is a positive relationship between these factors and the formation of social capital both in the presence and absence of cell phone use. This falls in line with previous theory, and suggests that interaction quality and the predictors of information sharing play an important role when it comes to social capital. We also find that these factors play a moderating effect on the negative influence of cell phone use on the formation of social capital. However, with similar levels of these factors reported in both experimental and control groups (despite observations which suggest that they were actually at lower level, such as the reluctance of group members to engage in conversation initially), it seems that once again cell phones have the tendency to make individual feel good about group interactions (and subsequent formations of social capital) despite a lower level of interaction.

This pattern is further illustrated when considering how participants did on the testing instrument which comprised the group task, and how well they felt about their accomplishment after the fact. We found that when cell phones were used, we found much higher scores on the test, and also greater feelings of accomplishment. However, we also found that cell phones did not provide one hundred percent accuracy, and in those cases that it didn't, there was less likelihood of critical discussion among group members. These findings ultimately may indicate that there is a definite individualism

associated with cell phone use, which gives confidence to its users and allows them to feel more secure in the face of new situations. And as such, it would appear that cell phones act as a type of safety blanket which reduces the need for interactions and the formation of trust and reciprocity with others in our surroundings, and thus a decrease the likelihood of social capital forming.

In the end, we must turn back to the beginning of our empirical and theoretical journey with this study, and once again consider the cell phone as a tool in our social lives. On the one hand, we have a popular conception and empirical work which seems to suggest that, as a tool for communication, cell phones have a great potential to reinforce existing networks and social capital, and perhaps even aid in the creation of new network connections. On the other hand, the results from this study are in line with previous research which suggests that cell phone use may hamper the formation of new network connections and social capital (Przybylski & Weinstein, 2013; Misra, et al., 2014; Ling, 2008; Turkle, 2012; Castells, 2000; Hampton, Goulet & Albanesius, 2014; Jin & Park, 2012; Kobayashi & Boase, 2014). Furthermore, this study suggests that, as a tool, cell phones have the tendency to steer users into a more individualistic path by offering an alternative to calling upon other for aid in the first place. And it is this reduction of the need for interactions which is perhaps the biggest effect of cell phones on the formation of social capital, given the central role that interpersonal interactions and relationships play in this social process.

This pattern is summed up in words of the iconic 1980s action hero, Angus MacGyver, who said: “A good relationship is a lot like a car. If you want it to work smoothly, you gotta put a lot of work into it, and have the right tools” (Anderson, 1986).



In other words, in order to have relationships which work for us (i.e., social capital), we must be able to put the work into forming meaningful and lasting relationships in the first place; and tools which can help in this formation of relationships would also seem to be highly desirable. However, what we have found in this study seems to suggest that, while we have the tools which can positively affect social capital and its formation, these same tools tend to make us less likely to put in the work which is necessary to form meaningful social capital via a diversity of network connections in the first place. And if the effort is less likely to be put into the formation of these network connections, then the other aspects of social capital (i.e., trust and reciprocity) would seem to be less important as well. Perhaps the biggest take away from this study is the fact that, when examined through a critical lens, the effects of cell phone use do not fall in line with a more utopian view. As such, as we move into the future, in which cell phones (and whatever replaces them down the line) will no doubt continue to play a major role in our daily lives, we must be willing question the status quo of these technologies as they impact our social lives. This questioning is especially prudent when it comes to something as important as social capital and being able to call upon one another for aid, as we will all have to do at some point in our lives.

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APPENDIX A

Human Subjects Institutional Review Board Approval and  
Informed Consent Form

## WESTERN MICHIGAN UNIVERSITY



Human Subjects Institutional Review Board

Date: October 6, 2015

To: Whitney DeCamp, Principal Investigator  
Simon Purdy, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 15-09-29

This letter will serve as confirmation that your research project titled “Can You Help Me Now? The Effects of Cell Phone Use on Social Capital Formation in a Group Setting” has been **approved** under the **expedited** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., ***you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study.”*** Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

**Reapproval of the project is required if it extends beyond the termination date stated below.**

The Board wishes you success in the pursuit of your research goals.

**Approval Termination:**

**October 5, 2016**

1903 W. Michigan Ave., Kalamazoo, MI 49008-5456

PHONE: (269) 387-8293 FAX: (269) 387-8276

CAMPUS SITE: 251 W. Walwood Hall

## WESTERN MICHIGAN UNIVERSITY



Human Subjects Institutional Review Board

Date: October 28, 2015

To: Whitney DeCamp, Principal Investigator  
Simon Purdy, Student Investigator for dissertation  
Student Investigators: Katherine Brown, Ryan Castillo, Anthony Frontiera,  
Brian Lunn

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 15-09-29

This letter will serve as confirmation that the changes to your research project titled "Can You Help Me Now? The Effects of Cell Phone Use on Social Capital Formation in a Group Setting" requested in your memo received October 28, 2015 (to add student investigators Katherine Brown, Ryan Castillo, Anthony Frontiera, and Brian Lunn, and to add revise survey instrument) have been approved by the Human Subjects Institutional Review Board.

