TRADITIONAL AND CYBER DEVIANCE: EXAMINING THE ROLE OF SELF-CONTROL AND DEVIANT PEER ASSOCIATION

By

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ABSTRACT

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Technology has brought considerable benefits to society and individuals, particularly creating changes in how young people communicate with each other. Despite the advantages of technology, there are also opportunities for offending and risks for victimization in cyberspace. With the widespread access to and use of computer-mediated devices, children and youth nowadays are increasingly exposed to a variety of deviant content and individuals on-line.

Although prior studies have examined the factors associated with deviant behaviors online, the majority of them have relied on college student samples and U.S. population in examining specific forms of cyber deviance and crime. To address these limitations, the current study sought to examine theoretical and demographic correlates of real world and cyber deviance in general and specific forms, using a South Korea adolescent sample. Specifically, the current study examined the applicability of the General Theory of Crime (Gottfredson & Hirschi, 1990) and the Social Learning Theory (Akers, 1998) in the context of cyber deviance. Furthermore, this study investigated the potential link between on-line and off-line environment by exploring the correlates of real world and cyber deviance. Finally, the current study sought to explore the mediating and conditioning relationship between low self-control, deviant peer association and deviance. Implications for research and policy are discussed.

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CHAPTER 1: INTRODUCTION

Technology has had a profound impact on the ways in which people interact and socialize with each other on a daily basis (Buckingham & Willett, 2006; Ito et al., 2010). The Internet and social media have emerged as primary means to form and or maintain personal networks and social relationships with others at any time from nearly any location. In 2011, over seventy-five percent of US adolescents owned a cell phone, and nearly half of them are owners of smartphones (Madden, Lenhart, Cortesi, Gasser, Duggan, Smith, & Beaton, 2013). Access to personal computers is ubiquitous, as 93 percent of American teenagers either own or can use a personal computer in their home (Madden et al., 2013).

Age and gender differences in technology use are also evident. While boys and girls are equally likely to own smartphones, older girls tend to be mobile users who access the Internet mostly via cell phones (Madden et al., 2013). Although less so than girls, older boys used mobile phones to access the Internet. In terms of text messaging among teenagers, boys generally send and receive 30 text messages daily, whereas girls send and receive 80 a day (Lenhart, Ling, Campbell, & Purcell, 2010). Girls between the ages of 14 to 17 sent an average of 100 or more text messages per day or more than 3,000 text messages per month (Lenhart et al., 2010). There are also differences in the international use of technology. For instance, 86 percent of smartphone owners use their device for text messaging and short message service (SMS) in the United States. By contrast, 93 percent of smartphone owners in South Korea, a country with both high mobile and smartphone ownership, sent text messages and used SMS using their devices (Nielsen, 2013). In the United States, the primary use of smartphones was related to seeking on-line coupons, comparing prices between stores, and purchasing products on-line (Nielsen, 2013).

There are educational benefits for adolescents as they can participate in on-line communications with others via different mode of communication such as chatroom, social networking sites, or instant messaging (Subrahmanyam & Smahel, 2010; Tynes, 2007a). For example, adolescents can engage in formal learning by collaborating with their peers via Facebook and organizing discussion groups to complete the school assignments or prepare for exams. They can also informally learn about other cultures and ethnicities by building on-line relationships and sharing their diverse backgrounds with individuals across the United States or from countries around the globe (Tynes, 2007b). As technology is more prevalent in both home and school environments, youth now use computers and other types of portable electronic devices (e.g. iPad) to engage in academic activities such as writing research papers (Purcell et al., 2012). The Internet also allows youth to seek advice and help on matters related to health and sexuality (Suzuki & Calzo, 2004). Moreover, the Internet and social media helps adolescents to explore and nurture their on-line identity (Lenhart, Rainie, & Lewis, 2001; Valkenburg & Peter, 2011) and develop social cognitive skills that increase empathy and emotional sensitivity to individuals of other races (Tynes, 2007a).

Though the use of computer-mediated communications technology adds substantive connective value and benefits for youth, there are also a number of negative outcomes that can result. For example, Internet addiction, often defined as the psychological dependence on the Internet illustrated by an growing investment of resources on on-line activities, negative feelings when not being on-line, and denial of one's problematic behaviors (Kandell, 1998), has been reported among adolescents due to excessive amounts of time spent on-line (Hur, 2006; Whang, Lee, & Chang, 2003). Adolescents who are addicted to technology are not only unable to function normally at school and home, but also likely to suffer from psychological problems

such as depression, social phobia, and suicidal ideation (Yen, Ko, Yen, Wu, & Yang, 2007). Similarly, youth who become addicted to on-line gaming tend to report lower levels of selfcontrol and high levels of aggression (Kim, Namjoong, Ku, & Kim, 2008).

Youth who engage in heavy computer use are also likely to report poor academic performance (Mythily, Qiu, & Winslow, 2008; Rocheleau, 1995; Subrahmanyam, Greenfield, Kraut, & Gross, 2001). The benefits of time spent in on-line communities that support conventional behaviors (e.g. school work) may be offset by the anonymity of on-line communication. Time on-line may increase the risk of victimization from cyberbullying by peers and unwanted sexual solicitation from strangers or on-line predators (Subrahmanyam & Greenfield, 2008; Valkenburg & Peter, 2011; Wolak, Finkelhor, Mitchell, & Ybarra, 2010; Ybarra & Mitchell, 2008).

The risk of victimization also extends to more serious forms of crime and deviance enabled by technology. Criminals view the Internet as an outlet and technology as equipment to engage in deviant, criminal activities. It is important to note that the nature of cybercrime tends to be informational, global, and interconnected (Wall, 2007). Unlike face-to-face confrontations with a traditional street criminal (e.g. burglar) or schoolyard bully, cyber criminals are capable of launching sophisticated attacks against governments, corporations, and individuals without any physical presence required (Choo, 2011; Taylor, Fritsch, Liederbach, & Holt, 2010).

On a global scale, the United States is considered one of the countries experiencing a high level of cybercrime victimization. The Internet Crime Complaint Center (2010) reports that the number of cybercrime complaints rose from 16,838 in 2000 to 336,655 in 2009, with FBI scams and non-delivered merchandise or payment constituting the most common and popular types of on-line criminal activity. According to the report by the Bureau of Justice Statistics

(Catalano, 2012), more than 1 in 4 victims are stalked through different forms of technology; 83 percent of these victims are harassed through email and 35 percent through instant messaging (Baum, Catalano, Rand, & Rose, 2009). Similarly, in South Korea, there has been a gradual increase in the number of cybercrimes; the number of incidents rose from 61,709 in 2004 to 144,959 in 2013, with Internet fraud comprising the largest percentage (45%) of total cybercrimes (Korean National Police Agency Cyber Bureau, 2014). This increasing trend may be only the beginning of how technology can be misused by those with malicious intents or attitudes.

Adolescents are constantly introduced to a range of inappropriate behaviors and on-line content, such as pornography, via the Internet (Wolak, Mitchell, & Finkelhor, 2007). Youths report engaging in a range of deviant or criminal activities on-line, including downloading pirated materials (Morris & Higgins, 2010), viewing pornography on-line (Buzzell, Foss, & Middleton, 2006), soliciting others through sexual messages and images (Mitchell, Finkelhor, Wolak, Ybarra, & Turner, 2011), stealing personal information via email (Reyns, 2013), harassing and bullying others on-line (Hinduja & Patchin, 2008), and illegally accessing computer systems without authorization (Holt, Bossler, & May, 2012).

A majority of the cybercrime scholarship has used convenient, yet purposive samples of college students to investigate the prevalence and correlates of cybercrime (Holt et al., 2014). Only a few studies have moved beyond U.S. college student samples. The study by Holt, Bossler, & May (2012) used a juvenile sample to examine the theoretical correlates of cyber deviance. More recently, using a sample of high school students in a rural area of North Carolina, a number of factors were examined to predict one's likelihood of participating in

hacking behaviors (Marcum, Higgins, Ricketts, & Wolfe, 2014) as well as cyber stalking (Marcum, Higgins, & Ricketts, 2014).

Developing a sample of South Korean adolescents can be helpful because the population has access to high-speed broadband networks, comprises a large percentage of Internet users (approximately 39.4 million) and reports experiences with incidents of cyber victimization (Central Intelligence Agency, 2012; Rhee & Kim, 2004). There is likely to be variations in technology use and ownership that can be examined in light of their effect on deviant behaviors on-line and off-line. Given that the majority of existing cybercrime research relied on US samples, the present study can make a contribution by exploring the effects of demographic, technology-related and theoretical correlates on multiple forms of offending among South Korea adolescents. Since cybercrime continues to be a global and international problem, South Korea provides a context for understanding youth deviance in cyberspace as well as in the real world.

Considering that adolescents are heavy users of technology and are more likely to gain access to and ownership of mobile devices at early ages, there is a great need to examine the phenomenon of cybercrime and deviance among adolescents. Adolescents spend a substantial amount of time on-line and access a variety of information, including sexually explicit material (Wolak, Mitchell, & Finkelhor, 2006). While they interact with different individuals or groups through social media, they may be exposed to deviant models, and, in turn, develop propensities to engage in illegal behaviors. Additionally, given that low detectability and convenient access to victims, young offenders may find cyberspace to be attractive place to engage in illegal and deviant activities (Williams, 2006). This study investigated the factors associated with adolescent participation in various types of cyber deviance. This study utilized a sample of elementary and

middle school children in South Korea, a population which has largely been overlooked in the cybercrime research literature.

The current study sought to empirically examine the applicability of two criminological theories – the General Theory of Crime by Gottfredson and Hirschi (1990) and Social Learning Theory by Akers (1998) - to various forms of crime and deviance in cyberspace. The study sought to contribute to the cybercrime literature in several ways. First, the study assessed two well-established theoretical predictors of crime and deviance – self-control and social learning – in its ability to explain the likelihood of offending in both real world and cyberspace among adolescents. Additionally, the study attempted to assess the effect of deviant peer association on the relationship between low self-control and deviance in on-line and off-line settings. Though criminologists have recently begun to theoretically explore cybercrime and deviance, there is still a need for statistically testing the empirical validity of self-control and social learning theories.

This study also analyzed the correlates for both generality and specificity of criminal behavior in on-line and off-line environments. For deviance in cyberspace, specific forms of cybercrime (e.g. on-line bullying, digital piracy, hacking) as well as a composite measure of cyber deviance were examined. The specific indicators were summarized in a single numerical score to provide a more valid and reliable indicator of cybercrime (Maxfield & Babbie, 2011). Similarly, traditional offending is also examined in general and in specific forms. Since prior research has put its emphasis on specific forms of cybercrime and the level of youth participation may vary depending on the type of offending, there is value in examining the generality of on-line and off-line deviance and comparing the predictive power of two criminological theories. Lastly, this study investigated the link between off-line and on-line deviant behaviors by comparing the effect of correlates for offending in the real and virtual world. Although the link

between physical crime and cyber deviance is unclear, research shows that those who bully the victims in person also bully them, using computer-mediated devices such as cell phone or tablets (Ybarra et al., 2007; Hinduja & Patchin, 2008). For example, if technology use among adolescents can explain the likelihood of engaging both off-line and on-line deviance, findings from this study can improve our understanding of whether the use of technology contributes to criminal behaviors occurring not only in the real world but also in cyberspace. While few studies have shed light on the link between on-line and off-line deviance (Holt, Bossler, & May, 2012), there is scant research examining whether use of technology has an impact on an adolescent's involvement in deviant behaviors in virtual and real worlds. The next section provides detailed descriptions of each theory and its empirical status in the current literature.

CHAPTER 2: LITERATURE REVIEW

Examination of Real World Offending

Juvenile delinquency is a serious concern that poses threats to the well-being and safety of families and communities across the world. According to the World Youth Report by the United Nations (2003), many countries have witnessed an increase in various types of crime among youth. In fact, there has been growing concern that the proportion of violent crimes committed by adolescents has been increasing in both developing countries (UNODC & World Bank, 2007; World Health Organization, 2014) as well as developed countries (Fitzgerald, Stevens, & Hale 2004; Wallace, 2009). Considering the rise in criminal involvement of youth, sufficient attention should be devoted to identifying the key factors that influence their participation in real world offending.

Although juvenile arrests for all crime types has been gradually declining in the United States since reaching its highest level in 1996 (Office of Juvenile Justice and Delinquency Prevention, 2014), adolescents have continued to engage in criminal behaviors such as property offense, status offense (e.g. truancy), as well as other delinquent and antisocial behaviors. Though there are multiple types of deviant and delinquent behavior in which adolescents engage, the current study focused on a range of non-violent forms of delinquency and crime: property offense, truancy, threatening, and three types of traditional bullying. These are considered to be common forms of deviant and criminal behavior in which youth participate. A number of deviant behaviors were presented below to represent youth offending and deviance in the real world.

Property offenses includes burglary, larceny-theft, motor vehicle theft, and arson, according to the Uniform Crime Reports. According to the Office of Juvenile Justice and Delinquency Prevention (2014) there has been a steady decline in juvenile arrest rates over the

past few decades. In 2013, there were 883 arrests of juveniles committing property crime index offenses for every 100,000 youth from 10 to 17 years of age in the United States. It should be noted that juveniles are involved in property crimes not only as offenders but also victims. In a nationally representative study of children's exposure to violence and crime by Finkelhor, Turner, Ormrod, & Hamby (2009), approximately 24.6 percent of youth experienced a property crime. Similarly, a sizeable number of youth are involved in property crime in South Korea; of the 45,735 property crimes in 2014, 29,730 were committed by school students (Supreme Prosecutors' Office, 2014). Although these statistics in two countries may not be directly comparable, the prevalence of property crime in South Korea may be alarming in light of the fact that more than half of the offenders were young students.

Truancy, also referred to as school absenteeism, occurs when a youth has been continuously involved in unexcused absences from school (Baker, Sigmon, & Nugent, 2001; Garry, 1996). Evidence from the National Survey on Drug Use and Health (SAMHSA, 2009) indicated that 11 percent of youth aged 12 to 17 reported skipping school in the past 30 days. Research showed truancy has been significantly linked to initiation of using alcohol, tobacco, and marijuana (Chou, Ho, Chen, & Chen, 2006) as well as lifetime prevalence of using illicit drug such as ecstasy and ketamine (Henry & Huizinga, 2007). Further, truancy was found to be a risk factor for serious and violent forms of juvenile delinquency (Huizinga & Jakob-Chien, 1998; Loeber & Farrington, 2000).

Traditional bullying is conceptually defined as exposure to negative actions carried out by one or more students, repeatedly over time (Olweus, 1993). Generally, there are three types of traditional bullying that are thoroughly discussed in the bullying literature (Espelage & Swearer, 2003). The most prevalent forms are verbal bullying (e.g. calling names, threatening words,

teasing with hurtful or sexual comments or gestures), physical bullying (e.g. kicking, punching, spitting, pushing), and relational bullying (e.g. spreading rumors, public posting embarrassing comments or images, social isolation). Additionally, *threatening* is a form of verbal bullying when a youth verbally intimidates others to cause physical harm.

Research has illustrated that bullying has been associated with aggression, anger, externalizing problems as well as delinquency and violence in adulthood (Bender & Losel, 2011; Olweus, 1993; Ttofi, Farrington, & Losel, 2012). Based on a nationally representative study of US adolescents, the percentages of students being victims of verbal, physical, and relational bullying were 13.8 percent, 37.8 percent, and 36.3 percent respectively (Wang, Iannotti, & Nansel, 2009). Considering that bullying has a long term impact on later criminality, it is important to investigate the theoretical factors influencing youth involvement in traditional bullying.

Examination of Cybercrime Research

The main focus of this dissertation is to enhance the understanding of cybercrime as a deviant and law-violating activity, and how it can be explained by applying self-control and social learning theories. To do so, it is crucial to clarify the definition and types of cybercrime as well as to recognize the properties of cyberspace and criminal use of computer technology. Cybercrime is deemed as a novel phenomenon that emerged with the development of technology (Yar, 2013). Unlike traditional street crime, technology allows offenders to gain remote access to victims' computers and evade detection due to the ubiquitous and anonymous nature of cyberspace and interconnectivity of the Internet. The increasing prevalence of technology-enabled crimes poses a new challenge to scholars, law enforcement agencies, policymakers, and

also society as a whole. Official statistics on cybercrime are scarce or unavailable for many countries, including the United States (Holt, 2013). Despite a growing body of research on cybercrime, there is a lack of knowledge concerning cybercrime and deviance committed by adolescents. It is important to understand the nature of cybercrime as well as the characteristics of cyberspace and the Internet.

Although there is no widely agreed definition of cybercrime, scholars have defined cybercrime as the commission of criminal or deviant activities that involve the use of networked computer technology and cyberspace (Brenner, 2007; Wall, 2001, 2007). Although there are different opinions towards what constitutes cybercrime, some view cybercrime as "old wine in new bottles" (Grabosky, 2001; Wall, 2007), arguing that computer technology and the Internet provides a medium to facilitate traditional crime and deviance. For example, technology enables school bullies to engage in bullying, stalking, or harassment via the Internet (Hinduja & Patchin, 2007; Ybarra, Diener-West, & Leaf, 2007). In other words, crime and those who perpetrate it remain the same, but the tools and techniques used in facilitating criminal activities have become modernized through technology

A distinct feature of cyberspace, compared to the real world, is that the physical presence of an offender is not required. Using the routine activities perspective, Yar (2005) points out that there is a spatial and temporal disconnect in cyberspace, meaning that space and time cannot be determined or measured by the metric units used in the real world. While offenders must be in physical contact with a victim to commit a crime in the real world, cybercrime does not recognize these spatial and temporal boundaries of the real world. A number of obstacles must be overcome to conduct methodologically sound research on cybercrime. This is partly due to the fact that there are different ways in which computers and digital technology are used in the

commission of crime. According to Taylor, Fritsch, Liederbach, and Holt (2010, p. 8), computers can be used in the following circumstances by offenders: 1) as a target, 2) as an instrument of a crime, 3) as incidental to a crime. First, criminals can target computers by launching cyber attacks. For instance, one of the most common cyber attacks targeting a computer would be the denial of service (DDoS) attack, which involves denying and preventing legitimate computer users from accessing the system for service (Taylor et al., 2010).

Secondly, computers are used as an instrument to target consumers on-line by deceiving and luring them into purchasing goods and services that do not exist (Pratt, Holtfreter, & Reisig, 2010). School bullies also use computers or other devices to threaten and harass others (Hinduja & Patchin, 2008), and offenders are able to stalk a victim through social media and other communication modalities such as chatroom and IM (Reyns, Henson, & Fisher, 2012).