The conditions and the duration of this approval are specified in the Policies of Western Michigan University.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

**Approval Termination: October 5, 2016**

1903 W. Michigan Ave., Kalamazoo, MI 49008-5456  
PHONE: (269) 387-8293 FAX: (269) 387-8276  
CAMPUS SITE: 251 W. Walwood Hall

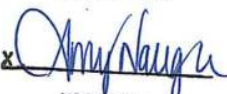


Western Michigan University  
H.S.I.R.B.  
Approved for use for one year from this date:

Western Michigan University  
Department of Sociology

Informed Consent Form

OCT 06 2015

x   
HSIRB Office

**Principal Investigator:** Simon J. Purdy  
**Title of Study:** Knowledge Acquisition in Group Settings

You have been invited to participate in a research project titled "*Knowledge Acquisition in Group Settings*". This project will serve as Simon J. Purdy's dissertation project for the requirements of the Ph.D. in Sociology at Western Michigan University. This consent document will explain the purpose of this research project and will go over all of the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

We would like to invite you to participate in a research study on knowledge acquisition in group settings, conducted on the campus of Western Michigan University. Participation in this study involves completing a task in a group, a general knowledge test. You will be asked to complete this test to the best of your ability, using all of the resources available to you (including group members). After the task, you will be asked to fill out a brief survey, and discuss your experiences as part of a debriefing procedure, during which time you will be able to share questions or concerns you may have with the study. The results of this project may help us to better understand the ways in which groups operate in order to share information and complete tasks. You have been selected to participate based on your interest in the study, and your availability for this time period as discussed with the principal investigator.

Your role in this project should take no more than one hour to complete. The experimental process you will be involved in is voluntary and you are free to stop participating at any time. Other than your time commitment, there are no costs involved with participating in this study. You will not be compensated for participating in this study, and should you decide to stop participating this will not change.

We will keep all responses you give to us confidential, and your identifying information will never be connected to any information or data collected from you during this study. Only the principal investigator will have access to the final dataset. Future studies and uses may necessitate sharing of the data with other approved researchers, however only datasets without any identifying information will be shared. No one will learn your personal responses.

You can choose to stop participating in the study at any time and for any reason. You will not suffer any prejudice or penalty by your decision to stop your participation. You will experience NO consequences either academically or personally if you choose to withdraw from this study. During this study, you may be asked not to use your cellular phone or other electronic communications devices. If you need to use any of these devices to receive or make important phone calls, text messages, etc. you will be able to do so by stepping outside of the research room.

Western Michigan University  
H.S.I.R.B.  
Approved for use for one year from this date:

OCT 06 2015



HSIRB Office

Should you have any questions prior to or during the study, you can contact the primary investigator, Simon Purdy at (517) 974-9860 or [simon.j.purdy@wmich.edu](mailto:simon.j.purdy@wmich.edu), or the research advisor, Dr. Whitney DeCamp at (269) 387-3597 or [whitney.decamp@wmich.edu](mailto:whitney.decamp@wmich.edu). You may also contact the Chair of the Human Subjects Institutional Review Board at (269) 387-8293 or the Vice President for Research at (269) 387-8298 if questions or problems arise during the course of the study.

This consent has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

-----  
I have read this informed consent document. The risks and benefits have been explained to me. I agree to take part in this study. If you agree with these statements, please sign and date below before beginning the study.

\_\_\_\_\_  
Please Print Your Name

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

APPENDIX B

Data Collection Materials

General Knowledge Test for Group Members

**Please answer the following questions to the best of your ability, using all of the resources available to you at this time.**

- 1) What is 15 percent of \$50?
- 2) Who is the current Speaker of the U.S. House of Representatives?
- 3) List all of the states that border Tennessee
- 4) How many cups are in a gallon?
- 5) How many keys are on a standard piano?
- 6) Which artist (individual, band, etc.) has the most number-one songs on the Billboard Hot 100 Chart?
- 7) Who painted the famous work *The Starry Night*?
- 8) How many syllables make up a Haiku?
- 9) What colors make up the visible light spectrum?
- 10) Name at least three of the six simple machines which can be used for applying a force.
- 11) Which constitutional amendment prohibits unreasonable searches and seizures?
- 12) In which country is the tallest building on earth located?
- 13) List three different foods which are sources of Vitamin C.
- 14) Clara Barton was the founder of which charitable organization?
- 15) Which Native American tribe inhabited the Kalamazoo valley area prior to white settlement?

## Control Group Survey Instrument

**Please select the best response to each of the following questions:**

- 1) How many times did you ask another group member for help in finding information or answering questions on the test?
  - I did not ask any other group members for help during the test.
  - 1-2 times
  - 3-4 time
  - 5-6 times
  - 7-8 times
  - 8-9 times
  - 10 or more times
- 2) How many times did you receive help from another group member during the test?
  - I did not receive help from any other group members during the test.
  - 1-2 times
  - 3-4 time
  - 5-6 times
  - 7-8 times
  - 8-9 times
  - 10 or more times
- 3) How many different group members helped you find information or answer questions on the test?
  - I did not receive help from any other group members during the test.
  - 1 group member
  - 2 group members
  - 3 group members
  - 4 group members
  - 5 or more group members.
- 4) How many times were you asked to help find information or answer questions by other group members during the test?
  - I was not asked to help by any other group members during the test.
  - 1-2 times
  - 3-4 time
  - 5-6 times
  - 7-8 times
  - 8-9 times
  - 10 or more times

Continue on the Back



- 5) Thinking about the group you were a part of during the test, how much do you agree with the following statements?  
Rate your level of agreement on the scale below:

	Strongly Agree					Strongly Disagree	
In general, the members of this group can be trusted to provide useful information.	1	2	3	4	5	6	7
I feel that there is a sense of cooperation in this group.	1	2	3	4	5	6	7
I feel that there was a focus on shared goals in this group.	1	2	3	4	5	6	7
I felt confident that the other group members would actively engage in problem solving with me if I asked for help.	1	2	3	4	5	6	7
Group members seemed to be accessible to me when it came to helping solve problems.	1	2	3	4	5	6	7

- 6) How much do you agree with the following statements regarding your interactions with other group members and your personal experiences during the test?  
Rate your level of agreement on the scale below:

	Strongly Agree					Strongly Disagree	
I felt a sense of connectedness with those who I interacted with during the test.	1	2	3	4	5	6	7
The interactions I had with other group members were of a high quality.	1	2	3	4	5	6	7
The interactions I had with other group members were helpful to me.	1	2	3	4	5	6	7
I felt close to those I interacted with during the test.	1	2	3	4	5	6	7
I would like the chance to interact more with those who I had contact with in this group.	1	2	3	4	5	6	7
It is likely that those I interacted with during the test could become my friends if we interacted a lot.	1	2	3	4	5	6	7
I felt that I could really trust those who I interacted with during the test.	1	2	3	4	5	6	7
Helping others during the test made me feel that I would be helped if I needed it.	1	2	3	4	5	6	7
I felt an obligation to help other group members during the test.	1	2	3	4	5	6	7
After finishing the test, I felt a sense of accomplishment.	1	2	3	4	5	6	7

Finally, we would like to know a little bit more about you. Your responses to these questions are completely anonymous and will only be used for demographic comparisons.

- 7) How many of your fellow group members were you acquainted with prior to today's session? \_\_\_\_\_
- 8) What do you estimate your household income will be this year? \_\_\_\_\_
- 9) How many hours a week do you work outside of school (for a paycheck)? \_\_\_\_\_
- 10) What is your current grade level here at the university?  
 Freshman       Sophomore       Junior       Senior       Other
- 11) What is the highest level of education attained by your parents? Select all that apply.  
 Less than High School  
 High School Diploma or GED  
 Some College  
 Associates Degree  
 Bachelor's Degree  
 Master's Degree  
 Professional Degree  
 Doctoral Degree
- 12) What is your Gender?  
 Male       Female       Transgendered       I Choose not to Respond
- 13) With which racial/ethnic groups do you identify with? Select all that apply.  
 American Indian or Alaskan Native  
 Asian  
 White or Caucasian  
 Black or African American  
 Arabic  
 Hawaiian or Pacific Islander  
 Multi-racial  
 Hispanic or Latina/Latino
- 14) What is your age? \_\_\_\_\_

## Experimental Group Survey Instrument

Please select the best response to each of the following questions:

- 1) How many times did you ask another group member for help in finding information or answering questions on the test?
  - I did not ask any other group members for help during the test.
  - 1-2 times
  - 3-4 time
  - 5-6 times
  - 7-8 times
  - 8-9 times
  - 10 or more times
- 2) How many times did you receive help from another group member during the test?
  - I did not receive help from any other group members during the test.
  - 1-2 times
  - 3-4 time
  - 5-6 times
  - 7-8 times
  - 8-9 times
  - 10 or more times
- 3) How many different group members helped you find information or answer questions on the test?
  - I did not receive help from any other group members during the test.
  - 1 group member
  - 2 group members
  - 3 group members
  - 4 group members
  - 5 or more group members.
- 4) How many times were you asked to help find information or answer questions by other group members during the test?
  - I was not asked to help by any other group members during the test.
  - 1-2 times
  - 3-4 time
  - 5-6 times
  - 7-8 times
  - 8-9 times
  - 10 or more times
- 5) How many times did you use a cell phone during the test in order to find information or answer questions?
  - I did not use a cell phone during the test.
  - 1-2 times
  - 3-4 time
  - 5-6 times
  - 7-8 times
  - 8-9 times
  - 10 or more times