Finally, criminal activities are facilitated through the use of computers, rather than as a main instrument or tool of the crime (Taylor et al., 2010). For instance, computers can be used as a storage device by criminal enterprises to conduct illegal activities in the real world (such as sex trafficking, prostitution, and drug rings). Information stored in computers and shared via the Internet helps to commit and facilitate various types of crime. Essentially, computers are used by criminal enterprises to store and manage incidental information (such as illegal transactions or personal information of clients) for the purpose of maintaining and supporting their criminal activities (e.g. child pornography, money laundering, loan-sharking).

Although cybercrime has been conceptualized and described by scholars, there are a broad range of offenses that fall under this definition. There is a need to adequately classify and separate into distinct categories in order to better understand what constitutes a cybercrime (Brenner, 2007; Gordon & Ford, 2006). The typology by Wall (2001) offers a comprehensive

approach for understanding and addressing the type and nature of offending and deviance using technology. According to Wall (2001), cybercrime can be divided into four categories: cyber-trespass, cyber-deception/theft, cyber-porn, and cyber-violence.

Cyber-trespass, also referred to as hacking or cracking, can be defined as an act of "unauthorized crossing of the boundaries of computer systems" into properties in which ownership has been determined (Wall, 2001, p. 3). Cyberspace has no physical boundaries but the interconnected nature of computer systems easily allows individuals to gain access to a vast number of potential victims (Brenner, 2007; Holt, 2013). Hacking occurs when an individual engages in unauthorized access and "trespass" by penetrating into personal computers or computer systems that he or she does not control (Jordan & Taylor, 1998). Hackers are often portrayed as ill-willed individuals who are responsible for security breaches or malicious attacks against computer systems (Furnell, 2002). There are also ethical hackers, described as "white hats", who identify security flaws or vulnerabilities in computer systems and networks, and use their knowledge to gain unauthorized entry in order to inform the computer security personnel of the vulnerabilities in their systems (Taylor et al., 2010). A majority of hackers are interested and committed to the learning and mastery of technology which propels them to understand and appreciate various facets of computers and technology on a fundamental level (Holt, 2007; Jordan and Taylor 1998). Hacking could involve a complex form of attack, like malicious software distribution. Unauthorized intrusions into computer networks, hackers also engage in creating and using viruses and Trojan horse programs to launch attacks on various targets via email, website, and other forms of Internet-based communication (Bossler & Holt, 2009; Holt & Bossler, 2013; Jordan & Taylor, 1998). It can also involve simple practices like guessing passwords to gain access to computers (Bossler & Burruss, 2010). This type of unauthorized

access through password cracking raises concerns for potential invasion of privacy and monetary loss due to data loss or theft (Schell, Dodge, & Mousatsos, 2002).

Acts of *Cyber-deception/theft* involve deceiving, stealing, and appropriating intellectual property or virtual money in an on-line environment (Holt, 2013; Wall, 2001; Williams, 2006). This category can be largely divided into two types of offending: cyber fraud and digital piracy. Cyber fraud occurs when criminals utilize different schemes to deceive and trick consumers while on-line. Cybercriminals use specific schemes (e.g. phishing, spamming) that utilize multiple forms of computer-mediated communication such as email, to obtain personal information (e.g. full name, mobile number, address) from victims (Holt & Graves, 2007). For instance, through a phishing attack, consumers could be lured into transmitting their sensitive information (e.g. bank account number, passwords, login ID) into fake websites where their information is acquired by criminals for fraudulent purposes (Wall 2007). A common form of phishing involves on-line scams (e.g. lottery) delivered by email or instant messenger that links the victims to a fake website that asks for sensitive information (Broadhurst & Chang, 2013). The personal information and data, including credit card number and bank account information, acquired by criminals are quickly disposed to the illegitimate stolen data markets and sold for profits without the knowledge of the victims (Decary-Hetu & Leppanen, 2013; Holt & Lampke, 2010; Motoyama, McCoy, Levchenko, Savage, & Voelker, 2011).

Another prevalent form of *cyber-theft* is digital piracy. While no single all-encompassing definition exists for this act, Gopal, Sanders, Bhattacharjee, Agrawal, and Wagner (2004) defined digital piracy as the "illegal act of copying digital goods, software, digital documents, digital audio (including music and voice), and digital video for any reason other than backup without explicit permission from and compensation to the copyright holder" (p. 3). Digital piracy

has become increasingly pervasive and ubiquitous because of convenient technology available for downloading and uploading copyrighted audio, video, and software files at any location with Internet access (Higgins, Fell, & Wilson, 2006; Higgins & Marcum, 2011). In a majority of Western industrialized countries, including the United States, pirating digital goods is prohibited by copyright laws.

Digital piracy can be divided into two types: software piracy and media piracy (e.g. music, movie). While software piracy requires a certain level of computer proficiency and Internet knowledge (Hinduja, 2003), illegally downloading and copying music and movie files can be achieved with relative little effort. The development of sophisticated technology played a large role facilitating Internet piracy as individuals are able to copy different types of intellectual property (e.g. music, movie, software, video game). Even individuals without technical knowledge can not only access and download pirated digital materials with ease, but also share them with others via peer-to-peer (P2P) networks (Nhan, 2013).

Cyber-porn/obscenity involves exposure to and circulation of pornographic and sexually explicit and deviant materials on-line (Wall, 2001, 2007). Although the Internet is used to connect individuals and build healthy on-line communities for constructive purposes, it also allows individuals to share their sexually deviant interests with others (Griffiths & Frobish, 2013; Holt, Blevins, & Burkert, 2010; Quinn & Forsyth, 2005; Selwyn, 2008; Wall, 2007). While pornography has been traditionally available in print, it became ubiquitous and readily accessible via the Internet. Serving as a new medium for buying or selling sexually related products, on-line pornography has been one of the most profitable industries that utilized the commercial nature of the Internet (Cooper, 1998; Hapgood, 1996).

For adolescents, voluntary exposure to pornography seems to be one of the most common forms of deviance on-line. In fact, 95 percent of teenagers aged between 10 and 17 who accessed on-line pornography are males, compared to their female counterparts in a nationally representative sample of US youth (Ybarra & Mitchell, 2005). This gender difference is not surprising since empirical evidence suggests that males tend to hold attitudes that are approving of on-line pornography compared to females (Albright, 2008; McCabe, 2000; Wright, 2013). For boys, voluntary exposure to on-line pornography increased with age; only one percent of boys from 10 to 11 years of age reported viewing porn, rising to 38 percent of those between 16 and 17 years of age (Wolak, Mitchell, & Finkelhor, 2007). The availability of different communication modalities such as chatrooms, peer-to-peer data sharing, and social networking services (SNS) allows them to share and circulate pornographic and obscene materials on-line. Adolescents may also encounter unwanted exposure to on-line pornography due to its availability and distribution by peers (Jones, Mitchell, & Finkelhor, 2012).

Exposure to on-line pornography may become a legal concern for adolescents. While it may be neither illegal nor socially unacceptable in some countries (Kuipers, 2006), minors are prohibited by law from viewing pornography in the United States because of its harmful effects on adolescents (Brown & L'Engle, 2009; Flood, 2009). In South Korea, on-line pornography is illegal but there is no punishment for viewing or possessing pornographic material (Worstall, 2012). Furthermore, even if on-line pornography is not illegal in particular countries, it may be viewed as deviant according to societal norms.

The final form of cybercrime is *cyber-violence*, pertaining to a range of on-line behaviors that pose potential harm to others by distributing materials via digital technologies and mobile devices (Wall, 2001; Williams, 2006). Examples of cyber violence include, but are not limited

to, on-line harassment, cyberstalking, and cyberbullying (Bossler, Holt, & May, 2012; Reyns, Henson, & Fisher, 2012; Hinduja & Patchin, 2009). With the growth of social media and mobile technology, harassers are able to send, post, and also disseminate threatening, offensive messages/images anonymously at their fingertips (Hinduja & Patchin, 2012). The prevalence of on-line harassment victimization seems to be on the rise, as a study by Jones, Mitchell, and Finkelhor (2013) found that on-line harassment rates increased from 6 percent in 2000 to 11 percent in 2010. On-line harassment and cyberbullying continues to be serious problem for school children and teenagers not only in the United States but also in other countries (Erdur-Baker, 2010; Yang et al., 2013).

The Link between Cyber and Real World Behaviors

Despite the different properties (e.g. temporal, spatial) of the physical world and cyberspace (Yar, 2005), it is undeniable that there is an interaction between real world behaviors and on-line behaviors. On-line interaction may be most influential for adolescents in altering their off-line behaviors. Research by Huang, Unger, Soto, Fujimoto, Pentz, Jordan-Marsh, & Valente (2014) illustrated that exposure to unhealthy content (e.g. drinking) via social media among peers impacts one's involvement in risky behaviors such as alcohol use or smoking. Sharing knowledge and experience in on-line social networks can contribute to the acceptance of norms and values through peer modeling, since adolescents reinforce and validate their off-line relationships with peers via on-line channels (Gross, 2004; Valentine & Halloway, 2002). In this respect, on-line interaction among peers plays a significant role in the perception of and participation in off-line activities.

In addition to risky behaviors, another example of the overlap between on-line and offline experiences is evident for computer hackers. Individuals interested in hacking share information and techniques with others through on-line social networks, and also socialize with fellow hackers in the real world (Holt, 2007). Hackers are informed about threats from law enforcement via real world gatherings and on-line communities (Holt, 2007). Through these online and off-line experiences, hackers learn the norms and values of a deviant and criminal subculture, including the ways to justify and neutralize their illegal behavior (Holt, 2007). Both on-line and real world interactions provide hackers with new tools, information, and techniques, and also shapes their identity as hackers. On-line personal experiences influence how an individual defines the on-line reputation of a hacker, which also reflects one's off-line status during real world meetings (Holt, 2007). In this sense, the interplay between an individual's digital representation and off-line socialization exists in a deviant subculture.

Cyberspace has created unprecedented opportunities for offending and victimization both on- and off-line. Prior research suggests that there may be a connectedness between the physical and virtual world with regard to deviant interests and behaviors (Doring, 2009; Holt, 2007; Pyrooz, Decker, & Moule, 2013). Moule, Pyrooz, & Decker (2013) found that the use of Internet by offenders and deviant individuals was found to be positively associated with their involvement in street crime. Further, youth who experienced harassment via the Internet are also likely to be bullied off-line (Ybarra, Diener-West, & Leaf, 2007). In this respect, on-line criminality may be potentially connected to real world criminality.

Real world behaviors and experiences can be transferred to and reinforced in on-line communities related to their interests such as cyber pornography and sexuality. In particular, young males, who view pornographic materials off-line, are also likely to view sexually explicit

content via the Internet (Træen, Nilsen, & Stigum, 2006). Individuals engaging in on-line interactions with others may seek off-line sexual relationships with whom they met on-line. For instance, Træen et al. (2006) found that a total of 28 percent of those who participated in erotic chatting on-line during the past twelve months reported that they met their most recent sex partner via the Internet. Given the accessibility and interconnectivity of the Internet, individuals view cyberspace as an arena to explore sexuality and to arrange for off-line sexual activity. In this case, cyberspace serves a medium that connects on-line and off-line boundaries.

Peer association seems to be salient in both off-line and on-line environments. Meldrum and Clark (2013) examined whether time spent on-line and off-line interacting with peers has an effect on one's delinquent behavior, and found virtual time spent with friends to be significantly linked to the likelihood of engaging in a variety of delinquent behaviors. Time spent on-line with friends increases the risk for substance use and petty theft. In the context of bullying behavior, youth who report school behavior problems like skipping school, were more likely to be victims of cyberbullying (Hinduja & Patchin, 2008). A recent review of research of social media and youth violent behavior found that technology plays a role in facilitating deviant, criminal activities across both off-line (e.g. gang activity, bullying) and on-line (e.g. cyberbullying, cyberstalking, cyber suicide) environments (Patton et al., 2014). Although based on a limited amount of research, these studies provide empirical support for a potential link between juvenile participation in cybercrime and juvenile delinquency off-line.

Review and Assessment of Self-Control Theory

Development of Self-Control Theory of Crime (General Theory of Crime)

The general theory of crime (also referred to as *self-control theory*) is one of the most well-documented perspectives to account for individual involvement in crime in the real world (Pratt & Cullen, 2000) as well as in cyberspace (Holt & Bossler, 2014).

Michael Gottfredson and Travis Hirschi proposed the general theory of crime (1990) that focuses on a single form of control, namely self-control. This theory is linked with social bond theory in that both perspectives assume social and individual restraints limit individual motivations to engage in criminal behavior (Gottfredson & Hirschi, 1990).

Unlike Hirschi's social bond theory (1969), the general theory of crime argues that individuals vary in their capacity for self-control which directly affects their propensity to commit crime. Gottfredson & Hirschi (1990) differentiate the concept of "criminality" from the commission of a crime, defining it as "propensity" to engage in criminal behavior. They assert that self-control is able to explain the differences in the propensity to engage in criminal and deviant activities regardless of age, gender, or other circumstances. Gottfredson and Hirschi (1990) attribute an individual's tendency to commit crime to inadequate child-rearing practice (e.g. lack of parental monitoring, ineffective disciplining by parents).

According to Gottfredson and Hirschi (1990), direct supervision by parents is considered to be the most important factor in the socialization of children through adequate parenting. Gottfredson and Hirschi (1990) claim that self-control is an individual trait acquired and internalized via parental management (specifically surveillance, labeling, and punishment) "directed toward teaching the child about the rights and feelings of others, and of how these rights and feelings ought to constrain the child's behavior" (p. 97). In addition to the effect of

parental socialization, school contexts can influence self-control among children. Turner, Piquero, and Pratt (2005) found that effective school socialization (e.g. teach right from wrong, maintain discipline) may increase the level of self-control an individual forms when parental socialization fails. In turn, low self-control, arising from ineffective socialization in the family or at school, is likely to contribute to the development of delinquent and criminal behavior.

Based on the general theory of crime, programs and policies that focus on positive development in early childhood and positive parenting have shown to be effective in preventing and reducing delinquent behaviors (Piquero, Jennings, & Farrington; 2010; Vazsonyi & Huang, 2010).

According to Gottfredson and Hirschi (1990), self-control is not a sufficient condition for crime to occur. Low self-control is contingent on the opportunity to commit crime. Drawing from the routine activities theory proposed by Cohen and Felson (1979), three components must converge in time and space for an opportunity to offend: suitable target, motivated offender, and absence of guardian. From an offender's standpoint, crime offers immediate, short-term benefits such as small monetary gain, brief sexual pleasure, or excitement.

Stability and Versatility of Self-control

The concept of self-control is unique because of its stability and versatility (Akers, 1991; Gottfredson, 2006). Gottfredson and Hirschi (1990) argue that self-control is the outcome of family socialization (specifically parental practice) during early childhood years, and remains reasonably stable throughout an individual's life. Scholars have contested this hypothesis by identifying noteworthy changes in a person's level of self-control (e.g. lower to higher) over time (Arneklev, Grasmick, Tittle, & Bursik, 1993; Turner & Piquero, 2002; Winfree, Taylor, He, &

Esbensen, 2006). The general framework of general theory of crime has not, however, changed in light of these findings.

With regard to versatility, the general theory of crime claims that low self-control is expected to explain a broad range of criminal and deviant acts. Gottfredson and Hirschi (1990) assert that individuals who engage in a certain type of deviance are likely to engage in other deviant behaviors. A considerable amount of research has found low self-control to be a predictor of various forms of deviant and analogous behaviors such as accident involvement (Junger & Tremblay, 1999), academic dishonesty (Cochran, Wood, Sellers, Wilkerson, & Chamlin, 1998), use of alcohol, cigarettes, and marijuana, as well as public fights and disorderly conduct (Perrone, Sullivan, Pratt, & Margaryan, 2004). Low self-control also influences one's involvement in theft, vandalism and general deviance (Vazsonyi, Pickering, Junger, & Hessing, 2001). In addition, Gottfredson & Hirschi (1990) argue that the impact of self-control on crime and delinquency is consistent across different cultures and nations, asserting that self-control explains the differences in delinquent behaviors across cultural and national contexts (Vazsonyi, Pickering, Junger, & Hessing, 2001; Vazsonyi, Wittekind, Belliston, & Van Loh, 2004; Vazsonyi & Belliston, 2007).

Despite its popularity and applicability, self-control theory is not exempt from criticisms. A major criticism that the theory has received by criminologists is that the concept of self-control is tautological because the propensity for offending is used an indicator of low self-control (Akers & Sellers, 2004). Akers (1991) criticized Gottfredson and Hirschi (1990) on the basis that the concepts of self-control and criminal propensity are treated synonymously, meaning low selfcontrol leads to criminal propensity and vice versa. This is due to the fact that they did not provide operational definitions for self-control and criminality separately (Akers, 1991).

Another major criticism towards the utility of general theory of crime is that it may not be suitable to explain why individuals commit certain types of crime because it does not take into account the motives (e.g. profit-seeking, racial hatred, religious/political motivation) of an offender (Akers, 1991). One of the most notable examples is white-collar crime. Research by Benson and Moore (1992) examined whether low self-control can account for different types of white-collar offending such as fraud, forgery, and embezzlement. Although Benson & Moore (1992) found partial support for the general theory of crime that white-collar criminals are similar to street criminals with regard to low self-control, they suggested that low self-control was a stronger correlate of conventional crimes than white-collar crimes.

For most part, existing literature does not provide strong support that low self-control can account for white-collar crime. Reed & Yeager (1996) explain that the general theory of crime does not take into consideration the important elements such as organizational culture and structure when explaining white-collar offending. Geis (2000) argued that low self-control has not been applicable to explain different forms of white-collar crime. Consistent with these claims, Simpson and Piquero (2002) found no significant relationship between behavioral measures of low self-control and corporate offending among a sample of MBA students. Piquero and Piquero (2006) also empirically assessed that self-control was not a significant predictor in explaining corporate crime. Piquero and Benson (2004) explains that individuals with high self-control engage in white-collar crime because they fear for the loss of their financial status and approve illegal pursuit of financial gain. While most offenders are perceived to have low self-control, white-collar criminals are believed to exhibit high levels of self-control, which is required to successfully commit a crime such as fraud or embezzlement.

Moreover, the link observed between low self-control and white-collar crime may be comparable to the link between low self-control and certain types of cybercrime in that selfcontrol does not play a significant role in the commission of crime. For complex forms of computer hacking, it may actually demand a high level of self-control for an individual to engage in this behavior (Bossler & Burruss, 2010). This is contrary to the assertion by Gottfredson and Hirschi (1990) that those with high self-control are "substantially less likely at all periods of life to engage in criminal acts" (p. 89). Because hacking requires a high level of computer skills and literacy as well as commitment to technology and learning (Holt & Kilger 2008), individuals with low self-control are unlikely to access and manipulate information stored in other people's computers. Hence, it is possible that self-control does not purport to account for certain types of cybercrime.