Continue on the Back





- 6) Thinking about the group you were a part of during the test, how much do you agree with the following statements?  
Rate your level of agreement on the scale below:

	Strongly Agree					Strongly Disagree	
In general, the members of this group can be trusted to provide useful information.	1	2	3	4	5	6	7
I feel that there is a sense of cooperation in this group.	1	2	3	4	5	6	7
I feel that there was a focus on shared goals in this group.	1	2	3	4	5	6	7
I felt confident that the other group members would actively engage in problem solving with me if I asked for help.	1	2	3	4	5	6	7
Group members seemed to be accessible to me when it came to helping solve problems.	1	2	3	4	5	6	7

- 7) How much do you agree with the following statements regarding your interactions with other group members and your personal experiences during the test?  
Rate your level of agreement on the scale below:

	Strongly Agree					Strongly Disagree	
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The interactions I had with other group members were helpful to me.	1	2	3	4	5	6	7
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I felt that I could really trust those who I interacted with during the test.	1	2	3	4	5	6	7
Helping others during the test made me feel that I would be helped if I needed it.	1	2	3	4	5	6	7
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- 8) How many of your fellow group members were you acquainted with prior to today's session? \_\_\_\_\_
- 9) What do you estimate your household income will be this year? \_\_\_\_\_
- 10) How many hours a week do you work outside of school (for a paycheck)? \_\_\_\_\_
- 11) What is your current grade level here at the university?  
 Freshman       Sophomore       Junior       Senior       Other
- 12) What is the highest level of education attained by your parents? Select all that apply.  
 Less than High School  
 High School Diploma or GED  
 Some College  
 Associates Degree  
 Bachelor's Degree  
 Master's Degree  
 Professional Degree  
 Doctoral Degree
- 13) What is your Gender?  
 Male       Female       Transgendered       I Choose not to Respond
- 14) With which racial/ethnic groups do you identify with? Select all that apply.  
 American Indian or Alaskan Native  
 Asian  
 White or Caucasian  
 Black or African American  
 Arabic  
 Hawaiian or Pacific Islander  
 Multi-racial  
 Hispanic or Latina/Latino
- 15) What is your age? \_\_\_\_\_

### Focus Group Schedule

How effective do you think you were, individually, in completing the test today?

What about as a group, how effective were you in working together on the test?

What were the positive aspects of working as a group?

Were there any barriers that you faced in completing the exam?

What about as a group, were there any barriers to working together?

What could have helped you (individually) to overcome these difficulties/barriers?

What could have helped you (as a group) to overcome these difficulties/barriers?

Did you see this test more as an individual pursuit or as a group pursuit?

Do you think things would have been different if you (had/had not) been able to use cell phones?

Is there anything else you would like to add about your experience here today?

#### Probing questions:

Why is that?

Could you explain that more?

Is there anything else about \_\_\_\_\_ you would like to share?

Why do you think this is the case?

Could you elaborate on that?

Can you tell me more about \_\_\_\_\_?

APPENDIX C  
Regression Assumption Tests

## Regression 1: Aid Given and Received and Cell Phone Use (Experimental Only)

The first regression model, predicting *Aid Given and Received* based on *Cell Phone Use*, using only control group responses, was a bivariate regression analysis. As such, issues of multi-collinearity among the independent variables.<sup>34</sup> A Shapiro-Wilk test for normality of the residuals from the initial regression model was significant (.952,  $p < .05$ ), indicating that the residuals were not normally distributed. In order to correct for this non-normality, the dependent variable (*Aid Given and Received*) was logged and the model run a second time. A second Shapiro-Wilk test found the residuals from this second model to be non-normally distributed as well (.914,  $p < .05$ ). Given this result, the original non-logged model was utilized as the analysis moved forward. Non-linear models were calculated next, in order to determine if one of these was a better fit for the relationship at hand. An incremental F-test between the linear model and the model with the highest  $R^2$  value (cubic  $R^2 = .106$ , linear  $R^2 = .092$ ) resulted in a non-significant statistic ( $F = .5$ ,  $p > .05$ ). As such, with no significant difference in variance explained by the cubic model, the basic linear model was settled upon for the analysis. Finally, utilizing a White's test (regressing the *Cell Phone Use* on the squared residuals from the linear model), a chi square statistic of 1.848 was calculated ( $R^2 = .028$ ,  $N = 66$ ). This was found to be non-significant ( $p > .05$ ) and thus we failed to reject the null of homoskedasticity for this model. Given these results, the best model for these two variables was the basic linear, non-corrected, model which explained 9.2% of the variance in *Aid Given and Received* based on *Cell Phone Use*.

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<sup>34</sup> All of the regression models discussed in this section fit this description, and as such, issues of multi-collinearity will not be discussed.