Empirical Assessment of Self-control and Offending

Among criminological theories, the general theory of crime has been widely tested as a one of the individual-level explanations for criminal behavior, and received considerable empirical support (Pratt & Cullen, 2000; Tittle, Ward, & Grasmick, 2003; Vold, Bernard, & Snipes, 1998). Despite the aforementioned criticisms, a vast amount of research has illustrated that low self-control is a consistently significant predictor of crime and other analogous and imprudent behaviors (Arneklev et al., 1993; Burton, Cullen, Evans, Alarid, & Dunaway, 1998; Burton, Cullen, Evans, & Dunaway, 1994; Evans, Cullen, Burton, Dunaway, & Benson, 1997; Gibbs & Giever, 1995; Gibbs, Giever, & Martin, 1998; Grasmick, Tittle, Bursik, & Arneklev, 1993; Hirschi & Gottfredson, 1993; Longshore & Turner, 1998; Longshore, Turner, & Stein, 1996; Nagin & Paternoster, 1993; Piquero & Tibbetts, 1996; Tibbetts & Herz, 1996). Overall, Pratt & Cullen (2000)'s analysis found low self-control to be one of the strongest predictors of criminal and analogous behaviors.

Criminologists have only recently begun to examine the theoretical correlates of cybercrime. A growing number of studies have investigated self-control as a theoretical correlate of cybercrime offending, particularly computer hacking (Bossler & Burruss, 2010), software piracy (Higgins, 2004, 2006), music piracy (Higgins, Wolfe, & Marcum, 2008), movie piracy (Higgins, Fell, & Wilson, 2006), illegal use of personal information (Moon, McCluskey, & McCluskey, 2010), on-line harassment (Holt et al., 2012), and viewing Internet pornography (Buzzell et al., 2006). These studies have consistently found that individuals with lower levels of self-control are more likely to engage in deviant activities in cyberspace. In particular, low selfcontrol has shown to be a strong predictor especially for different forms of digital piracy (Higgins, 2004, 2007; Higgins et al., 2006, 2007; Malin & Fowers, 2009). Few studies have examined low self-control as a theoretical explanation for cybercrime offending using adolescent samples (Holt et al., 2012, Marcum, Higgins, Ricketts, & Wolfe, 2014; Moon, McCluskey, & McCluskey, 2010). Moon et al. (2010) found low self-control to be significantly associated with illegal downloading of software among adolescents in South Korea. Marcum et al. (2014) found that low self-control is predictive of hacking behaviors via Facebook and website among a sample of US high school students. Finally, Holt et al. (2012) used a youth sample to further examine not only specific types of cyber deviance but also cyber deviance in general, and found a positive association between low self-control and the likelihood of engaging in cyber deviance.

Overall, the general theory of crime has received a significant amount of empirical support for explaining individual-level variation in a wide variety of real-world criminal and delinquent behaviors (Pratt & Cullen, 2000), as well as cybercrime (Bossler & Holt, 2010;

Higgins, 2004; Holt et al., 2012). Further research is needed beyond college student samples, and also to consider whether the effect of self-control is consistent across diverse forms of cybercrime and deviance (e.g. identity theft, hacking, sexting).

Review and Assessment of Social Learning Theory

Differential Association Theory by Sutherland (1947)

While the general theory of crime emphasizes the effect of parental management on a child's development of self-control, which influences one's criminal propensity (Gottfredson & Hirschi, 1990), another competing theory of criminal and delinquent conduct is social learning theory (Akers, 1985, 1994, 1998). Among criminological perspectives, social learning theory has been applied to account for a wide variety of criminal and deviant behaviors (Akers & Jensen, 2006). This theory developed from propositions of differential association theory proposed by Edwin Sutherland (1947). Differential association is defined as a direct association and interaction with others who share similar attitudes, values, and norms towards certain behavior (both criminal and non-criminal) (Sutherland, 1947). Sutherland's differential association theory (1947) asserts that delinquent and criminal behavior is learned through intimate interactions with others. When a child's parents or peers have crime-favorable definitions, exposure to these definitions may contribute to their learning of criminal behavior. For example, children can learn to accept and perceive deviant and law-breaking behavior as normative, particularly through interaction with peers (Sutherland, 1947; Akers, 1985, 1998). Conforming and law-abiding behaviors are acquired by the same process as the law-breaking behaviors. If definitions favorable to crime exceed those unfavorable to crime, an individual should be more likely to engage in criminal behavior (Sutherland, 1947).

The process of differential association is not merely an act of associating with intimate others who support definitions favorable to deviance/delinquency (Sutherland, 1947). Associations vary based on four conditions: frequency, duration, priority, and intensity. While frequency is related to how often an individual interacts with another person or group, duration is concerned with the time invested in interacting with others. According to Sutherland (1947), priority does not refer to relative ranking in importance, but is characterized as association that occurred early in life. Priority in associations indicates whether an individual's lawful or unlawful behavior developed in early childhood may persist over time. Finally, intensity can be described as the importance and significance of the association to the individual. For instance, association of high intensity may be found in best or closest friendships.

Despite its theoretical appeal, differential association theory was criticized for abstract ideas and lack of specification and concrete content concerning the social learning mechanism (Akers, 1994; Matsueda, 1988). Sutherland's theory does not identify the process or mechanism by which criminal and deviant behavior is learned. Later, behavioral and social learning theories from other disciplines were drawn for the reformulation of differential association theory to specify and describe the process of social learning (Akers, 1985; Burgess & Akers, 1966).

Development of Social Learning Theory

Burgess and Akers (1966) refined Sutherland's differential association theory through their model of "differential association-reinforcement" theory. This model integrated the principle of operant conditioning (from psychology) and the process of symbolic interaction (sociological component found in the differential association theory). The theory focused on the balance of rewards and punishments for voluntary conduct that operates in both social

interactions and non-social situations in which certain behaviors, including criminal and deviant behavior, may be reinforced (Akers & Jennings, 2009). Ronald Akers (1973) further refined this framework by creating the social learning theory based on four key variables. Akers' recognizes that being exposed to pro-criminal definitions in terms of priority, intensity, frequency, and duration through association with those are favorable or unfavorable to these definitions is likely to influence one's criminal motivation and, in turn, engagement in criminal behavior. Consistent with Sutherland's differential association theory (1947), Akers suggests that criminal behavior is learned as a result of exposure to and acceptance of crime-favoring definitions.

The social learning theory asserts that an individual engages in criminal behavior through the process of social learning. Congruent with Sutherland's ideas, Akers (1998) suggests that criminal behavior is more likely "when, on balance, the combined effects of these four main sets of variables instigate and strengthen nonconforming over conforming acts" (p. 50). The social learning mechanism is contingent on the following four components: differential association, definition, differential reinforcement, and imitation (Akers, 1998).

Differential association can be defined as a process in which an individual is exposed to definitions that are either favorable or unfavorable to pro-criminal or conforming behavior (Akers, 1998). Akers recognizes that there is an interactional dimension of association based on both direct interaction with others (e.g. peers, family) engaging in specific types of behavior and indirect association with a more distant reference groups (e.g. social, religious organizations). An additional normative dimension refers to the different norms and values to which an individual is exposed as a result of association with these groups. Four dimensions of differential association were retained from Sutherland's sociological theory (1947): priority (occurring first), duration (lasting longer), frequency (occurring more often), and intensity (with whom an

individual has the more significant relationships). Associations that begin earlier in life, occur frequently, endure over a lengthy period of time, and involve important, close relationships are more likely to have a strong impact on one's behaviors and attitudes (Akers & Jensen, 2006).

Definition refers to a set of cognitive elements, including values, beliefs, attitudes, and orientations that are used to evaluate a behavior as "being more right or wrong, good or bad, desirable or undesirable, justified or unjustified, appropriate or inappropriate, and excusable or inexcusable" (Akers & Jennings, 2009, p. 106). These definitions can be general and specific. While general definitions include conventional values and norms (e.g. religious, moral) that are unfavorable to law-violating behavior, specific definitions refer to norms oriented towards particular conducts. For instance, a youth may believe that auto theft is morally impermissible, but he or she may perceive intellectual property crimes as normative, and rationalize his or her participation in digital piracy.

Imitation involves direct or indirect observation and modeling of others' behavior, leading to mimicry of those behaviors. According to Bandura (1977, 1986), three factors influence one's likelihood of imitating a behavior modeled by others: characteristics of behavioral models, the behavior observed, and the observed consequences. While a child's observational learning occurs through direct interaction with those in primary groups, behaviors can also be observed and learned indirectly through models that are verbally and visually depicted in the media, including the Internet (Akers, 1998). Observing salient models of deviance and violence is likely to influence a child's imitation of deviant or antisocial behavior. The process of observational learning and modeling also applies to behaviors that are conforming and prosocial (Akers, 1998).
Differential reinforcement is described as a "balance of perceived, experienced, or anticipated reward and punishment" generated by a behavior (Akers & Jennings, 2009, p. 108). It functions through positive and negative reinforcement as well as positive and negative punishment. According to Akers (1998), reciprocal and sequential effects are observed in the concept of differential reinforcement. For instance, when a particular behavior (e.g. identity theft) is more frequently and highly rewarded and its punishment is low in its frequency and severity, an individual can compare it to the balance of reward and punishment for an alternative behavior (e.g. law-abiding). After this behavior has frequently occurred and is more strongly reinforced, the individual is likely choose the same behavior over alternative behaviors. In addition, punishment of non-conforming behaviors may initially have a deterrent effect but the effect may be weakened and lead to further involvement in deviant behavior (Akers, 1990).

Critique of Social Learning Theory

Despite the empirical support for the social learning theory as a theoretical perspective, it faces a few criticisms. First, the social learning theory does not fully determine the temporal sequence of differential peer association and crime/deviance. A significant amount of research examining this unidimensional causality found that peer associations precede the development of delinquency more than the other way around (Warr, 1993). The direction and temporal order of peer association and delinquency is dependent, however, on the method and measurement used (Kandel, 1996; Thornberry, Lizotte, Krohn, Farnworth, & Jang, 1994). Matsueda & Anderson (1998) investigated the dynamic relationship between delinquency peer association and delinquency terms of hypotheses derived from learning, interactional, and control theories, and found that delinquent peer association is reciprocally linked with delinquent

behavior. Specifically, their findings indicated that the effect of delinquency on delinquent peer association is stronger compared to the effect of delinquent peer association on delinquency. They also pointed out that the latter effect may have been overestimated in existing research.

According to Matsueda & Anderson (1998), many studies do not address whether initiation of delinquent behavior needs association with delinquent peers, and these research findings depend on how delinquency is measured. Longitudinal research have found that spending time with delinquent peers precedes involvement in delinquency (Elliott & Menard, 1996; Warr, 2002). The sequence of the social learning variables and involvement in delinquency hypothesized by the theorists (Akers, 1998; Akers & Sellers, 2004) have been generally supported (Pratt, Cullen, Sellers, Winfree, Madensen, Daigle, Fearn, & Gau, 2010). While it is generally accepted that the relationship between delinquent peer association and delinquency is reciprocal, research, for the most part, has identified association with delinquent peers to be significantly linked with delinquency (Warr, 2002).

Secondly, the social learning theory was initially criticized for being tautological with the definition of differential reinforcement (Burgess & Akers, 1966). Initially, based on the definition of reinforcement, one would hypothesize that if a behavior is reinforced, then it is strengthened. Akers (1998) resolved this tautology issue by separately defining reinforcement and other measures in the operant conditioning. Also, variables pertaining to reinforcement were measured independently from crime measures. Lastly, research on social learning lacks the full operationalization of its four components of social learning. Most studies examining the social learning theory models have focused merely on two components, differential association and definitions; in comparison, the other two components of differential reinforcement and imitation have received less empirical attention (Pratt et al., 2010).

Empirical Assessment of Social Learning and Offending

Social learning theory has been one of the most widely recognized and empirically tested theoretical frameworks to explain criminal and delinquent behavior over the past several decades (Akers & Jennings, 2009; Pratt et al., 2010). The vast amount of research examining social learning can be divided into a body of research focusing on family environment and peer influence. Empirical evidence illustrates that family, as the primary contexts of socialization, exerts a significant impact on one's involvement in criminal and deviant activity (Barnes, Reifman, Farrell, & Dintcheff, 2000; Canter, 1982; Cernkovich & Giordano, 1987; Demuth & Brown, 2004; Huh, Tristan, Wade, & Stice, 2006; Pratt, Turner, & Piquero, 2004; Smith & Krohn, 1995). Under the scope of social learning theory, family are considered to be the most intimate group with which an individual is associated (Akers & Jenson, 2006). Hence, if children are exposed to pro-criminal and deviant influence of parents, they are more likely to engage in delinquent behaviors than those exposed to law-abiding and responsible parents (Cernkovich & Giordano, 1987; McCord, 1991). This is evident in the context of bullying behavior, as Baldry (2003) found that those who are exposed to physical violence between parents are significantly more likely to engage in direct form of bullying, particularly for girls.

Prior research suggests that differential association with peers who approve of and engage in deviant behaviors is one of the strongest factors associated with criminal and delinquent behavior (Akers, 1998; Krohn, 1999; Lee, Akers, & Borg, 2004; Warr, 2002). It is widely acknowledged that antisocial and deviant attitudes, values, and behaviors are learned through socialization and reinforcement among peers (Akers, 1977, 1998; Warr, 2002). For example, youth are likely to learn to bully others in various forms through socialization with peers engaging in bullying (Espelage, Bosworth, & Simon, 2000; Hinduja & Patchin, 2013).

Peers tend to resemble one another in analogous behaviors such as smoking (Christakis and Fowler, 2008), drinking (Rosenquist, Murabito, Fowler, & Christakis, 2010), and substance use (Hwang & Akers, 2003).

Based on a meta-analysis of the general theory of crime by Pratt & Cullen (2000), differential association and definition measures derived from social learning theory are found to be one of the strongest predictors of crime and deviance, rivaling the influence of low selfcontrol. Another meta-analysis of the social learning theory by Pratt et al. (2010) found strong support for the predictive strength of social learning measures, particularly differential association and definitions, which have been consistently operationalized measures included in past research examining the social learning process (Akers, 1998).

Although social learning presents a useful framework to understand why individuals engage in criminal and deviant behavior, criminologists have recently given attention to the effect of peer deviance on offending behavior in cyberspace. From an offender perspective, some cybercrime requires individuals to learn a specialized set of skills to manage highly sophisticated equipment and technology to perform illegal computer activities (Skinner & Fream, 1997). Yet, not all forms of cybercrime are technologically complex. For example, on-line harassment or cyberstalking does not require specialized knowledge as individuals can send messages to one another via email or text messages. It is rather the association with peers who model and reinforce behaviors, which, in turn, influences one's participation in cyber deviance.

Subcultural research on cybercrime illustrates that hackers and digital pirates not only exchange knowledge to access computer systems intended for deviant activities but also share and transmit values and norms for justifying their illegal behaviors (Holt, 2007; Holt & Copes, 2010; Morris & Higgins, 2010; Schell, Dodge, & Moutsatsos, 2002). While the concept of

differential association from the social learning theory (Akers, 1998) refers to a range of associates in primary groups such as parents, family members, peers, and other intimate groups, modern technology created "virtual peer groups" who interact with each other via mass media, the Internet, and other computer-mediated communication (Warr, 2002).

Cybercrime and deviance is influenced by social interaction with others, particularly peers (Hinduja & Patchin, 2013). Adolescents and young adults are often introduced to a range of risky behaviors through social interactions on-line and provided with opportunities to learn deviant activities as well as the values and rationalizations of deviant subculture (Bossler & Burruss, 2010; Higgins & Marcum 2011; Holt, 2007; Ingram & Hinduja 2008; Sykes & Matza, 1957). Deviant peers are able to communicate with each other via web forums, exchanging and sharing ideas and information used for hacking (Holt, 2007) or piracy (Holt & Copes, 2010). By associating with peers who pirate digital goods, individuals may conform to the norms and beliefs of peer group and learn to rationalize their deviant behaviors (Hinduja, 2007; Ingram & Hinduja, 2008; Morris & Higgins, 2008).

In fact, multiple studies examined the effect of deviant peers on cybercrime offending, most of them focused on specific forms of cybercrime such as different types (e.g. software, movie, music) of digital piracy (Higgins, Fell, & Wilson, 2007; Hinduja & Ingram, 2009; Morris & Blackburn, 2009; Morris & Higgins, 2010), hacking (Bossler & Burruss, 2010), exposure to on-line pornography (Buzzell et al., 2006), intellectual property theft (Hinduja & Ingram, 2008), cyberbullying (Hinduja & Patchin, 2013) and sexting (Lee, Moak, & Walker, 2013). Overall, existing research on cybercrime suggests that juveniles who associate with deviant peers are more likely to engage in offending behaviors on-line.

Extant research on cybercrime have examined the impact of social learning, relying on differential association and definitions. Studies on digital piracy and hacking have found a significant relationship between deviant peer associations, definitions favoring deviance, and participation in cyber deviance (Higgins, 2006; Higgins et al., 2007; Hollinger, 1992; Morris & Higgins, 2010; Skinner & Fream, 1997). Both differential peer association and definitions favorable to digital piracy was found to be strong predictors for one's intention and commission of digital piracy (Higgins 2005; Higgins & Marcum 2011; Higgins & Wilson, 2006; Higgins et al., 2007, 2012; Hinduja & Ingram 2008; Holt et al. 2012; Skinner & Fream, 1997).

These studies do not offer a test of the full model because they have included only differential association and definitions in examining cyber deviance. There is a general lack of research that examine the elements of differential reinforcement and imitation in explaining conventional crime (Pratt et al., 2010) and cybercrime (Holt & Bossler, 2014). Despite a growing number of studies on digital piracy, the majority omitted differential reinforcement and imitation variables when testing the social learning model in predicting one's involvement in digital piracy (Higgins, Fell, & Wilson, 2006, 2007; Higgins, Wolfe, & Marcum, 2008).

Several studies demonstrated that these two measures affect one's participation in deviant behavior. Hinduja & Ingram (2008) found positive reinforcement and imitation predicted one's likelihood of engaging in music piracy. Skinner & Fream (1997) examined the four components of social learning theory, and found that different sources of imitation such as family, siblings, teachers and even on-line bulletin boards influence individuals to engage in piracy and password guessing to gain illegal access to computers. Without all four components, it is not possible to fully understand the concepts and dynamics that underlie the social learning process.

In addition to the effect of four individual-level elements of social learning theory, there are macro-level indicators that are relevant to an individual's learning of criminal behaviors (Akers, 1998; Jensen & Akers, 2003). In 1998, Akers expanded the social learning theory into the *social structure and social learning* (SSSL) model by incorporating the social structural measures as mediating factors and specifying them into four dimensions: differential social organization, differential location in the social structure, theoretically defined structural variables, and differential social location. Akers (1998) argues social structural variables impact individual's criminal propensity via their effect on four individual-level variables of social learning mentioned above.