### Regression 2: Reciprocity and Cell Phone Use (Experimental Only)

The second regression model predicted *Reciprocity* based on *Cell Phone Use* for experimental groups. A significant Shapiro-Wilk test (.941,  $p < .05$ ) indicated the need to log the dependent variable to correct for non-normality of the residual distribution. After logging *Reciprocity* however, a second significant Shapiro-Wilk test (.796,  $p < .05$ ) and the appearance of extreme outliers to the distribution indicated that this transformation did not improve normality of the residuals. As such, the basic linear model was utilized for the analysis. As for linearity, the creation of non-linear models did not find a single model (including linear) that was significant in the relationship between these two variables. A test for Homoskedasticity indicated that no corrections needed to be made ( $\chi^2=0$ ,  $p < .05$ ). Despite the lack of a need for corrections or transformations, the final model was found to be non-significant ( $p > .05$ ) in the relationship between *Cell Phone Use and Reciprocity*. An examination of the individual indicators of *Reciprocity* and their relationship with *Cell Phone Use* found no significant regression models as well, as well as no need for transformations or corrections.

### Regression 3: Trust and Cell Phone Use (Experimental Only)

The third regression model predicted *Trust* based on *Cell Phone Use* for experimental groups. The initial model was not found to be significant in the relationship between these two variables. A significant Shapiro-Wilk test (.932,  $p < .05$ ) indicated that the residuals were non-normally distributed. Logging the dependent variable, *Trust*, did not improve this non-normality and if anything made it worse (created extreme outliers in the distribution). As for linearity, while a cubic model indicated the best  $R^2$  value (.065),

none of the models were found to be significant in the relationship between *Trust* and *Cell Phone Use*. No issues were found in terms of heteroskedasticity, with a  $\chi^2$  value of .000 found to be non-significant. And so, despite the lack necessity for correction, no significant models were found for this relationship. This might indicate a need to examine the individual indicators of *Trust* when it comes to hypothesis testing. And indeed, when the two indicators were examined, a significant linear model was found for the relationship between *Cell Phone Use* and “I felt that I could really trust those who I interacted with during the test”, which accounted for around 1.4% of the variance in the trust indicator. For this regression model, no other corrections or transformations were found to be necessary.

#### Regression 4: Information Sharing and Cell Phone Use (Experimental Only)

The fourth regression model predicted *Information Sharing* based on *Cell Phone Use* for experimental groups. The initial linear model was not found to be significant. A significant Shapiro-Wilk test (.780,  $p < .05$ ) indicated a non-normal distribution of residuals. Logging the dependent variable, *Information Sharing*, did not correct this non-normality. When it came to linearity, the only significant model was the cubic model, and therefore cubic terms were calculated for *Cell Phone Use* (DEV=mean deviation, DEV2=mean deviation squared, DEV3= mean deviation cubed) and used in lieu of the single linear indicator for further tests. A White’s test for heteroskedasticity resulted in a non-significant  $\chi^2$  statistic (4.488,  $p > .05$ ) and thus no departures from a homoskedasticity were found. These results indicate that a cubic model (with no other transformations) is the best option for the relationship between *Information Sharing* and *Cell Phone Use*.

This same pattern holds for the relationships between *Cell Phone Use* and the individual indicators of *Information Sharing*, with cubic models and no other corrections or transformations needed. As such, in the analysis, should we require a closer examination of *Information Sharing* cubic terms for cell phone use will be utilized.

#### Regression 5: Test Accuracy and Cell Phone Use (Experimental Only)

The fifth regression model predicted the number of questions correct on the test based on *Cell Phone Use* for experimental groups. A Shapiro-Wilk test for normality of residuals, on the initial non-significant linear model, returned a significant statistic (.925,  $p < .05$ ), though logging the dependent variable in order to correct for this non-normality did not change the outcome of a secondary Shapiro-Wilk test (.910,  $p < .05$ ). None of the non-linear models were found to be significant, though all of them appeared to have a negative trend in the relationship between the variables. As for heteroskedasticity, a White's test returned a non-significant  $\chi^2$  value (.000,  $p > .05$ ) indicating no apparent issues with heteroskedasticity. These results indicate that there is no significant regression model for the relationship between *Cell Phone Use* and the number of questions correct on the test.

#### Regression 6: Accomplishment and Cell Phone Use (Experimental Only)

The sixth regression model predicted the feeling of accomplishment with the test based on *Cell Phone Use* for experimental groups. The initial non-significant model returned a significant Shapiro-Wilk test (.886,  $p < .05$ ), indicating a non-normal distribution of residuals. Logging the dependent variable did not correct for this however



with a second significant Shapiro-Wilk test (.756,  $p < .05$ ) and the appearance of extreme outliers to the distribution. As such, the non-transformed model was used from this point forward. As for linearity, none of the models (linear or otherwise) returned a significant explanation of variance in the dependent variable. A White's test found a non-significant  $\chi^2$  value (.132,  $p > .05$ ), indicating no significant departure from homoskedasticity.