Unlike most studies examining cybercrime, Holt, Burruss, and Bossler (2010) tested the expanded SSSL model of crime using demographic variables (as individual-level aspects of social structure) and four measures of social learning (Akers, 1998) for the purpose of exploring different forms of cyber deviance (including digital piracy). Using structural equation modeling, they found that social learning variables, particularly differential association and imitation, play a significant part in one's participation in cyber deviance, and that social learning mediates race and gender (full) and computer skills (partial) on cyber deviance. Their study provides strong empirical support for the social learning process as well as partial support for the SSSL mediation hypothesis.

Relationship between Self-control, Social Learning, and Cybercrime Offending

As illustrated above, the general theory of crime (Gottfredson & Hirschi, 1990) and social learning theory (Akers, 1998) have received a great deal of empirical support for explaining crime and deviance. These theories have competing explanations as to which factors contribute to individual differences in criminal behavior. While the general theory of crime (Gottfredson & Hirschi, 1990) proposes that low self-control is the major determinant of criminal and deviant behavior, social learning theory argues that criminal behaviors are learned through interaction with intimate groups such as family or peers as well as internalization of definitions or values favorable to law-breaking (Akers, 1998). Low self-control and deviant peer association are considered to be among the strongest and most consistent predictors of crime and delinquency in the real world (Akers, 1998; Gottfredson & Hirschi, 1990).

There is a need to examine the relationship between these two theoretical variables and crime in the context of cybercrime and deviance. Despite its competing explanations for criminal behavior, there seems to be a link between the two theories in that low self-control interacts social learning through social dynamics, specifically deviant peers (Akers, 1991, 1998; Gottfredson & Hirschi, 1987, 1990). Gottfredson & Hirschi (1987) imply that those with low self-control connect with delinquent peers and subsequently engage in criminal behavior. Akers (1998), however, asserts that individuals eventually learn self-control through socialization with peers.

While some scholars have supported the idea of integration involving social control and learning theories (Elliott, Ageton, & Canter, 1979; Akers, 2008), others considered it unlikely because the theoretical assumptions behind them may be deemed incompatible (Gottfredson & Hirschi, 1990; Hirschi & Gottfredson, 1993). Control theorists argue that individuals are alike in their motivation for committing crimes and that criminal and delinquent behavior is influenced by one's internalization of conventional norms and values (Hirschi, 1969; Gottfredson & Hirschi, 1990, Kornhauser, 1978). Proponents of social learning theories insist that individual differences in law-abiding or deviant behavior are largely determined by one's exposure to conforming and

deviant influence, the presence or absence of socialization in conventional values, as well as a learning process involving peer associations, social reinforcement, and acquisition of definitions and imitation (Sutherland, 1947; Akers, 1998; Akers & Jenson, 2006).

Additionally, the account by Kornhauser (1978) added that a culture consists of consensual values and norms that shape individual personality and social systems, meaning that there is agreement among the members of a society in how they perceive and evaluate delinquency and criminal behavior. However, if norms and values favorable to a deviant subculture are in opposition with those in a larger society or culture, being socialized into these deviant values and norms can lead to criminal behaviors. Given that values and norms may vary depending on cultural contexts, Kornhauser (1978)'s point may be relevant in exploring emerging crimes such as digital piracy or hacking.

With regards to the integration of self-control and social learning theories, scholars like Akers (2008) suggested that improvements can be made by integrating the concepts derived from both theories; an individual's low self-control can be linked with his or her association with deviant friends. Moreover, from a life-course perspective, low self-control and deviant peers may be interdependent throughout an individual's early life. According to the study by Wright, Caspi, Moffitt, and Silva (2001), the establishment of self-control in early adolescence before reaching the age at which a considerable amount of peer socialization takes place may explain the onset of offending. The impact of self-control may, however, decrease when peer interactions becomes more frequent and intense during early adolescence. More recently, Meldrum, Young, and Weerman (2009) examined an interaction between self-control and direct measure of peer delinquency, and found an interactive effect between self-control and peer delinquency

longitudinally. Overall, the debate on the theoretical integration between self-control and social learning perspectives seems to be inconclusive and ongoing.

Although there has been a general disagreement between scholars on the theoretical link between these two criminological perspectives, the common overlap points to the role of interactions with deviant peers. The inclusion of both low self-control and deviant peer association measures in the analysis may contribute to a fuller understanding real world and cyber deviance (Evans et al., 1997; Holt et al., 2012; Wright et al., 2001). Yet, further research must be conducted to assess whether self-control and social learning variables in single analytic models can serve as explanatory frameworks for investigating the phenomenon of cybercrime and deviance.

Only a few studies have examined the impact of self-control, social learning and involvement in specific forms of cybercrime. Utilizing structural equation modeling, Bossler and Burruss (2010) examined the direct and indirect effect of self-control on computer hacking (defined as unauthorized access of computer systems) using a sample of college students. They found that those with higher levels of self-control are more likely to engage in hacking after controlling for social learning measures. Although the finding seems to be contrary to the main proposition of self-control theory, Bossler and Burruss (2010) point out that computer hacking requires a certain level of patience and commitment to learn not only sophisticated techniques for hacking but also group norms and values of the hacker subculture (Holt, 2007; Jordan & Taylor, 1998). Moreover, associating with peers who have experience in hacking seems to be essential in order to become a successful hacker (Holt, 2007, 2010). Importantly, the study by Bossler & Burruss (2010) revealed that the four components of the social learning process are most

predictive of hacking behavior, and that the impact of self-control on the likelihood of participation in hacking is partially mediated by the social learning construct.

In a more recent study, Marcum, Higgins, Ricketts, & Wolfe (2014) utilized a sample of high school students to examine the impact of self-control and deviant peer association on three forms of hacking (logging into another person's email without person and sent an email, logging into another person's Facebook account without permission and posted a message, and unauthorized access to a website). They found that while deviant peer association came out to be significantly associated with all three forms of hacking, self-control was predictive of two forms of hacking (involving logging into Facebook account and unauthorized access to websites). It must be noted that while prevalence for the unauthorized access via Facebook and via websites were 14 percent and 12 percent respectively, the unauthorized access via email was only seven percent. The non-significant effect of low self-control may have been due to the severely limited variation in the measure for hacking via email.

Although this study provides empirical support for the social learning and self-control perspectives in explaining hacking behavior, the authors did not specifically control for self-control and deviant peer association. This is a limitation with the larger body of research on digital piracy overall (Higgins, 2004, 2007; Higgins & Makin, 2004; Higgins et al., 2007; Higgins, Wolfe, & Ricketts, 2008).

Among the limited research on cybercrime offending among juveniles so far, only one study has examined the effect of self-control and deviant peer influence on the likelihood of engaging in multiple forms of cybercrime and deviance. Holt, Bossler, and May (2012) examined a sample of middle and high school students, and found that low self-control and association with deviant peers were predictive of cyber deviance in general. These two

theoretical measures were also linked to specific types of cyber deviance: piracy (software and media), on-line pornography, and on-line harassment, and hacking.

Importantly, Holt et al. (2012) found that deviant peer association not only mediates but also exacerbates the effect of low self-control on cyber deviance in general. This is consistent with the finding that propensity to commit crime may interact with social influences (e.g. peers) to heighten the effect of individual characteristics (Evans et al., 1997). They did not, however, find the interaction between low self-control and deviant peer association for the five specific forms of cyber deviance. Overall, these findings suggest that self-control and social learning independently contribute to the risk of general and specific forms of deviance in cyber space among school adolescents (Holt et al., 2012).

At the same time, considering that the two theories conceptually overlap in the social contexts (Chapple, 2005; Evans et al., 1997; Longshore, Chang, Hsieh, & Messina, 2004), it seems logical to examine whether deviant peer association plays a mediating role in the relationship between low self-control and cybercrime. Gottfredson and Hirschi (1987) stated that individuals "acquire the propensity to delinquency, find delinquent friends, and then commit delinquent acts, including serious criminal acts" (p. 597). This comment implies the effect of low self-control may not be independent of differential peer association.

According to the social learning perspective (Akers, 1998), it is within deviant peer groups where individuals learn and gain the ability to control their behaviors. Associating with deviant peers increases the probability of one's involvement in deviant behavior. If there is a mediating relationship, it would support the finding that peers with low self-control "flock together" to facilitate crime and deviance in cyberspace (Higgins et al., 2006; Holt et al., 2012), similar to how they select themselves into deviant groups in the real world (Chapple, 2005;

Evans et al., 1997). Some even argue that the impact of low self-control would be greater when an individual associates with larger number of deviant peers, compared to when associating with smaller number of deviant peers, in the real world (Evans et al., 1997; Gibson & Wright, 2001) and even in the virtual world (Holt et al., 2012). There is also value in utilizing a juvenile sample to investigate if the interaction between low self-control and deviant peer association may be present as early as adolescence. The current dissertation sought to explore the link between low self-control, deviant peer association and involvement in real world and cyber deviance.

Summary of Hypotheses

Based on the general theory of crime (Gottfredson & Hirschi, 1990) and social learning theory (Akers, 1998), two sets of hypotheses were generated to test the independent effect of low self-control and deviant peer association on traditional and cyber deviance. The significance for hypothesis testing was determined at the .05 alpha level. Although existing studies identified low self-control and deviant peer association as significant predictors of deviance on-line and offline, this study examined the impact of each theoretical correlate, even while controlling for its competing variable.

A final set of hypotheses was created to examine whether there is a mediating or conditioning link between low self-control, deviant peer association and deviance. The present study hypothesized that the impact of low self-control on one's involvement in deviant behaviors on-line and off-line would be stronger when he or she socializes with deviant peers at a greater frequency. There is value in exploring this relationship given the theoretical linkage between the general theory of crime and social learning (Akers, 1998; Gottfredson & Hirschi, 1987). Further, there is scant literature on the relationship between low self-control, deviant peers, and cyber

deviance beyond digital piracy (Donner et al., 2014; Holt & Bossler, 2014). The following hypotheses were tested through the current analysis.

Low Self-Control and Deviance

Hypothesis 1a: Low self-control is positively associated with a general scale of traditional deviance.

Hypothesis 1b: Low self-control is positively associated with specific forms of traditional deviance.

Hypothesis 1c: Low self-control is positively associated with a general scale of cyber deviance.

Hypothesis 1d: Low self-control is positively associated with specific forms of cyber deviance.

Deviant Peer Association and Deviance

Hypothesis 2a: Deviant peer association is positively associated with a general scale of traditional deviance.

Hypothesis 2b: Deviant peer association is positively associated with specific forms of traditional deviance.

Hypothesis 2c: Deviant peer association is positively associated with a general scale of cyber deviance.

Hypothesis 2d: Deviant peer association is positively associated with specific forms of cyber deviance.

Low Self-Control, Deviant Peer Association and Deviance

- Hypothesis 3a: The effect of low self-control on traditional deviance is greater when youth associate with deviant peers more frequently.
- Hypothesis 3b: The effect of low self-control on cyber deviance is greater when youth associate with deviant peers more frequently.

The present study tested the hypotheses above using a sample of South Korean adolescents. The data, methodology, and analytic techniques employed for this study are discussed in detail in the following chapter.

CHAPTER 3: METHODOLOGY

This dissertation examined the extent to which self-control and associations with deviant peers affect involvement in specific and general forms of deviance on and off-line in a sample of South Korean youth. Prior studies examining cyber deviance have focused on specific forms of deviant behavior, particularly digital piracy. There is a need to understand the prevalence of cyber deviance occurring overall among youth population as well as the major correlates of cyber deviance in general. The majority of prior studies examining cybercrime offending utilized samples consisting of college students (Bossler & Burruss, 2010; Buzzell et al., 2006; Higgins, 2005; Higgins, Fell, & Wilson, 2006; Higgins & Wilson, 2006; Holt, Burruss, & Bossler, 2010; Reyns, Henson, & Fisher, 2012; Skinner & Fream, 1997). The current study utilized a juvenile sample to examine cyber deviance as youth are thought to spend substantial time engaging in unauthorized access to computer networks, and other forms of cybercrime and deviance (Furnell, 2002; Taylor et al., 2010; Yar, 2005).

Although the overlap between physical criminal activity and on-line deviance is unclear, this study investigated the potential link between real world and cyber behaviors by exploring the impact of technology on traditional deviance among adolescents. Specifically, different on-line activities, smartphone ownership, and computer proficiency were examined to consider their association with real world deviance. Extending to both person-based and property-based offending behaviors, this study examined multiple forms of cybercrime and deviance such as hacking, Internet pornography, on-line harassment, and different forms of digital piracy.

The main research questions were concerned with whether theoretical variables – low self-control and deviant peer association – can predict one's likelihood of engaging in deviance in the real world and cyberspace. Another research question focused on the socio-demographic

characteristics of cybercrime offending, specifically, age, gender, and family structure. Finally, this study attempted to explore if there is a potential mediating or conditioning relationship between low self-control, deviant peer association, and deviance. Below are the research questions that the current study sought to answer.

Question 1) What are the socio-demographic correlates of cyber deviance? (e.g. technology use, computer proficiency, demographics)

Question 2a) Is low self-control predictive of deviance in the real world and cyberspace? (specificity and generality)

Question 2b) Is social learning (e.g. deviant peer association) predictive of deviance in the real world and cyberspace? (specificity and generality)

Question 3) Is there a mediating or conditioning relationship between self-control and social learning in relation to cyber deviance?

Role of Technology and On-line Communities in South Korea

Before discussing the sample and measures, it is necessary to contextualize technology use in South Korea and the reasons for examining this population in general. Following decades of economic advancement, South Korea experienced a phenomenal growth of the Internet, touted as one of the most "wired" countries in the globe (National Internet Development Agency of Korea, 2008). Teenagers and young adults are considered to be the most active users of technology based on the widespread use of smartphone devices and high social media usage by the adolescent population (National Information Society Agency, 2011). Technology offers adolescents unprecedented opportunities to communicate and interact with peers overseas at

anytime and anywhere, using instant messaging applications (e.g. Kakao Talk) through their mobile gadgets.

The current generation of youth is frequently exposed to technological gadgets at an earlier age, and a significant number of parents in South Korea tend to purchase these devices for their children. A report by the Ministry of Gender Equality and Family (2013) in South Korea surveyed more than 10,000 school students from fourth through 12th grade. Of the respondents, nine in 10 adolescents own or had access to a cell phone. In terms of smartphone ownership, 72.2 percent of elementary school students, 86.2 percent of middle school students, and 84.9 percent of high school students owned a smartphone in 2013. This illustrates that a large number of South Korean youth own Internet-enabled devices during early childhood.

Technology also plays an instrumental part in facilitating off-line collective activities (e.g. street demonstration, social protest). On-line communities and groups in South Korea play a crucial role in encouraging civic engagement and political participation in off-line activities via social media, (Lee & Lee, 2010). For teenagers, the Internet can be used in gathering political information on-line and facilitating political activity such as public demonstrations (Yun & Chang, 2011). Citizens on the Internet, generally referred to as the "netizens," have taken an active role in organizing off-line meetings and events (Postmes & Brunsting, 2002). For example, Twitter is used as a social network tool to disseminate information and to mobilize collective actions in the real world; off-line meetings may increase the level of intimacy among members of on-line communities (Choi & Park, 2014).

In a collectivistic society like South Korea that emphasizes the values of communalism and solidarity over individualism, technology can assist in transferring social relationships and a sense of community from on-line to off-line environments, and vice versa (Kim & Yun, 2007;

Rhee & Kim, 2004). Despite the widespread availability of high-speed networks and CMCs in this country, there seems to be little research examining the impact of technology use on the development of deviant behaviors (e.g. harassment, hacking) among adolescents. Since South Korean youth are heavy technology users who spend a great deal of time on-line, their patterns of technology use may increase their risk of involvement in deviant behaviors in on-line spaces. Different communication modalities, such as instant messaging systems, Internet Relay Chat, and social networking sites provide opportunities for adolescents to engage in deviant or delinquent behaviors off-line (e.g. bullying) and on-line (e.g. piracy). The current study addresses whether the use of CMCs influences one's participation in various forms of deviance both on-line and off-line.

Research Design and Analytic Strategy

The study utilized a cross-sectional survey design that seeks to examine the prevalence and correlates of cybercrime and traditional offending among South Korean adolescents. Survey research is useful for studies with exploratory or descriptive purposes, allowing researchers to investigate the association of two or more variables at one point in time (Bachman & Schutt, 2012). It is one of the most widely used for collecting data among criminal justice researchers (Maxfield & Babbie, 2011).

In this study, the main purpose was to explore the relationship between self-control, deviant peer association, and offending behavior (off-line and on-line) by testing a series of hypothesis based on two individual-level criminological perspectives, namely the general theory of crime (Gottfredson & Hirschi, 1990) and social learning theory (Akers, 1998). Examining the relationship between these theoretical variables and youth deviance in the context of traditional

and cyber environment can provide pertinent information for our understanding of deviance and crime among young people. Given that there is little understanding of how pervasive the problem of cyber deviance is outside of the United States, the findings from the current study can be useful in gaining an understanding of risk factors that are associated with deviant and criminal behaviors off-line and on-line.

A cross-sectional design was used to examine in this study for several reasons. Among types of survey design, cross-sectional designs are most commonly used by researchers and involve a sample of respondents selected to represent a specific target population at one point in time. Cross-sectional studies generally have an advantage over other research designs in terms of cost, time to collect data, and resources for follow-up (Singleton & Straits, 2005).

With regard to analytic strategy, this study began with an exploration of bivariate relationships between deviant behaviors on and off-line, low self-control, deviant peer association, technology-related and demographic variables. This analysis was conducted to identify the statistical significance and direction of the relationship between the aforementioned variables. Based on the correlation matrix, it was determined whether the hypothesized relationships were supported at the bivariate level.

A number of analyses were conducted to address whether low self-control and deviant peer association are predictive of traditional and cybercrime offending at the multivariate level, while controlling for other technology-related and demographic variables. Moreover, z-tests were used to compare the regression coefficients (of reduced and full models) and identify any statistically significant differences between the models, in order to examine the conditioning effect of deviant peer association on the link between low self-control and deviance (Paternoster, Brame, Mazerolle, & Piquero, 1998).

Sampling

The target population of this study was upper elementary (4th to 6th grade) and middle (7th to 9th grade) school students in South Korea. A convenience sampling strategy was used to collect a sample of 780 upper elementary and middle school students in a medium-sized urban school district in South Korea. This is a non-probability sampling procedure that relies on the accessibility and availability of subjects (Maxfield & Babbie, 2011).

Using a convenience sampling process, the data from upper elementary and middle school students for the purpose of examining correlates of cyber deviance during early and middle adolescence. As new technologies become an integral part of lives of school youth and children, there is evidence that use and ownership of technology starts early. Youth aged between 12 and 17, as the most active age group of technology use, participates in a wide range of on-line activities that involve creating content in cyberspace such as blogs, photo stories, and social media (Madden et al., 2013). Six in ten of all children in the United States had owned a mobile phone before they turned age 14 (Lenhart et al., 2010). Outside the United States, a majority of elementary school students (72.2%) in South Korea own a cell phone or smart phone. Considering the growing use of technology by youth, there is concern that they may be exposed to unwanted on-line materials and content from which they can form deviant values and behaviors (Wolak, Mitchell, & Finkelhor, 2006). Hence, the earlier onset of exposure to technology can lead to earlier involvement in deviant activities.

Recent literature shows that adolescents are increasingly perpetrating deviance both online and off-line using the Internet via interaction with peers (Marcum et al., 2014; Meldrum & Clark, 2013). For instance, time spent on-line socializing with peers was found to be

significantly linked to deviant behaviors such as substance use and petty theft (Meldrum & Clark, 2013).

Although a random sampling is desirable, a convenience sample was used due to the challenging issue of gaining permission from the school administrators, teachers, and parents for youth to participate in the current research. Without the approval from these parties, it would be impossible to conduct research using a random sample drawn from the list of registered schools (sampling frame) provided by the ministry of education in South Korea. Although attempts to gain an accurate representation of Korean youth can be made via random sampling, there is absolutely no guarantee whether schools would permit a researcher to conduct research on students enrolled at their institutions. Moreover, it is very uncertain whether the school administrators would allow one to disclose or report the study findings. Unless the research is funded or sponsored by a government agency, it is extremely difficult to gain permission from the school administrators and teachers.

Furthermore, middle and high school students in Korea devote a majority of their time in studying and preparing entrance exams for college. It is very challenging for them to allocate their time in participating in non-academic activities. Given South Korea's culture and expectation for students to achieve academic success in school (Schneider & Lee, 1990), teachers and parents of middle and high school students are very likely to be unwilling to give consent to research participation. Consequently, convenience sampling becomes a "catch-as-catch-can" since it relies on conveniently available subjects (Singleton & Straits, 2005).

Although this sampling strategy does not gain a representative sample of the general adolescent population, convenience sampling can help us to understand the prevalence of technology use across different age and gender groups, as well as the factors that are related to

participation in deviant activities in both real and virtual worlds among South Korean adolescents. One of the key limitations of a non-probability sampling method is that it typically excludes a large number of individuals from the selection process (Dillman, Smyth, & Christian, 2014). It relies mainly on the voluntary participants whose selection probabilities are not known. It must be noted that the current sample does not yield a representative sample of the targeted population, and thus unable to generalize the findings to other populations. Although nonprobability sampling suffers a number of limitations, conducting a probability sampling can be challenging and infeasible in social science research.

Data Collection Procedure

The current study collected self-reported survey data from students in upper elementary and middle schools in South Korea. A survey instrument was created to gather information on prevalence of technology use, experience engaging in deviant behaviors on-line and off-line, demographic characteristics. The questionnaire contained a short introduction of the study, statements about protection of privacy and assurance of confidentiality, method of data collection, contact information of principal investigators and institutional review board (IRB), and the question items relevant to the current study. The survey instrument was translated from English to Korean by the researcher, which was then reviewed by two Korean doctoral students at Michigan State University for enhancing clarity and consistency. The final version of translated instrument was thoroughly assessed by a school teacher in South Korea to further validate the translation.

To increase the reliability of the measures, a pilot test of the survey instrument (Korean translation) was conducted with five young respondents (aged between 10 and 14) who were

native Korean speakers. These respondents were recruited to read the questionnaire within a thirty minute period. After reading the questionnaire, they were asked whether or not they fully understood words in each item and whether they thought of better way to formulate the question items. Based on their feedback and suggestions, revisions were made accordingly. Using the pilot test, the survey instrument was further refined to ensure some reliability in thee measurement of the study.

Upon receiving approval of the consent forms from the IRB office at MSU, they were sent out to the school teachers in South Korea. Consent forms and letters describing the purpose and goals of the study were sent out and collected from both the participants and their parents in selected classrooms. In order to administer self-reported questionnaires, head teachers in each classroom were trained and educated about the protecting human subjects' rights to privacy and anonymity, voluntary participation, and possibility to withdraw from the current study. Prior to distributing the survey questionnaire, students were clearly informed that they were not obligated to participate or complete the questionnaire. Teachers also verbally informed the students of their rights, including anonymity and confidentiality of the current survey, and the information stated in the questionnaire. Once the consent process was completed, the school teachers handed out the questionnaire to students whose parents or guardians agreed to allow their children to voluntarily participate in this research.

All of the survey questionnaires were administered by classroom teachers during school hours between March and May 2012. Of the total of 1,887 school students, 780 students (42%) participated in the survey. Figure 1 displays the response rates for the elementary and middle schools. Of the 780 adolescents who participated in the survey, 350 students were enrolled in elementary school and 430 were enrolled in middle school. More specifically, 24 percent

(187/780) were in fourth grade, 21 percent (163/780) were in fifth grade, and 55 percent were (430/780) in ninth grade.

School	Total number of students	Number of survey returned	Response rate (%)	Type of school
А	787	350	44%	Elementary school
В	1,100	430	39%	Middle school
Total	1,887	780	42%	

Figure 1. Response Rate for Survey Instrument

Measurement of Variables

Dependent Variables

A total of 13 dependent measures were examined in this study, each of them relating to deviant behaviors in real world and on-line contexts. Six variables were used to measure traditional offenses committed by adolescents in the real world, and five variables were included to measure deviant and criminal behaviors in cyberspace. Initially, all of the 11 deviance variables were measured on a nine-point ordinal scale (0=Never; 1=Once or twice a year; 2=Once every two to three months; 3=Once a month; 4=Once every two to three weeks; 5=Once a week; 6=Two to three times a week; 7=Once a day; 8=Two to three times per day).

Traditional Deviance was measured by asking respondents about how often they engaged in the following specific behaviors in the past 12 months: 1) Purposely damaged or destroyed property that does not belong to you (*property offense*), 2) Skipped classes without an excuse (*truancy*), 3) Verbally threatened someone to physically hurt them (*threatening*), 4) Teased someone in a

hurtful way (*verbal bullying*), 5) Physically hurt someone such as kicking or punching (*physical bullying*), and 6) Purposely left out someone (*relational bullying*).

Cyber Deviance was measured by items asking respondents about how often they engage in the following specific behaviors in the past twelve months: 1) Knowingly used, made, or gave to another person a "pirated" copy of commercially sold computer software (*software piracy*), 2) Knowingly used, made, or gave to another person "pirated" media (*media piracy*), 3) Intentionally posted or sent mean or hurtful messages to another person on-line (*on-line harassment*), 4) Purposely used the Internet to view sexually explicit materials (*on-line pornography*), and 5) Accessed another person's computer or files without his or her knowledge or permission (*hacking*) (Bossler & Burruss, 2010; Bossler et al., 2012; Rogers, Smoak, & Liu, 2006; Skinner & Fream, 1997).

Binary Measure of General Deviance

In order to assess the generality of the deviant behavior in the physical world and cyber space, six specific traditional and five specific on-line deviance measures were combined and added to measure a construct that reflects an individual's general tendency or likelihood to engage in deviant or antisocial behavior in each type of environment. Firstly, the general deviance in the physical world was created by adding six items of real world deviance above and subsequently collapsing into a dichotomous measure (0=no deviance; 1=deviance). The *Cronbach's alpha* value for the six items of traditional deviance was generated to assess the reliability of measurement scales (*Cronbach's \alpha = .87*). Similar to the binary dependent variable for traditional deviance, the general deviance in cyberspace was measured by adding five items

of on-line deviance above and subsequently converting into a dichotomous variable (0=no deviance; 1=deviance). The *Cronbach's alpha* value for these five items was .84.

For the multivariate analysis, a binary logistic regression was selected as a main analytic technique due to the skewed distribution and excessive amount of zeros, especially with cyber deviance variables. While the percentage of zeros for the specific forms of cyber deviance ranged from 79 to 90 percent, 61 percent of the general cyber deviance measure were considered to be zeros.

In terms of prevalence of those engaging in specific forms of cyber deviance, 8.1 percent of youth engaged in software piracy once or twice a year, whereas only 2.2 percent of respondents reported participation in this behavior once every two to three months. Among the remaining response categories, slightly above 1% or smaller than 1% engaged in the same behavior. For media piracy, 7.9 percent of respondents engaged in this type of piracy once or twice a year. While 2.8 percent of youth participated once every two to three months, 2.3 percent of youth uploaded and downloaded pirated media once a month. There was very low prevalence for the five remaining response categories.

Concerning the prevalence of viewing on-line pornography, 11.2 percent viewed pornographic materials on-line once or twice a year. While 2.9 percent of youth viewed them once every two to three months, 2.1 percent of youth did so once a month. Another 2.6 percent of youth spent time viewing on-line pornography once every two to three weeks. In fact, 1.4 percent of respondents reported that they viewed them two to three times a week. There was much lower prevalence for the two remaining response categories.

For on-line harassment, 9 percent of respondents harassed others on-line once or twice a year. 2.6 percent participated in on-line harassment once every two to three months, whereas 1.8

percent did so once a month. For the remaining response categories, less than 1 percent engaged in this behavior. Finally, 5.8 percent of youth engage in hacking once or twice a year. While 1.2 percent of youth participated in hacking once every two to three months, only 1 percent of them did so once a month. For the five remaining response categories, less than 1 percent of youth engaged in this behavior. As illustrated, the distributions of these dependent variables were skewed with a large amount of zeros and a lack of variation in the response categories.

As a result, the ordinal dependent variables were coded into two categories (0=no deviance, 1=deviance). These dichotomous dependent measures were employed in the binary logistic analysis that examined the effect of low self-control and deviant peer association. Additionally, these same dichotomous measures were used for the binary logistic regression using the two partitioned samples (based on high and low levels of deviant peer association).

Independent Variables

Low self-control was measured using the nine item scale measuring five dimensions of selfcontrol derived from Grasmick et al. (1993). The items pertaining to the dimensions of selfcontrol were coded on a scale from 1(strongly disagree) to 4 (strongly agree). Scores for these items were summed to create a higher score indicating lower self-control. Only nine items are collected due to a shortened version of survey instrument¹. Those nine items for low self-control were divided under five dimensions. For the *impulsivity* dimension, two items are measured: 1) I often act on the spur of the moment without stopping to think, 2) I often do whatever brings me

¹ Since the survey instrument was being distributed to a group of youth, the page length of the questionnaire needed to be reasonable depending on the target audience (Dillman, Smyth, & Christian, 2014). Also, based on the suggestion of school administrators, the survey instrument was limited to a certain number of pages. In order to fit all of the question items, the remaining items for low self-control were excluded.

pleasure here and now, even at the cost of some distant goal. The *simple tasks* dimension had one item is measured, 3) The things in life that are easiest to do bring me the most pleasure. For the *risk-seeking* dimension, two items are the following, 4) Sometimes I will take a risk just for the fun of it, and 5) I sometimes find it exciting to do things for which I might get in trouble. For the *self-centeredness* dimension, one item is measured: 6) If things I do upset people, it's their problem, not mine. Lastly, the *temper* dimension consists of three items: 7) I lose my temper pretty easily, 8) Often when I'm angry at people, I feel more like hurting them than talking to them about why I am angry, and 9) When I am really angry, other people better stay away from me. The results from the principal components factor analysis of the self-control items indicated that nine factors ranged from 3.5 to 0.4 in the eigenvalues. Consistent with prior research (Grasmick et al., 1993; Mitchell & MacKenzie, 2006), it was reasonable to consider the measure of low self-control to be unidimensional given the sizeable difference in eigenvalues between the first (3.5) and second factor (1.3); hence, these items were collapsed into a single construct of low self-control.

Theoretically, Gottfredson and Hirschi (1990) argue that that self-control is a single, unidimensional construct. Prior research has used varying number of items to create the attitudinal measure of low self-control (Evans et al., 1997; Grasmick et al., 1993; Turner & Piquero, 2002). For example, Turner and Piquero (2002) utilized 6 attitudinal items of selfcontrol based on the National Longitudinal Survey of Youth (NLSY) to test the stability of selfcontrol within and across groups with different characteristics. In addition, a *Cronbach's alpha* value was used to assess the reliability of this measure (Cronbach's $\alpha = .81$). By using the selfcontrol measure derived from Grasmick et al. (1993), the study findings from the current study

can be compared with prior research examining self-control and specific forms of traditional and cybercrime.

Deviant peer association was a five-point scale (0=None; 1=Only a few; 2=About half; 3=More than half; 4=Almost all of them) measure that was used to reflect the level of association with negative or deviant peers in cyberspace. It should be noted that the current measure of deviant peer association does not capture an individual's association of deviant peers in the real world. This measure was operationalized by asking respondents how many of their friends have engaged in the following specific behaviors in the past twelve months: 1) Posted mean or hurtful on-line messages through a message board or on-line forum, 2) Sent a mean or hurtful message to someone via e-mail or instant messaging, 3) Knowingly used, made, or gave to another person a "pirated" copy of commercially-sold computer software, 4) Knowingly used, made, or gave to another person "pirated" media (e.g. music, movie), 5) Tried to guess another person's password to get into his/her computer account or files, 6) Accessed another's computer account or files without his/her knowledge or permission only to view the information or files, 7) Viewed pornographic, obscene or offensive materials on-line (Bossler & Holt, 2010; Rogers et al., 2006; Skinner & Fream, 1997), and 8) Tried to get someone to talk about sex when they did not want to (sexual conversation via the Internet) (Wolak et al., 2006). In order to create a more robust measure of deviant peer association, a composite measure was created by summing all of the eight items of association with deviant peers above.

Based on prior studies concerning peer influence on delinquency, peers serve as agents that reinforce aggressive and deviant behaviors in the real world and cyberspace (Akers, 1998; Warr, 2002). Research has documented the significant role of peer associations explaining youth

involvement in delinquent behaviors (Pratt & Cullen, 2010). In addition to real world peers, virtual peers have shown to be influential in individual's offending behavior with computer hacking (Holt, 2007, 2009; Jordan & Taylor, 1998), digital piracy (Cooper & Harrison, 2001; Holt & Copes, 2010; Morris & Higgins, 2010), on-line harassment (Bossler et al., 2012; Holt et al., 2012) and on-line pornography (Skinner & Fream, 1997). Through interaction with virtual peers, knowledge and techniques for the commission of cybercrime are learned (Holt, 2007; Holt & Copes, 2010). However, only a few studies have examined the effect of virtual peers on traditional deviance (McCuddy & Vogel, 2014; Meldrum & Clark, 2013).

Some argued that virtual peer associations may be as important as traditional peer associations in the context of digital piracy (Hinduja & Patchin, 2009; Miller & Morris, 2014). With the widespread use of peer-to-peer sharing technology and social networking sites, youth form on-line social networks for exchanging information and files. There is evidence that an individual's participation in crime is significantly related to one's exposure to criminal behavior via on-line networks (McCuddy & Vogel, 2014). Thus, it is important to explore whether differential peer association in cyberspace influences one's involvement in deviance both off-line and on-line. This study utilized the measures of associating with peers who engage in deviant behavior on-line in the models for quantitative analysis of both traditional and cyber deviance.

A number of cybercrime studies found a composite measure of peer deviance to be a direct, significant predictor of cyber deviance (e.g. media piracy, software piracy, on-line harassment, Internet pornography, hacking) (Bossler & Burruss, 2010; Holt et al., 2010, 2012). Consistent with these prior studies, this study also used a composite measure of deviant peer association to explain the probability of cyber deviance. Furthermore, it should be noted that the current study used only one of the four components of the social learning theory (Akers, 1998) –

differential association. According to Akers (1998), individuals learn to engage in deviant and criminal behavior depending on their differential associations. Individuals associate with peers by which deviant definitions and models are introduced and reinforced through a social learning process. Although this study offers a partial test of the social learning theory, association with deviant peers have previously been shown to be a stronger correlate of most types of crime and deviance, compared to low self-control (Pratt & Cullen, 2000; Pratt et al., 2010; Warr, 2002). Despite this limitation, the current measure of differential peer association appears to have some value for examining deviance on-line and off-line.

Control Variables

Five demographic characteristics were assessed in the study. *Computer proficiency* was a fourpoint measure created, partly based on an ordinal scale adapted from the study by Rogers (2001), to assess how well an individual is able to proficiently use technology (e.g. Internet, computer): 1) "I am afraid of computer technology, so I rarely use computers" (unskilled), 2) "I have no problem using the Internet and I can also use general software, but I cannot repair computers when they are broken" (beginner), 3) "I can use a variety of softwares and fix some computer problems I have" (intermediate), and 4) "I can use Linux, most softwares, and fix most computer problems I have" (advanced). A larger number indicates a higher level of computer knowledge of the student. Adolescents who are equipped with computer knowledge and skills not only take part in cybercrime activities (e.g. hacking) but also guide others toward a deviant subculture (Pyrooz et al., 2013; Sela-Shayovitz, 2012).

Technology use was divided into six measures: five measures for technology use and one measure for ownership of portable technology (e.g. smart phone, tablet). For technology use,

respondents were asked to rate the amount of time spent on-line related to non-academic and academic activities among adolescents using an ordinal scale ((0=Never; 1=Less than an hour; 2=One to two hours; 3=Three to five hours; 4=Six to nine hours; 5=Ten or more hours; Holt & Bossler, 2009; Bossler & Holt, 2009). Four variables, *hours on-line playing video games, hours on-line checking email, hours on-line using instant messaging* (IM), and *hours on-line downloading & uploading files*, were measured on a six-point scale by asking respondents about how many hours have they spent each week performing the following activities while on-line or using a computer in the past six months.

A five-point scale² was used to measure the variable, *hours on-line for school-related reasons*, by asking respondents about the number of hours spent on-line for school related work (0=Less than five hours; 1=Five to ten hours; 2=Eleven to fifteen hours; 3=Sixteen to twenty hours; 4=Twenty one or more hours). Lastly, concerning the dichotomous measure for *smartphone ownership*, respondents were asked about whether they currently have a smart phone of their own (0=No; 1=Yes).

Finally, *family structure* was a dichotomous variable that aimed to measure the level of measure of family intactness (1=Intact; 0=Non-intact). This variable was coded as intact if the respondents reported to live with both parents and non-intact if they reported other family structures (e.g. living with a single parent, living with a grandparent). *Age* was an ordinal measure that ranges from 10 to 16. *Gender* was a dichotomous measure with 0 indicating male and 1 indicating female.

Descriptive Statistics

² This scale was slight different from the scales used for other technology measures in order to capture a wide variation of time spent using the Internet for school related activities.