Despite the lack of need for corrections or transformations, these results indicate that no significant models can be found for the relationship between *Cell Phone Use* and feelings of accomplishment on the test.

#### Regression 7: Aid Given and Received and Information Sharing (Experimental Only)

The seventh regression model predicted *Aid Given and Received* based on *Information Sharing* for experimental groups. The initial model returned a normal distribution of residuals, with a non-significant Shapiro-Wilk test (.965,  $p > .05$ ), and therefore no transformations were necessary. Looking at the linear and non-linear models, a significant F-test between the linear and quadratic models ( $F=13.28$ ,  $p < .05$ ) indicated that the quadratic was significantly better at explaining the variance in *Aid Given and Received*. A second test between the quadratic and cubic models found no significant difference ( $F=.397$ ,  $p > .05$ ) and thus the cubic model was no better at explaining the relationship than the quadratic model. As such, quadratic terms were calculated (DEV and DEV2) and used in the model moving forward instead of the single linear *Information Sharing* variable. The first White's test found a significant  $\chi^2$  statistic (9.504,  $p < .05$ ) and thus issues with heteroskedasticity were detected. Weighting the regression by  $1/\text{predicted values}$  from the White's regression resulted in a non-significant

$\chi^2$  statistic from a second White's test (1.386,  $p > .05$ ). These results indicated that the best coefficient estimates would come from a weighted quadratic model, which accounts for 32.6% of the variance in *Aid Given and Received*, and this was the model used for the final analysis.

#### Regression 8: Aid Given and Received and Information Sharing (Control Only)

The eight regression model predicted the same relationship between *Information Sharing* and *Aid Given and Received* as the seventh regression, but was calculated for control group members only. A non-significant Shapiro-Wilk test (.971,  $p > .05$ ) indicated that the residuals for this model were not significantly non-normal in their distribution. As for linearity, the only two models which were found to be significant were the quadratic and cubic models. An F-test between these two models found a non-significant statistic ( $F=1.446$ ,  $p > .05$ ) and thus no significant difference was found. Thus, the more parsimonious model (quadratic) was utilized by adding the quadratic terms for *Information Sharing* into the model. Finally, a White's test found a non-significant statistic ( $\chi^2=.456$ ,  $p > .05$ ) and thus we fail to reject the null hypothesis of homoskedasticity for the quadratic model. These results indicate that the non-weighted quadratic model, which accounts for 6.3% of the variance in *Aid Given and Received*, was the best model to use for the analysis.

#### Regression 9: Reciprocity and Information Sharing (Experimental Only)

The ninth regression model predicted *Reciprocity* based on *Information Sharing* for experimental groups. A non-significant Shapiro-Wilk test (.977,  $p > .05$ ) indicates a

normal residual distribution and thus no transformations were necessary. As for linearity, all of the models were found to be significant. An F-test between the linear model and the model with the highest  $R^2$  (the power model) found that the power model accounted for significantly more variance ( $F=12.875$ ,  $p<.05$ ). The power model was also found to account for significantly more variance than the cubic, quadratic, logarithmic and growth models. As such, both the independent and dependent variables were log transformed in order to create a power model for further analysis. When it comes to heteroskedasticity, previous work has found that log transformed models (including power models) have the tendency to give biased estimates due to issues of heteroskedasticity (Manning, 1998). As such, the test for heteroskedasticity in this power model is paramount in its importance. A White's test found a significant  $\chi^2$  value (17.556,  $p<.05$ ), indicating that heteroskedasticity was an issue for the model. After weighting by  $1/\text{predicted values}$  from the White's regression, a second test found a non-significant  $\chi^2$  value (.924,  $p>.05$ ). As such, the final power model was weighted, and accounted for 16.7% of the variance in *Reciprocity*.<sup>35</sup>

#### Regression 10: Reciprocity and Information Sharing (Control Only)

The tenth regression model predicted *Reciprocity* based on *Information Sharing* for control groups. The initial model yielded a non-significant Shapiro-Wilk test (.971,  $p>.05$ ), indicating that the residual distribution is normal in its shape. When it came to

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<sup>35</sup> After weighting to account for heteroskedasticity, the variance explained was greatly reduced (from around 40% to 15%), as was the standardized regression coefficient (.653 to .409). These findings are in line with Manning (1998), who suggests that in power models heteroskedasticity has the tendency to make  $\beta$  estimates inefficient and inconsistent on the variance-covariance matrix.

linearity, all of the models (linear and non-linear) were found to be significant. A series of F-tests found that the power model was the best fit for this relationship, explaining significantly more variance than the linear model ( $F=13.455$ ,  $p<.05$ ) but not more than the growth model, which had the highest  $R^2$  value, ( $F=1.48$ ,  $p>.05$ ). Given the use of the power model in regression nine (this same relationship, but with experimental groups), it was decided that for comparison purposes, the power model would be the best choice for this regression as well. As for heteroskedasticity, a White's test revealed a non-significant  $\chi^2$  value of .000 ( $p>.05$ ) and thus we fail to reject the null of homoskedasticity for the power model. With these results, the un-weighted power model, which accounts for 69.5% of the variance in *Reciprocity*, will give the best estimates for the relationship at hand.

#### Regression 11: Trust and Information Sharing (Experimental Only)

The eleventh regression model predicted *Trust* based on *Information Sharing* for experimental groups. A non-significant Shapiro-Wilk test (.987,  $p>.05$ ) indicates no issues with the normality of the residuals from this regression. All of the linear and non-linear models were found to be significant. A series of F-tests indicated that the power model, which had the highest  $R^2$  value (.736) explained more variance in *Trust* than the linear model ( $F=8.500$ ,  $p<.05$ ), but no more than the cubic model ( $F=2.625$ ,  $p>.05$ ). Given that the power model is more parsimonious, it was decided that simpler was better in this case, and the power model was used for the remainder of the analysis. As for heteroskedasticity, a significant White's test ( $\chi^2=15.774$ ,  $p<.05$ ) indicated a departure from homoskedasticity. When weighted by  $1/\text{predicted values}$  from the White's

regression, a new white's test was found to be non-significant ( $\chi^2=.792$ ,  $p>.05$ ), and thus by weighting the model heteroskedasticity was dealt with. In the end then, the weighted power model, which accounted for 48.9% of the variance in *Trust*, was the final regression for the analysis.

#### Regression 12: Trust and Information Sharing (Control Only)

The twelfth regression model predicted *Trust* based on information sharing for control groups. No issues with residual normality were found given a non-significant Shapiro-Wilk test (.980,  $p>.05$ ). As for linearity, while all models were found to be significant, and while both quadratic and cubic models had higher  $R^2$  values than the linear model, F-tests indicated that the difference between these models was non-significant ( $F=3.162$  and  $F=1.770$ ,  $p>.05$  respectively for quadratic and cubic). As such, the linear model was the best choice for this regression. When it came to heteroskedasticity, a non-significant White's test ( $\chi^2=.741$ ,  $p>.05$ ) indicated no apparent issues. Given these results, the basic non-linear regression, accounting for 32.9% of the variance in *Trust*, was the best option for this relationship.

#### Regression 13: Interaction Quality and Cell Phone Use (Experimental Only)

The thirteenth regression predicted *Interaction Quality* based on *Cell Phone Use* for experimental groups. A significant Shapiro-Wilk test (.956,  $p<.05$ ) indicated a departure from a normal distribution of residuals. Logging the dependent variable did not remedy this with a second significant Shapiro-Wilk test (.840,  $p<.05$ ) and the appearance of extreme outliers. As such, the non-transformed model was used from this point

forward. As for linearity, none of the models were found to be significant, suggesting that there may not actually be a relationship between these two variables. A non-significant White's test ( $\chi^2=.066$ ,  $p>.05$ ) indicated no issues with heteroskedasticity for this model. However, despite the lack of corrections required, this regression equation was not found to be significant in the prediction of *Interaction Quality*.

#### Regression 14: Aid Given and Received and Interaction Quality (Experimental Only)

The fourteenth regression predicted *Aid Given and Received* based on *Interaction Quality* for experimental groups. A non-significant Shapiro-Wilk test (.972,  $p>.05$ ) indicates no issues with residual normality for the initial model. Systematic F-tests between linear and non-linear models (all of which were found to be significant) revealed that none explained significantly more variance in *Aid Given and Received* than the basic linear model. A non-significant White's test ( $\chi^2=.132$ ,  $p>.05$ ) also indicates that no corrections are necessary to ensure the assumption of homoskedasticity. Given these results, the basic linear model which accounts for 10.6% of the variance in *Aid Given and Received* is the best option for this regression.

#### Regression 15: Aid Given and Received and Interaction Quality (Control Only)

The fifteenth regression predicted *Aid Given and Received* based on *Interaction Quality* for control groups. A non-significant Shapiro-Wilk test (.979,  $p>.05$ ) indicates that residual normality is not an issue for this regression model. Looking at all of the linear and non-linear models reveals that none are found to be significant predictors of *Aid Given and Received*. This is rather interesting, given the significance of this same

relationship among experimental groups, and will need to be further examined in later analyses. A non-significant White's test ( $\chi^2=.057$ ,  $p>.05$ ) indicates that heteroskedasticity is not an issue for this regression. However, despite the lack of necessary corrections, this model remains insignificant in the prediction of *Aid Given and Received*.