The sample characteristics are presented in Table 1. In terms of the type of deviance, the youth in the sample engaged in deviant behaviors in more frequently in the real world (58%) than in cyberspace (39%). Among the types of traditional deviance, the three forms of bullying – verbal (36%), physical (34%), and relational (31%) – were the most prevalent. Approximately 23 percent of the youth were involved in property offense. The acts of truancy (18%) and threatening (13%) had the lowest among the six types of traditional deviance. For cyber deviance, viewing of on-line pornography was the most prevalent behavior (21%) engaged by the youth. They were equally involved in media piracy (16%) and on-line harassment (16%). Since software piracy and hacking requires more sophisticated computer skills and greater technical knowledge (e.g. use of torrent technology, cracking code) compared to other forms of cybercrime (Jordan & Taylor, 1998; Morris & Blackburn, 2009), youth in the current sample engaged in these activities to a lesser degree compared to other offenses. Only 14 percent of youth engaged in software piracy, and an even smaller percentage of youth engaged in hacking (10 percent). Regarding the two composite measures of deviance, 58 percent and 39 percent of youth participated in real world deviance and cyber deviance respectively.

While a limited number of quantitative studies on computer hacking found that the rate of self-reported offending ranges from six percent (Bossler & Burruss, 2010) to 100 percent (Skinner & Fream, 1997) among college students, the majority of the rates fall between 14 and 87 percent (Bossler & Burruss, 2010; Holt et al., 2010; Morris, 2010; Rogers et al., 2006) for simple forms of hacking such as password guessing or unauthorized access to view or modify files. For the adolescent population, the study by Marcum et al. (2014) revealed that seven to 14 percent of juveniles engaged in some form of hacking. Although the prevalence of hacking in the current sample was within the lower range of existing studies, it must be acknowledged that the

current sample consisted of mainly adolescents aged from 10 to 16. Presumably, college students are more likely to be more experienced and proficient in using computers for various purposes, compared to adolescents.

While the level of low self-control ranged from 9 to 45, with a mean of 19.29, the *association with deviant peers* ranged from 0 to 25, with a mean of 2.09. The descriptive statistics indicated that overall the youth in the current sample reported having only a small percentage of peers who engage in deviant behaviors on-line.

As previously mentioned, the sample contained information on different types of on-line activity and the amount of hours spent per week engaging in them. Youth reported the greatest amount of time spent playing video games (4.26). The second most prevalent activity that the youth participated in cyberspace was downloading and uploading files (3.65). Youth spent the least amount of time on-line doing school related work (2.49). Research by Holt and Bossler (2009) illustrated that spending more time in cyberspace for purposes that are not related to academic work may lead to more opportunities to engage in deviant behaviors such as sending harassing messages to others.

Respondents were also asked about ownership of smartphones and general computer proficiency. While approximately 31.8 percent of the respondents owned a smartphone, a majority of the respondents considered themselves to be at a beginner (28.2%) or intermediate (64.8%) level in terms of computer skills. Prior research indicated that those with higher levels of computer skill were more likely to engage in intermediate or advanced types of cybercrime offending such as media piracy software piracy, hacking, and malware writing (Hinduja, 2001; Holt et al., 2012; Holt, Strumsky, Smirnova, & Kilger, 2012).

The current sample, consisting of 780 school children, indicated that mean age of the sample is 14 years old. In terms of gender, 50.7 percent of the sample was male and 49.3 percent was female. For family structure, 84.3 percent of the respondents in the sample were residing in an intact family structure with both biological parents, while 15.7 percent were living in a non-intact family.
	Ν	%	Mean	SD	Range
Dependent Variables					
Traditional Deviance (General)	779		.58	.494	0-1
Property Offense	779		.23	.419	0-1
Truancy	779		.18	.383	0-1
Threatening	779		.13	.332	0-1
Verbal Bullying	779		.36	.482	0-1
Physical Bullying	779		.34	.475	0-1
Relational Bullying	779		.31	.463	0-1
Cyber Deviance (General)	779		.39	.488	0-1
On-line Pornography	779		.21	.411	0-1
On-line Harassment	779		.16	.366	0-1
Media Piracy	779		.16	.365	0-1
Software Piracy	779		.14	.348	0-1
Hacking	779		.10	.304	0-1
Independent Variables					
Low Self-Control	779		19.29	6.248	9-45
Deviant Peer Association	779		2.09	3.802	0-25
Computer Proficiency	20	4.0			
Beginner	505	4.9 64.8	-		
Intermediate	220	28.2	2.27	.582	1-4
Advanced	16	20.2	-		
Smartphone Ownership					
Own a smartphone	248	31.8			
Do not own one	531	68.2	.32	.466	0-1
Hours on-line for school related work	779		2.49	1.563	1-5
Hours on-line playing video games	779		4.26	1.691	1-6
Hours on-line checking email	779		3.54	1.822	1-6
Hours on-line using instant	770		2.52	1.007	1 (
messaging	//9		2.53	1.896	1-6
Hours on-line downloading and	779		3 65	1 897	1-6
uploading files			5.05	1.077	1-0
A ~~	770		14.26	1.961	10.16
Age	119		14.30	1.801	10-10
Male	395	50.7		500	0-1
Female	384	493	- · · · ·	.500	0-1
Family Structure	201	19.5			
Intact	657	84.3	.84	.364	0-1
Non-intact	122	15.7	1		

 Table 1. Descriptive Statistics (n=779)

CHAPTER 4: FINDINGS

This chapter provided a detailed description of diagnostic procedures and results of the quantitative analyses, and interpretation of study findings. First, bivariate correlations were presented to identify meaningful relationships between variables under study. The tolerance and variation inflation factor (VIF) diagnostics for multicollinearity were performed to examine if there are any highly intercorrelated independent variables in the regression models. The analysis proceeded with the estimation of multivariate logistic regression models that examine the impact of low self-control and deviant peer association on the general and specific forms of deviance on-line and off-line. It should be noted that a listwise deletion procedure was applied for one case due to a missing response. A respondent did not complete one of the question items (specifically the *level of computer proficiency*), and there was no other missing values in the dataset. After excluding 1 case, all of the analyses comprised a sample of 779 students³.

For the binary logistic regression analyses, reduced and full models predicting the likelihood of traditional deviance and cyber deviance were presented. A total of 13 logistic regression models were performed: two for general deviance in the real world and cyberspace, six for specific types of real world deviance, and five for specific types of cyber deviance.

Among the control variables, this study examined a hypothesized relationship between gender and deviance. Similar to the gender difference in traditional crime, empirical evidence suggested that males are more likely than females to engage in more serious and sophisticated forms of cybercrime such as malware creation (Skinner & Fream, 1997), software piracy (Higgins, 2006; Hinduja, 2003), unauthorized access to computers (Jordan & Taylor, 1998), as

³ After running all statistical analyses with a sample of 780 as well as a sample of 779 participants, there was practically no difference between the two results, including the numerical value and significance of the coefficients.

well as illegal downloading of software and use of sensitive, personal information (Moon, McCluskey, & McCluskey, 2010).

Moreover, the current study examined whether the Internet use and ownership of technology influences one's participation in traditional and cyber deviance. Considering that adolescents are active users of the Internet and social media, it is reasonable to suppose that they are likely to be introduced to a variety of deviant, risky behaviors (e.g. pornography, piracy) in on-line environments (Wolak, Mitchell, & Finkelhor, 2007). Also, owning a technological device (e.g. laptop, smartphone) gives individuals greater access and opportunity to engage in deviant and criminal activities on-line (Holt, 2012; Holt, Fitzgerald, Bossler, Chee, & Ng, 2014). Both computer and digital media player ownership were shown to influence the likelihood of one's participation in digital piracy among college students (Holt & Morris, 2009), whereas mobile phone ownership was also found to be correlated with the risk of being harassed by peers (Holt, Chee, Ng, & Bossler, 2013). Hence, it can be hypothesized that technology ownership and time spent on on-line activity is positively linked with the risk of engaging in deviant behavior.

The current study also examined whether deviant peer association mediates or conditions the relationship between low self-control and deviance in both real world and cyberspace. Prior research has indicated a mediating effect of deviant peer association on the linkage between low self-control and offending in the physical (Chapple, 2005; Evans et al., 1997; Longshore et al., 2004) and virtual world (Gibson & Wright, 2001; Higgins & Makin, 2004; Holt et al., 2012). To better examine the potential relationship between low self-control, peer deviant association and crime in both on-line and off-line domains, reduced and full regression models were performed to assess the mediating role of deviant peer influence on the likelihood of engaging in deviant behavior. Further, the sample was partitioned into two groups of adolescents with a high and low level of one's association with deviant peers. Subsequently, logistic regression models were used for the two partitioned samples In addition, by using the Z-score test developed by Paternoster et al. (1998), the current study examined whether the deviant peer association conditions (specifically enhances or exacerbates) the effect of low self-control on the risk of traditional and cyber deviance.

Bivariate Correlation

The first analysis involved exploring bivariate relationships between deviance in the digital and real world as well as technology use, deviant peer association, and demographic variables. Six variables representing traditional deviance (property offense, truancy, threatening, verbal, physical, and relational bullying) and five variables representing cyber deviance (on-line harassment, software piracy, media piracy, pornography, and hacking), as well as both general deviance measures were all dichotomous variables used in this bivariate correlation model.

In Table 2, a correlation matrix was generated using Spearman's correlation coefficients rather than Pearson's correlation coefficients for two reasons⁴. First, the Spearman's correlation coefficient (also called Spearman's Rho) is a non-parametric measure of correlation that is especially useful when using skewed measures because they take into account the similarity of rank ordering (Hauke & Kossowski, 2011). Based on the descriptive statistics, all of the dependent measures were highly skewed (with excess zeros), particularly the cyber deviance measures (see Table 1). Secondly, the Spearman's Rho does not require a normal distribution and is useful for using ordinal ranked data (Faherty, 2007; Myers & Sirois, 2006). Because there is no strict assumption made concerning the population from which a sample is drawn,

⁴ A Pearson's correlation matrix was also conducted, but the levels of significance as well as the actual coefficients were very similar to those for the Spearman's correlation.

Spearman's correlation coefficients are applicable to non-normal, skewed distribution (Doane & Seward, 2011). Thus, it provided a more adequate correlational analysis for the current data.

The relationships between the dependent variable and each of the independent variables were examined at the bivariate level in order to identify the direction, magnitude, and the level of significance of Spearman's correlation coefficients. Based on the correlation matrix illustrated (see Table 2), several hypothesized relationships were supported. First, the analysis found that the two theoretical variables – low self-control and deviant peer association – were significantly and positively correlated with traditional and cyber deviance measures. Although low selfcontrol was significantly correlated with both traditional and cyber deviance in general, it was more highly correlated with traditional deviance (Spearman's rho = 0.34, p < 0.01) compared to cyber deviance (Spearman's rho = 0.25, p < 0.01). Deviant peer association, based on the social learning theory, was also found to be significantly and positively correlated with both types of deviance. Associating with deviant peers seemed to be stronger in cyberspace (Spearman's rho = 0.46, p < 0.01) than in the physical world (Spearman's rho = 0.22, p < 0.01). Considering that the question item for *deviant peer association* asked respondents about their virtual peers engaging in a variety of deviant behaviors on-line, it may be attributable to the fact that the Internet may simply play a role in the social learning of deviant activities among youth.

Secondly, an individual's ownership and proficiency with technology seemed to be linked with cyber deviance. Both the level of computer proficiency (Spearman's rho = 0.14, p < 0.01) and ownership of smartphone (Spearman's rho = 0.10, p < 0.01) were positively correlated with one's likelihood of engaging in cyber deviance. This is consistent with the existing research that individual computer skills and ownership of technology affects their capability to engage in specific forms of cyber deviance such as digital piracy, cyberbullying, or computer hacking

(Hinduja, 2001; Hinduja & Patchin, 2008; Higgins, 2005; Holt & Morris, 2009; Holt et al., 2012). Moreover, all technology-related variables, except hours spent on-line for school work, were positively correlated with cyber deviance. Hours spent on-line playing video game (Spearman's rho = 0.17, p < 0.01), checking email (Spearman's rho = 0.10, p < 0.01), using instant messaging (Spearman's rho = 0.22, p < 0.01), and downloading and uploading files (Spearman's rho = 0.29, p < 0.01) were positively associated with participation in cyber deviance. Prior research indicated that an individual's time spent on-line is significantly related to one's involvement in the illegal downloading and use of another personal information on-line (Moon et al., 2010). Only three technology-related variables – hours spent on-line playing video game (Spearman's rho = 0.10, p < 0.01), using instant messaging (Spearman's rho = 0.12, p < 0.01), and downloading and uploading files (Spearman's rho = 0.12, p < 0.01), and downloading and uploading files (Spearman's rho = 0.15, p < 0.01) – were positively correlated with one's likelihood of participating in deviant activities off-line. These significant correlations indicated a potential connection between on-line and off-line behaviors, which is supported by recent studies examining interactions between on-line and off-line environments.

Research by Van Wilsem (2011) illustrated that the type of on-line activities can influence one's victimization experiences; for instance, routine activities using the Internet (e.g. retrieval of on-line information, maintenance of on-line SNS profile) determined one's risk of being victimized off-line by traditional means. This may be especially evident among young people because youth nowadays use various modes of computer-medicated communications such as instant messaging (IM) and peer-to-peer (P2P) technology to share files and resources as well as to communicate with one another for planning offline activities (Koh, Kim, Butler, & Bock, 2007). Time spent on-line with friends was found to be significantly associated with the risk of engaging in delinquent behaviors such as substance use and theft (Meldrum & Clark, 2013).

Finally, the demographic variables had mixed correlations with both types of deviance. Age was found to be negatively correlated with traditional deviance, but was found to be positively correlated with cyber deviance. The association between age and traditional deviance is mixed. Age was positively related to property offense (Spearman's rho = 0.12, p < 0.01) and truancy (Spearman's rho = 0.25, p < 0.01). For property offense, there is well-known research on the relationship between age and crime indicating that the prevalence of offending increases from late childhood, peaks in the adolescence, and subsequently decreases beginning in the early 20s (Farrington, 1986; Sampson & Laub, 2003). Moreover, adolescents who reported a moderate and high level of skipping school were much more likely to be older compared to those not reporting skipping school (Vaughn, Maynard, Salas-Wright, Perron & Abdon, 2013). On the contrary, age was negatively correlated with three forms of traditional bullying: verbal bullying (Spearman's rho = -0.09, p < 0.01), physical bullying (Spearman's rho = -0.08, p < 0.05), and relational bullying (Spearman's rho = -0.12, p < 0.01). In cyberspace, age was positively associated with all five forms of deviance, meaning older adolescents were more likely to more likely to engage in on-line deviant behaviors than younger adolescents.

With regards to the effect of gender, being female was negatively correlated with both traditional (Spearman's rho = -0.08, p < 0.05) and cyber (Spearman's rho = -0.18, p < 0.01) deviance. This is consistent with the literature that males are generally more likely to engage in deviant behavior (Broidy & Agnew, 1997; LaGrange & Silverman, 1999). Finally, while there was no significant relationship between family structure and traditional deviance, it was negatively correlated with cyber deviance. Youth living in a non-intact family were more likely to engage in cyber deviance than those living in an intact family. For the most part, these bivariate analyses supported the hypothesized relationships presented previously and highlighted

	TD	CD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Tradition. Dev. (TD)	-																								
Cyber Dev. (CD)	.28**	-																							
1 Property Offense	.46**	.33**	-																						
2 Truancy	.39**	.28**	.36**	-																					
3 Threaten	.32**	.30**	.38**	.35**	-																				
4 Verbal Bully	.64**	.24**	.33**	.22**	.45**	-																			
5 Physical Bully	.61**	.30**	.31**	.26**	.44**	.61**	-																		
6 Relational Bully	.57**	.23**	.32**	.19**	.42**	.51**	.46**	-																	
7 On-line Harass.	.26**	.54**	.38**	.38**	.49**	.30**	.28**	.32**	-																
8 Software Piracy	.22**	.51**	.38**	.31**	.38**	.19**	.29**	.25**	.45**	-															
9 Media Piracy	.19**	.54**	.26**	.30**	.31**	.18**	.20**	.22**	.36**	.60**	-														
10 On-line Porn.	.20**	.65**	.28**	.30**	.29**	.22**	.30**	.16**	.31**	.30**	.26**	-													
11 Hacking	.23**	.42**	.38**	.38**	.46**	.30**	.36**	.31**	.47**	.46**	.45**	.44**	-												
12 Low Self-Control	.34**	.25**	.32**	.28**	.26**	.27**	.29**	.21**	.22**	.11**	.11**	.20**	.20**	-											
13 Deviant Peer	.22**	.46**	.30**	.25**	.25**	.20**	.24**	.25**	.29**	.32**	.36**	.41**	.34**	.26**	-										
14 Comp. Profic	.05	.14**	.05	.05	.08*	.03	.11**	.03	.10**	.12**	.11**	.10**	.11**	.10**	.12**	-									
15 Smartphone	.04	.10**	.08*	.11**	.08*	.04	.06	.03	.08*	.04	.11**	.14**	.12**	.07	.11**	.01	-								
16 Hrs. School	.01	.02	02	07*	03	.06	.06	.07	.01	.05	.02	02	.04	.03	.03	.15**	02	-							
17 Hrs. Video	.10**	.17**	.11**	.09*	.10**	.13**	.09**	.05	.13**	.13**	.03	.21**	.06	.18**	.15**	.20**	.04	.07*	-						
18 Hrs. Email	.06	.10**	.10**	.13**	.03	.03	.02	.07	.03	.08*	.10**	.07	.02	.13**	.11**	.12**	.12**	.13**	.26**	-					
19 Hrs. IM	.12**	.22**	.20**	.18**	.14**	.10**	.08*	.12**	.18**	.13**	.13**	.17**	.17**	.16**	.23**	.08*	.10**	.05	.16**	.36**	-				
20 Hrs. Download	.15**	.29**	.17 **	.21**	.10**	.10**	.08*	.08*	.15**	.16**	.17**	.21**	.12**	.27**	.21**	.21**	.11**	.16**	.28**	.46**	.38**	-			
21 Age	07*	.25**	.12**	.25**	.02	09**	08*	12**	.09*	.11**	.19**	.36**	.16**	.12**	.13**	.08*	.19**	05	.10**	.26**	.17**	.37**	-		
22 Gender	08*	18**	09*	00	15**	14**	22**	06	15**	22**	05	23**	10**	13**	15**	21**	01	10**	32**	.11**	.06	03	01	-	
23 Family Structure	01	12**	03	04	.00	.04	03	.04	05	06	02	14**	.00	00	04	05	07*	.08*	01	06	07	03	20**	02	-

Table 2. Correlation Matrix using Spearman Rho (n=779)

p<0.05, p<0.01; Six variables representing traditional deviance (property offense, truancy, threatening, verbal, relational, and physical bullying) and five variables representing cyber deviance (on-line harassment, software piracy, media piracy, pornography, and hacking), as well as both general deviance measures are all dichotomous variables used in the logistic regression models.

the significance of low self-control and deviant peer association in predicting deviance on-line and off-line. These findings demonstrated sufficient relationships to explore through multivariate regression analyses.

Multicollinearity Diagnostics

Prior to performing a multivariate regression analysis, multicollinearity and diagnostic tests were performed. The variance inflation factor (VIF) and tolerance values were generated to test for any reasonable indication of multicollinearity among independent variables used in the models (O'Brien, 2007).Based on the diagnostics results, multicollinearity did not appear to bias the parameter estimates because the independent variables were not strongly correlated with each other (see Table 3). The highest VIF and lowest tolerance were 1.65 and .61 respectively (*hours spent downloading and uploading files*). Overall, the results suggested that there is little concern regarding multicollinearity among independent variables in this dissertation.

	Traditiona	1 Deviance	Cyber D	eviance
Variables	VIF	Tolerance	VIF	Tolerance
Low Self-Control	1.15	.88	1.14	.88
Deviant Peer Association	1.14	.87	1.14	.87
Computer Proficiency	1.12	.89	1.12	.89
Smartphone Ownership	1.06	.94	1.06	.94
Hours (school related)	1.08	.93	1.08	.93
Hours (videogame)	1.28	.78	1.28	.78
Hours (email)	1.45	.69	1.45	.69
Hours (instant messaging)	1.31	.77	1.31	.77
Hours (downloading files)	1.65	.61	1.65	.61
Family	1.06	.94	1.06	.85
Age	1.27	.79	1.27	.79
Gender	1.27	.80	1.25	.80

Table 3. Multicollinearity Diagnostics

Based on the significant relationships drawn from the correlation matrix (see Table 2), it was possible to conduct a multivariate analysis using logistic regression models. All of the following models sought to assess the significance and impact of low self-control and deviant peer association on the likelihood of youth deviance in the real world and cyber environment. For control purposes, demographic and technology-related variables were included in the models.

Model for Low Self-Control and Deviance

This model examined the effect of low self-control on traditional and cyber deviance in general and specific forms, while controlling for other demographic and technology-related variables. Low self-control has shown to be significantly predictive of traditional offending (Pratt & Cullen, 2000) and cyber deviance (Holt et al., 2012). Given that prior studies focused on specific form of deviance, this study also examined a general scale of deviance on-line and off-line.

Traditional/Cyber Deviance = $\beta_0 + \beta_1$ Low self-control + β_2 Computer proficiency + β_3 Smartphone ownership + β_4 Hours (school related) + β_5 Hours (video game) + β_6 Hours (email) + β_7 Hours (instant messaging) + β_8 Hours (downloading & uploading files) + β_9 Family Structure + β_{10} Age + β_{11} Gender + ϵ

Model for Deviant Peer Association and Deviance

This model examined the role of deviant peer association in predicting traditional and cyber deviance in general and specific forms, while controlling for other demographic and technology-related variables. A large number of studies have found differential peer association to be a consistent correlate of traditional offending (Pratt et al, 2010) and cyber deviance (Bossler & Bossler, 2010; Higgins & Marcum, 2009; Higgins et al., 2007, 2008; Holt et al., 2012). Few have investigated the impact of deviant peers on-line on traditional deviance. The current study examined whether virtual peers influence one's involvement in both on-line and off-line deviance.

Traditional/Cyber Deviance = $\beta_0 + \beta_1$ Deviant peer association + β_2 Computer proficiency + β_3 Smartphone ownership + β_4 Hours (school related) + β_5 Hours (video game) + β_6 Hours (email) + β_7 Hours (instant messaging) + β_8 Hours (downloading & uploading files) + β_8 Family Structure + β_{10} Age + β_{11} Gender + ϵ

Full Model for Low Self-Control, Deviant Peer Association, and Deviance

The full model simultaneously investigated the influence of low self-control and peer deviance on the likelihood of engaging in offending behavior in the real world and cyberspace. Prior studies have found the mediating effect of deviant peer association on the relationship between low self-control and deviance in the real world (Chapple, 2005; Longshore et al., 2004) and cyberspace (Bossler & Burruss, 2010; Higgins et al., 2006; Holt et al., 2012). A potential mediating relationship between low self-control, deviant peer association and both traditional and cyber deviance was examined by comparing the significance levels (p-value) of low selfcontrol in the reduced model as well as the full model. If there is a change in the significance level from the reduced to the full model, it indicates a potential mediation. For example, if the significance of low self-control (in the reduced model) decreases after adding deviant peer association measures (in the full model), it is likely that deviant peer association plays a potential mediating role in the relationship between low self-control and one's involvement in deviance.

Despite limitations, this analysis served the purpose of exploring any potential mediating effects of deviant peer association.

To empirically assess the relationship between low self-control and social learning theories in explaining variations in cyber deviance, the full model examined the effect of low self-control and deviant peer association, after accounting for age, gender, and other socio-demographic characteristics. The logistic regression models for traditional and cyber deviance included nine independent variables (low self-control, deviant peer association, and seven technology use and ownership measures) along with three control variables (family structure, age, and gender). Further, in order to test a conditioning link between these three variables, a z-score test by Paternoster et al. (19) was employed to examine an interactive effect when using split samples by identifying the difference between the two regression coefficients for low self-control across the independent samples. Specifically, it allows one to determine which effect is stronger only if both regression coefficients of the independent variable are significant in the subgroups.

Traditional/Cyber Deviance = $\beta_0 + \beta_1$ Low self-control + β_2 Deviant peer association + β_3 Computer proficiency + β_4 Smartphone ownership + β_5 Hours (school related) + β_6 Hours (video game) + β_7 Hours (email) + β_8 Hours (instant messaging) + β_9 Hours (downloading & uploading files) + β_{10} Family structure + β_{11} Age + β_{12} Gender + ϵ

Multivariate Analysis

Following the correlation analysis and multicollinearity diagnostics, multivariate analyses were performed to confirm whether the significant relationships observed in the bivariate results emerge after including all the relevant variables in the regression model. A logistic regression was selected rather than traditional linear regression models due to the skewed distribution and limited variation of the deviance measures, particularly for cyber deviance. One of the assumptions of the ordinary least square (OLS) regression is that the dependent variables must be continuous and measured on an interval or ratio scale (Lewis-Beck, 1980).

All of the dependent variables in the current sample were non-continuous and skewed, except the three forms of traditional bullying. If the data indicates a skewed distribution and excessive zeros for the dependent variables, a linear relationship between the dependent and independent variables is unlikely. Rather, there is likely to be a non-linear relationship between dependent and independent variables. Given the skewed distribution of dependent variables, it was sensible to collapse the response categories into a dichotomous outcome.

With the dependent variables being dichotomized and ranging from 0 to 1, using a nonlinear model was more appropriate and well-suited for analyzing the current dataset. When a dichotomous dependent variable is modeled using a logistic regression, it can be assumed that the logit transformation of the dependent variable has a linear relationship with the independent (or predictor) variables (Pampel, 2000). Hence, a binary logistic regression effectively handles the problem of non-linearity (Menard, 2002).

Based on the skewness and kurtosis values⁵, all six traditional deviance measures had non-normal distributions that skewed to the right. The Kurtosis values indicated more peaked distributions than a normal distribution for property offense and three forms of bullying, whereas distributions were flatter than a normal distribution for truancy and threatening. For cyber deviance, skewness and kurtosis values demonstrated that all five measures had non-normal

⁵ While the skewness value of 0 points to a symmetrical distribution, a positive value indicates the skewed distribution to the right and a negative value indicates skewed distribution to the left. If Kurtosis value is close to 0, it indicates a normal shape. A positive Kurtosis value indicates a flatter shape than normal, and a negative Kurtosis value indicates a more peaked shape than normal.

distributions that are skewed to the right. The Kurtosis values indicated that the distributions have flatter than a normal distribution, except on-line pornography.

Due to the skewed distribution and limited prevalence (with excess zeros) for five cybercrime measures, the dependent measures were recoded into a dichotomous variable to run binary logistic regression models. Approximately 16 percent of respondents reported engaging in on-line harassment and media piracy. 21 percent of respondents reported that they viewed on-line pornography, whereas 14 percent reported engaging in software piracy. Only 10 percent of respondents reported that they were accessed an individual's computer or files without his or her permission. Although initially measured as continuous variables using a nine-point ordinal scale, all of the 13 dependent variables were recoded into dichotomous variables (0 = never engaged in the behavior; 1 = engaged in the behavior at least once or twice per year). Specifically, the "never" response remained as "0" while all other 8 responses were recoded as "1" indicating that a youth engaging in a form of deviance (whether on-line or off-line) at least "once or twice a year."

It should be noted that the technique for estimating the regression coefficients in a logistic regression model is different from that used to estimate the regression coefficients in a linear regression model. With the binary logistic regression, it computes and quantifies the effect of an independent variable in terms of a log-odds ratio. In terms of interpretation, the coefficients derived from the model indicate the change in the expected log odds relative to a one unit change in the main independent variable, holding all other variables constant (Menard, 2002). When using a logistic regression, one can examine the *Exp* (*B*) to estimate the increase in

				Tradi	tional De	viance			Cyber Deviance									
		1 (Partial)			2 (Partial))		3 (Full)			1 (Partial))		2 (Partial))		3 (Full)	
	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds
Low Self-Control	.12**	.015	1.12		-		.11**	.01	1.11	.06**	.01	1.05		-		.04**	.01	1.04
Deviant Peer Association		-	•	.11**	.03	1.12	.10**	.03	1.09		-	•	.25**	.03	1.28	.24**	.03	1.27
Computer Proficiency	04	.14	.96	05	.14	.94	05	.14	.95	.17	.14	1.18	.13	.15	1.14	.14	.15	1.15
Smartphone Ownership	.15	.17	1.16	.12	.17	1.13	.10	.18	1.11	.15	.18	1.16	.03	.19	1.03	.03	.19	1.05
Hours (School related)	03	.05	.97	03	.05	.96	03	.05	.97	03	.05	.97	03	.06	.97	02	.06	.97
Hours (Video game)	.02	.05	1.01	.04	.05	1.04	.01	.05	1.01	.07	.05	1.06	.07	.06	1.07	.06	.06	1.06
Hours (Email)	01	.05	.98	.00	.05	1.00	.00	.05	1.00	12*	.05	.88	11*	.06	.89	11	.06	.89
Hours (Instant message)	.09	.05	1.09	.07	.05	1.07	.07	.05	1.00	.16**	.05	1.17	.12*	.05	1.12	.12*	.05	1.12
Hours (Downloading & uploading files)	.12*	.05	1.12	.16**	.05	1.18	.11	.05	1.07	.20**	.05	1.22	.21**	.06	1.24	.19**	.06	1.21
Family Structure	12	.13	.88	08	.13	.92	10	.13	.90	28*	.13	.75	27	.14	.76	27	.14	.76
Age	21**	.05	.81	21**	.05	.81	23**	.05	.79	.20**	.05	1.21	.18**	.05	1.19	.18**	.05	1.19
Gender	20	.17	.81	24	.17	.78	16	.18	.85	62**	.18	.53	53**	.19	.58	52**	.19	.59
Constant		1.00			2.64			1.21			-4.71			-3.74			-4.43	
-2 LL		939.49			989.79			926.37			886.96			824.80			816.81	
Chi-square		118.55			68.25			131.67			154.13			216.28			224.28	
Nagelkerke R ²		.19			.11			.21			.24			.33			.34	

 Table 4. Binary logistic regression models for 2 types of general deviance (n=779)

 $Unstandardized \ logistic \ coefficients, \ standard \ errors, \ and \ odds \ ratios \ are \ presented; \ *p<0.05; \ **p<0.01; \ All \ \chi^2 \ are \ significant \ at \ 0.01 \ level.$

the odds of engaging in deviant behavior for a 1 unit increase in the independent variable. For example, for each increase in the level of deviant peer association, it increases the odds of a youth engaging in media piracy by 1.24 times or by 24 percent, controlling for all other variables.

A series of binary logistic regression models were employed to examine the main predictors of traditional and cyber deviance: 1) low self-control 2) deviant peer association 3) technology use and demographics. Logistic regression models were generated for the two general forms deviance and 11 specific forms of deviance. For each form of deviance, there were three models -- two reduced model testing the effect of low self-control or deviant peer association and a full model that simultaneously examines the effects of both theoretical predictors

In Table 4, low self-control and deviant peer association were significant predictors of youths' general involvement in traditional deviance in all of the reduced and full models. In the full model, both low self-control and deviant peer association significantly impacted the odds of traditional deviance, after controlling for all other variables. Specifically, the odds ratio indicated that a one unit increase in low self-control leads to an 11 percent increase in the odds of engaging in traditional deviance. For deviant peer association, one unit increase in the level of deviant peer association resulted in a nine percent increase in the odds of engaging traditional deviance. Based on the full model, these findings supported hypotheses 1a and 2a that individuals with both lower levels of self-control and greater deviant peer associations are more likely to participate in traditional deviance in general.

Based on the R-squared values for these models, the full model displayed a greater explanatory power than the reduced models. While the R-squared value for the model examining

low self-control was 19 percent, the full model with the inclusion of deviant peer association measure increased its R-squared value to 21 percent. This demonstrated the importance of low self-control in predicting traditional deviance (Pratt & Cullen, 2000; Vazsonyi et al., 2001). By adding deviant peer association, the R-squared value increased about 2 percent.

For the cyber deviance models, both low self-control and deviant peer association were significant predictors of a general scale of deviance in the reduced and full models. The full model (33 percent) seemed to have greater explanatory power, compared to the reduced model examining low self-control (24 percent), indicating the stronger explanatory power of deviant peer association in the context of cyber deviance. This may suggest that virtual peers are a salient factor that influences one's involvement in cyber deviance.

The full model found both theoretical correlates to be significantly predictive of a general scale of cyber deviance, supporting hypotheses 1c and 2c. In the full model, for every 1 unit increase in one's low self-control, the odds of engaging in cyber deviance increased by 4 percent after controlling for all other variables. Note that in this full model, for every 1 unit increase in the level of deviant peer association, the odds of youth participation in cyber deviance increased by 27 percent increase. Overall, the effects of low self-control and deviant peer association seemed to be stronger in the context of cyber deviance than traditional deviance, which were illustrated in both reduced and full models.

While two of the technology-related variables were statistically significant and consistent predictors of cyber deviance, only one technology measure seemed to be significantly associated with traditional deviance. Among the technology-related variables, *hours spent on-line downloading and uploading files* (p<0.01) as well as *hours spent on-line using instant messaging* (p<0.05) were significant predictors of cyber deviance. Although one of the technology-related

	Property Offense Truancy																	
		1 (Partial)			2 (Partial)			3 (Full)			1 (Partial)			2 (Partial))		3 (Full)	
	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds
Low Self-Control	.11**	.02	1.11		-		.10**	.02	1.1	.11**	.01	1.11		-		.10**	.02	1.10
Deviant Peer Association		-	•	.15**	.02	1.16	.13**	.02	1.1		-	1	.14**	.02	1.14	.12**	.02	1.12
Computer Proficiency	06	.17	.94	06	.16	.94	09	.17	.91	.04	.19	1.04	.03	.19	1.03	.00	.20	1.00
Smartphone Ownership	.20	.20	1.22	.12	.20	1.12	.10	.20	1.10	.27	.21	1.31	.17	.22	1.18	.17	.22	1.18
Hours (School related)	08	.06	.92	08	.06	.92	07	.06	.92	16*	.07	.85	17*	.07	.84	16*	.07	.85
Hours (Video game)	.01	.06	1.01	.03	.06	1.03	.02	.07	1.01	.03	.07	1.03	.04	.07	1.04	.04	.07	1.04
Hours (Email)	02	.06	.98	.00	.06	1.00	00	.06	.99	02	.07	.98	.01	.07	1.01	.00	.07	1.00
Hours (Instant messaging)	.18**	.05	1.20	.14**	.05	1.14	.14**	.05	1.15	.13*	.06	1.13	.09	.06	1.09	.09	.06	1.09
Hours (Downloading & uploading files)	.06	.06	1.05	.10	.06	1.10	.03	.06	1.03	.11	.07	1.11	.15*	.07	1.15	.08	.07	1.08
Family Structure	01	.15	.98	.02	.15	1.02	.02	.15	1.02	.03	.15	1.02	.05	.16	1.05	.06	.16	1.06
Age	.06	.06	1.06	.03	.05	1.03	.03	.06	1.03	.36**	.07	1.42	.30**	.07	1.35	.33**	.07	1.38
Gender	32	.21	.72	29	.21	.74	20	.21	.81	.17	.23	1.18	.20	.23	1.22	.35	.24	1.41
Constant		-4.74			-2.59			-4.37			-9.99			-8.46			-9.63	
-2 LL		726.50			737.12			694.20			596.60			606.77			571.54	
Chi-square		105.44			94.83			137.75			130.67			120.40			155.72	
Nagelkerke R ²		.19			.17			.25			.25			.24			.30	

 Table 5. Binary logistic regression models for 6 types of traditional deviance (n=779)

Unstandardized logistic coefficients, standard errors, and odds ratios are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

variables, *hours downloading and uploading files*, was significantly predictive of youth involvement in traditional deviance in the reduced models, Technology generally did not influence one's likelihood of engaging in deviance in the real world based on the reduced and full models.

In terms of the effect of age on deviance, older youth were more likely to engage in cyber deviance. It should be noted that the effect of age for traditional deviance would be better understood by reviewing the models for specific types of traditional deviance (see Tables 5, 6, 7). With gender difference, females were less likely than males to engage in both traditional and cyber deviance. Particularly for cyber deviance, this is consistent with the prior studies (Skinner & Fream, 1997; Holt et al., 2012). Females were significantly less likely to participate in cyber deviance than males. However, further analyses were provided for the effect of gender on specific types of cyber deviance.

Family structure was not significantly related to cyber deviance in general. This may be due to the lack of visibility of the youth's on-line behaviors. Considering that this variable measured family intactfulness, the mere presence of both parents may not necessarily create conditions for effectively supervising youth. Unless parents regularly monitor the on-line use and activities of their children, it is likely that they may not be aware of their children's deviant use of computers. Also, depending on the physical location of computers in the household, the ability of parents to monitor youth behavior may be limited. For instance, parents may be unable to properly monitor their children's deviant activities on-line if computers are situated in an isolated location (e.g. child's bedroom, basement) within the household, as opposed to a public location such as living room or kitchen (Bossler et al., 2012; Marcum, Higgins, & Ricketts, 2010a).

Binary logistic regression analyses were conducted separately for six forms of traditional deviance in order to examine the multivariate association between low self-control, deviant peer association, and specific forms of deviance in the physical world. In Table 5, each of the reduced models indicated that low self-control and deviant peer association were independently predictive of property offense and truancy. In the full models, both theoretical variables were significantly associated with property offense and truancy, after controlling for other demographic and technology-related variables.