#### Regression 16: Reciprocity and Interaction Quality (Experimental Only)

The sixteenth regression predicted *Reciprocity* based on *Interaction Quality* for experimental groups. A non-significant Shapiro-Wilk test (.985,  $p>.05$ ) finds no issues with residual normality for this regression. When it came to linearity, a series of F-tests revealed that the cubic model ( $R^2=.407$ ) was not significantly greater in its explanation of variance than the linear model ( $R^2=.367$ ), and the power model ( $R^2=.447$ ) was not significantly greater in its explanation of variance than the cubic model. Given this progression, and despite the finding that the power model had a significantly higher  $R^2$  value than the linear model ( $F=9.259$ ,  $p<.05$ ), it was decided that in this case the linear model would be the best option. A non-significant White's test ( $\chi^2=1.386$ ,  $p>.05$ ) finds no issues with heteroskedasticity in this basic linear model. As such, the linear model which accounts for 36.7% of the variance in *Reciprocity* was the regression used for the analysis.

#### Regression 17: Reciprocity and Interaction Quality (Control Only)

The seventeenth regression predicted *Reciprocity* based on *Interaction Quality* for control groups. Yet another non-significant Shapiro-Wilk test (.982,  $p>.05$ ) indicates that

residual normality is not an issue with the initial regression model. As for linearity, though it had the highest  $R^2$  value, the power model was not found to be significantly greater in its explanation of *Reciprocity* variance than the linear model based on an F-test ( $F=3.889$ ,  $p>.05$ ). Similar non-significant results were returned by a White's test ( $\chi^2=.798$ ,  $p>.05$ ) indicate that heteroskedasticity is not an issue for this model either. As such, these results suggest that the basic linear model, which accounts for 46.8% of variance in *Reciprocity* is the best option for this regression analysis.

#### Regression 18: Trust and Interaction Quality (Experimental Only)

The eighteenth regression predicted *Trust* based on *Interaction Quality* for experimental groups. A non-significant Shapiro-Wilk test (.981,  $p>.05$ ) suggests that no issues exist in residual normality for the initial regression model. As for linearity, the power model was found to explain significantly more variance in *Trust* than any other model after a series of F-tests were carried out. As such, both the independent and dependent variables were log transformed prior to further analysis. A significant White's test ( $\chi^2=15.642$ ,  $p<.05$ ) finds an issue with heteroskedasticity in the power model. Weighting by  $1/\text{predicted}$  values from the White's regression appears to correct for this with a second test finding a non-significant  $\chi^2$  value (1.122,  $p>.05$ ). These results indicate that the weighted power model, which accounts for 38.6% of the variance in *Trust*, is the best option for this regression.



#### Regression 19: Trust and Interaction Quality (Control Only)

The nineteenth regression model predicted *Trust* based on *Interaction Quality* for control groups. A non-significant Shapiro-Wilk test (.987,  $p > .05$ ) suggests that residual normality is not an issue with this regression model. When it came to linearity, a series of F-test indicate that while all of the models are significant, the quadratic model ( $R^2 = .648$ ) does not explain significantly more variance than the linear model ( $R^2 = .622$ ), and while the Cubic model ( $R^2 = .666$ ) explains significantly more variance in *Trust* than the linear model, it does not explain more than the quadratic model. Given this progression, it was decided that the linear (and more parsimonious) model was the best option for this regression model. As for heteroskedasticity, a non-significant  $\chi^2$  value (1.14,  $p > .05$ ) from the White's test leads to the decision not to reject the null of homoskedasticity for this regression. As such, these results indicate that the basic linear model, which accounts for 62.2% of the variance in *Trust*, is the best option for this regression.

#### Regression 20: Interaction Quality and Information Sharing (Experimental Only)

The twentieth regression predicted *Interaction Quality* based on *Information Sharing* for experimental groups. A non-significant Shapiro-Wilk test (.974,  $p > .05$ ) suggests no issues with residual normality in this model. As for linearity, the power model, which had the highest  $R^2$  value was found to explain significantly more variance in *Interaction Quality* than the linear model ( $F = 4.423$ ,  $p < .05$ ). As such, both the independent and dependent variables were log transformed before further analysis. A significant White's test ( $\chi^2 = 11.946$ ) indicates that heteroskedasticity is an issue with this

power model. After weighting by 1/predicted values from the White's regression, the heteroskedasticity appears to be resolved ( $\chi^2=.462$ ,  $p>.05$ ). These results suggest that the weighted power model, which accounts for 15.9% of the variance in *Interaction Quality* is the best option for this regression.

#### Regression 21: Interaction Quality and Information Sharing (Control Only)

The twenty-first and final regression predicts *Interaction Quality* based on *Information Sharing* for control groups. A non-significant Shapiro-Wilk test (.977,  $p>.05$ ) indicates that residual normality is not a problem for this regression. A comparison of linear and non-linear models via F-tests, finds that no significant differences exist between the  $R^2$  values of these models. As such, the linear (and most parsimonious) model was utilized for the remainder of the analysis. Finally, a non-significant White's test ( $\chi^2=.912$ ,  $p>.05$ ) indicates no issues with heteroskedasticity for this regression. Given these results, the best model for this regression is the basic linear model, which accounts for 41.3% of the variance in *Interaction Quality*.