For property offense, none of the technology-related variables were significant, except *hours spent on-line using instant messaging* which was significant (p<0.01) in all of the reduced and full models. For truancy, only *hours spent on-line for school related work* reached levels of significance (p<0.05) in all of the reduced and full models. It can be assumed that adolescents who spend less time on-line doing school related work are more likely to skip school, compared to those spending more time on-line for school related work. These findings demonstrated that most of the technology-related variables were not significantly associated with property offense and truancy.

Table 6 examined the multivariate effect of low self-control and deviant peer association on threatening and verbal bullying, while controlling for other demographic and technologyrelated variables. Each of the two theoretical variables came out to be significantly predictive of threatening and verbal bullying in all the reduced and full models. In general, technology-related variables were not significant in explaining the likelihood of engaging in these two types of deviant behavior. Only hours spent on-line using instant messaging was significant in all of the reduced and full models for threatening. The level of significance was reduced from p<0.01 to

				Т	hreatenir	ıg							Ve	rbal Bully	ing			
		1 (Partial)			2 (Partial)			3 (Full)			1 (Partial)			2 (Partial)			3 (Full)	
	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds
Low Self-Control	.11**	.02	1.11		-		.10**	.02	1.10	.09**	.01	1.09		-		.08**	.01	1.08
Deviant Peer Association		-		.16**	.02	1.16	.14**	.02	1.14		-		.10**	.17	1.10	.08**	.02	1.08
Computer Proficiency	.10	.20	1.10	.11	.20	1.11	.05	.21	1.05	20	.14	.82	19	.14	.82	21	.15	.80
Smartphone Ownership	.39	.24	1.47	.26	.25	1.29	.25	.25	1.27	.17	.17	1.18	.14	.17	1.15	.11	.18	1.11
Hours (School related)	13	.08	.87	13*	.08	.87	13	.08	.87	.05	.05	.105	.05	.05	1.05	.06	.05	1.06
Hours (Video game)	.03	.08	1.03	.05	.08	1.05	.04	.09	1.04	.07	.05	1.07	.09	.05	1.09	.07	.05	1.07
Hours (Email)	06	.07	.94	04	.08	.96	05	.08	.95	03	.05	.97	02	.05	.98	02	.05	.98
Hours (Instant messaging)	.21**	.06	1.23	.16*	.07	1.17	.16*	.07	1.17	.10*	.05	1.10	.08	.05	1.08	.08	.05	1.08
Hours (Downloading & uploading files)	.02	.08	1.01	.06	.08	1.06	.00	.08	1.00	.06	.05	1.06	.10*	.05	1.10	.05	.05	1.05
Family Structure	.13	.20	1.13	.16	.20	1.17	.15	.20	1.16	.07	.14	1.07	.09	.13	1.09	.09	.14	1.09
Age	06	.07	.94	11	.07	.89	11	.07	.89	18**	.05	.83	19**	.05	.82	20**	.05	.81
Gender	89**	.27	.40	81**	.27	.44	73**	.28	.48	48**	.18	.61	48**	.17	.61	43*	.18	.65
Constant		-4.09			-1.77			-3.35			112			1.318			.125	
-2 LL		507.862			504.98			479.59			922.59			948.50			909.81	
Chi-square		81.305			84.183			109.580			98.56			72.64			111.34	
Nagelkerke R ²		.18			.19			.25			.16			.12			.18	

Table 6. Binary logistic regression models for 6 types of traditional deviance (n=779) (continued)

Unstandardized logistic coefficients, standard errors, and odds ratios are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

p<0.05 after adding the deviant peer association variable. This may suggest that deviant peer association is more important in explaining traditional deviance. Moreover, this reduction in the level of significance could be interpreted as support for the relationship between deviant peers and technology as a means to connect youth with peers on-line. For instance, children may use computer technology such as instant messaging to interact and socialize with deviant friends.

In Table 7, binary logistic regression results found low self-control and deviant peer association to be significantly related to physical and relational bullying in all of the reduced and full models. None of the technology-related variables came out to be significantly associated with these two types of bullying.

With regards to the demographic variables, the logistic regression models for the general measure of traditional and cyber deviance (Table 4) indicated that age was a significant predictor of offending. The significance of this effect depended on the specific type of real world deviance. The findings indicated that age had a positive effect on the likelihood of truancy and a negative effect on all three forms of traditional bullying (verbal, physical, and relational). Based on prior research using nationally representative samples, younger adolescents are more likely to be victims of verbal, physical, and relational bullying (Nansel et al., 2001; Wang et al., 2009). Age was also found to be predictive of truancy, suggesting that older youth are more likely to skip school than younger youth. A recent nationally representative study in the United States reported that truant adolescents are more likely to be older (Vaughn et al, 2013). Gender is significant for only three specific forms of traditional deviance – threatening, verbal bullying, and physical bullying. The findings indicated that females are less likely than males to engage in threatening as well as verbal and physical bullying. Prior research on bullying behavior suggested that while boys tend to be more involved in verbal or physical bullying, girls engage in

	Physical Bullying Relational Bullying																	
		1 (Partial)			2 (Partial))		3 (Full)			1 (Partial)			2 (Partial))		3 (Full)	
	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds
Low Self-Control	.10**	.01	1.10		-		.09**	.01	1.09	.07**	.01	1.07		-		.06**	.01	1.06
Deviant Peer Association		-		.12**	.02	1.12	.10**	.02	1.11		-		.13**	.02	1.13	.12**	.02	1.12
Computer Proficiency	.13	.14	1.13	.12	.14	1.12	.12	.15	1.12	05	.15	.95	05	.15	.95	06	.15	.94
Smartphone Ownership	.27	.18	1.31	.23	.18	1.26	.20	.18	1.22	.16	.18	1.17	.10	.18	1.10	.07	.18	1.07
Hours (School related)	.03	.05	1.03	.03	.05	1.03	.04	.05	1.04	.05	.05	1.05	.05	.05	1.05	.06	.05	1.06
Hours (Video game)	02	.05	.97	00	.05	.99	03	.06	.97	04	.05	.96	02	.05	.98	04	.06	.96
Hours (Email)	00	.05	.99	.01	.05	1.01	.01	.05	1.00	.06	.05	1.05	.07	.05	1.07	.07	.05	1.07
Hours (Instant messaging)	.07	.05	1.07	.04	.05	1.03	.03	.05	1.03	.11*	.05	1.11	.07	.05	1.07	.07	.05	1.07
Hours (Downloading & uploading files)	.03	.05	1.03	.07	.05	1.07	.02	.06	1.02	.04	.05	1.04	.07	.05	1.07	.03	.06	1.03
Family Structure	17	.14	.84	14	.13	.86	16	.14	.85	.09	.14	1.09	.12	.14	1.13	.12	.15	1.12
Age	19**	.05	.83	20**	.05	.81	21**	.05	.81	23**	.05	.79	25**	.05	.77	26**	.05	.77
Gender	90**	.18	.40	87**	.18	.41	84**	.18	.43	27	.18	.76	22	.18	.80	17	.19	.84
Constant		.35			1.90			.70			.31			1.57			.68	
-2 LL		888.38			907.18			866.98			896.26			888.22			868.24	
Chi-square		112.32			93.53			133.72			68.37			76.41			96.39	
Nagelkerke R ²		.18			.16			.22			.12			.13			.16	

Table 7. Binary logistic regression models for 6 types of traditional deviance (n=779) (continued)

 $Unstandardized \ logistic \ coefficients, \ standard \ errors, \ and \ odds \ ratios \ are \ presented; \ *p<0.05; \ **p<0.01; \ All \ \chi^2 \ are \ significant \ at \ 0.01 \ level.$

relational or social bullying (Bjorkqvist, 1994; Wang et al., 2009). Lastly, family structure was not statistically significant in any of the models for all six forms of traditional deviance.

In terms of explanatory power, the effect of low self-control was slightly stronger than that that of deviant peer association for the four types of traditional deviance – property offense, truancy, verbal bullying, and physical bullying. For threatening and relational bullying, the model for deviant peer association had a slightly larger R-squared value, compared to model for low self-control. The consistent effect of deviant peer association on traditional deviance may suggest that interacting with deviant peers on-line may result in the youth's participation in different forms of deviant behavior in the real world.

For the most part, technology-related variables were not consistently linked to specific forms of traditional deviance. This could simply mean that technology is not required to facilitate real world crime and deviance. Overall, all the full models for six traditional deviance types indicated that lower levels of self-control and higher levels of on-line deviant peer association increased the odds of property offense, truancy, threatening, verbal bullying, physical bullying, and relational bullying. All of these findings provided empirical support for hypotheses 1b and 2b that specific forms of traditional deviance are positively associated with low self-control (Pratt & Cullen, 2000; Reisig & Pratt, 2011) and deviant peer association (Espelage et al, 2000; Hinduja & Patchin, 2013; Hwang & Akers, 2003; Warr, 2002).

After examining the changes in the level of significance of low self-control from reduced model to full model, no mediating link between low self-control, deviant peer association was revealed. For all six types of real world deviance, the level of significance of low self-control remained significant (p<0.01) even after including the deviant peer association measure in the full model. However, it should be acknowledged that binary logistic regression technique is not

	Media Piracy									So	ftware Pir	acy						
		1 (Partial)			2 (Partial)			3 (Full)			1 (Partial)			2 (Partial))		3 (Full)	
	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds
Low Self-Control	.03	.02	1.03		-		.003	.02	1.00	.02	.02	1.02		-		01	.02	.99
Deviant Peer Association		-		.22**	.03	1.24	.22**	.03	1.24		-		.19**	.02	1.20	.19**	.03	1.21
Computer Proficiency	.36*	.18	1.42	.37	.19	1.44	.37	.20	1.44	.18	.18	1.19	.16	.19	1.17	.16	.20	1.17
Smartphone Ownership	.37	.21	1.44	.20	.24	1.21	.20	.24	1.21	04	.22	1.03	20	.26	.81	20	.26	.82
Hours (School related)	00	.07	.99	.00	.07	1.00	.00	.07	1.00	.02	.07	1.02	.04	.07	1.03	.04	.07	1.03
Hours (Video game)	11	.07	.89	12	.07	.88	12	.07	.88	.02	.08	1.02	.04	.08	1.03	.04	.08	1.03
Hours (Email)	01	.07	.99	.04	.07	1.04	.04	.07	1.04	02	.07	.98	.02	.08	1.02	.02	.08	1.02
Hours (Instant messaging)	.09	.06	1.09	.03	.06	1.02	.03	.06	1.02	.11	.06	1.12	.05	.06	1.05	.05*	.06	1.05
Hours (Downloading & uploading files)	.11	.07	1.12	.08	.08	1.07	.07	.08	1.07	.15*	.07	1.16	.12	.08	1.13	.13	.08	1.13
Family Structure	.06	.16	1.06	.14	.18	1.14	.14	.18	1.14	22	.16	.79	22	.18	.80	22	.18	.80
Age	.25**	.07	1.29	.19**	.07	1.21	.19**	.07	1.21	.09	.07	1.09	.02	.07	1.02	.02	.07	1.01
Gender	23	.23	.79	.02	.25	1.02	.02	.25	1.02	-1.31	.27	.271	-1.23**	.28	.29	-1.25**	.29	.28
Constant		-7.29			-6.50			-6.57			-3.89			-4.42			-2.73	
-2 LL		620.04			544.75			544.72			560.95			502.32			502.07	
Chi-square		55.80			131.09			131.12			69.47			128.09			128.34	
Nagelkerke R ²		.12			.27			.27			.15			.27			.27	

 Table 8. Binary logistic regression models for 5 types of cyber deviance (n=779)

 $Unstandardized \ logistic \ coefficients, \ standard \ errors, \ and \ odds \ ratios \ are \ presented; \ *p<0.05; \ **p<0.01; \ All \ \chi^2 \ are \ significant \ at \ 0.01 \ level.$

well-suited to examine a mediating role of deviant peers in the relationship between low selfcontrol and deviant behavior. To take into account the skew distribution of the dependent variables, the current study employed a logistic regression techniques after dichotomizing the dependent variables. A structural equation modeling may be more appropriate for investigating the mediation because it allows one to specify and estimate the direct and indirect association between low self-control, deviant peers, and involvement in deviance on-line and off-line. Although the current technique of binary logistic regression did not permit one to fully examine the mediation effect, it sought to explore the impact of low self-control in the subgroups of lower and higher levels of one's deviant peer association.

Table 8 presented individual models for two forms of digital piracy, media and software piracy. Deviant peer association was predictive of both types of piracy in all models. On the other hand, low self-control was not significantly linked to media piracy or software piracy in all of the reduced and full models. This finding is inconsistent with previous studies examining the link between self-control and digital piracy (Higgins, 2004, 2007; Higgins et al., 2008; Hinduja, 2006; Holt et al., 2012; Malin & Fowers, 2009). The non-significance of low self-control may be due to the incomplete measure of self-control used in this survey (Grasmick et al., 1993). Given that the current study used single construct consisting only nine items from the original self-control scale, it failed to take into account all of the dimensions and their items into the concept of self-control.

In general, the technology-related variables were not predictive of media and software piracy behavior, suggesting that time spent on-line, computer proficiency, and smartphone ownership did not influence one's involvement in digital piracy. This may imply that associating with deviant peers on-line are more important than exposure to technology and individual's

	On-line Harassment On-line Pornography																	
		1 (Partial)			2 (Partial)			3 (Full)			1 (Partial)			2 (Partial)			3 (Full)	
	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds	В	SE	Odds
Low Self-Control	.07**	.02	1.07		-		.06**	.02	1.06	.05**	.02	1.05		-		.04*	.02	1.03
Deviant Peer Association		-		.15**	.02	1.16	.14**	.02	1.15		-	•	.19**	.03	1.20	.18**	.03	1.19
Computer Proficiency	.14	.18	1.15	.13	.19	1.14	.12	.19	1.12	.13	.18	1.14	.05	.19	1.05	.06	.19	1.06
Smartphone Ownership	.27*	.22	1.31	.18	.23	1.19	.15	.23	1.16	.32	.21	1.37	.21	.23	1.23	.193	.23	1.21
Hours (School related)	02	.07	.98	01	.07	.98	01	.07	.99	06	.07	.94	05	.07	.94	05	.07	.94
Hours (Video game)	.08	.07	1.08	.10	.08	1.10	.10	.08	1.10	.21**	.07	1.22	.23**	.08	1.26	.23**	.08	1.26
Hours (Email)	16*	.07	.85	15	.07	.86	15*	.07	.85	18**	.07	.83	16**	.07	.85	16*	.07	.85
Hours (Instant messaging)	.23**	.06	1.26	.19**	.06	1.21	.19**	.06	1.21	.14*	.06	1.15	.10	.06	1.10	.10	.06	1.10
Hours (Downloading & uploading files)	.09	.07	1.09	.11	.07	1.11	.07	.07	1.06	.09	.07	1.09	.07	.07	1.07	.04	.07	1.04
Family Structure	12	.16	.88	11	.17	.89	18	.17	.88	18	.14	.83	16	.15	.84	17	.15	.84
Age	.06	.06	1.06	.00	.06	1.00	.01	.07	1.01	.65**	.08	1.91	.60**	.08	1.82	.62**	.08	1.85
Gender	66**	.24	.51	57	.25	.56	51*	.25	.60	-1.10**	.23	.33	-1.05**	.24	.35	-1.01**	.24	.36
Constant		-4.63			-2.86			-3.96			-12.44			-11.05			-11.86	
-2 LL		597.98			574.94			563.40			597.96			553.21			548.96	
Chi-square		81.22			104.25			115.80			208.64			253.39			257.65	
Nagelkerke R ²		.17			.21			.24			.36			.43			.44	

Table 9. Binary logistic regression models for 5 types of cyber deviance (n=779) (continued)

Unstandardized logistic coefficients, standard errors, and odds ratios are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

computer skills and ownership of computer-mediated devices. Age was positively linked to media piracy, indicating the older youth were more likely to pirate media files than younger youth.

Interestingly, the effect of gender was significant only for the software piracy models that included and controlled for deviant peer association. Existing research on digital piracy revealed that males are more likely to pirate software (Higgins, 2006; Higgins et al, 2005; Gunter, Higgins, & Gealt, 2010; Hinduja, 2001, 2003; Holt et al., 2010; Moon et al., 2013). Software piracy requires a more advanced understanding and knowledge of how a torrenting program functions as well as the ways to obtain license code in unlocking and accessing copyrighted digital materials (Holt & Copes, 2010). By participating in on-line forums and interacting with like-minded others, offenders are able to improve their pirating skills.

In Table 9, the models for on-line harassment and on-line pornography indicated that low self-control and deviant peer association were significant predictors in both the reduced and full models. It may be that individuals with lower self-control and higher levels of deviant peer associations are more likely to harass others on-line and view pornography via the Internet. This is consistent with previous studies on on-line harassment and on-line pornography (Holt et al., 2012; Skinner & Fream, 1997).

Few technology-related variables were linked to these two types of cyber deviance. Both on-line harassment and on-line pornography were negatively associated with time spent on-line using email. Since using email does not ensure anonymity, youth may choose not to harass others through this form of communication. It is argued that one of the reasons that individuals engage in criminal behavior in virtual environment is because of the relatively anonymous nature of computer-mediated communication (Jaishankar, 2008). With on-line pornography, if youth

spend more time searching and viewing pornography via the Internet, they may be less inclined to allocate their time using emails.

Further, while time spent on-line using instant messaging was positively associated with online harassment, time spent playing video games on-line was positively related to on-line pornography. Consistent with previous research, spending hours on-line for non-school related purposes influenced one's participation in on-line harassment, since opportunities to engage in deviant behavior in cyber space is plentiful (Hinduja & Patchin, 2009; Holt & Bossler, 2009). Online games are often interactive and can be played by connecting to game servers through the Internet, allowing youth to interact with peers that they know in off-line lives or that they met first on-line (Lenhart, Kahne, Middaugh, Macgill, Evans, & Vitak, 2008). Adolescents who spend time playing games on-line are more likely to be exposed to various risks on-line such as unwanted exposure to on-line pornography (Chang, Chiu, Miao, Chen, Lee, Chiang, 2014). This is supportive of the current finding that individuals who frequently spend time on-line playing video games are more likely to view on-line pornography compared to those spending lesser time playing video games.

Age had a positive impact on one's viewing of on-line pornography, suggesting older youth are more likely to view pornography on-line. Being older was related to greater exposure to pornographic and sexually explicit materials (Brown & L'Engle, 2009). With the increasing exposure to on-line content, older adolescents are exposed to deviant and risky behaviors on-line (Mitchell, Wolak, & Finkelhor, 2007). Females were less likely than males to engage in on-line harassment and on-line pornography. Consistent with a nationally representative study on school bullying, females were moderately less likely than males to be perpetrators of on-line harassment or cyberbullying (Wang et al., 2009).

					Hacking				
		1 (Partial)			2 (Partial)			3 (Full)	
	В	SE	Odds	В	SE	Odds	В	SE	Odds
Low Self-Control	.08**	.02	1.08		-		.06**	.02	1.06
Deviant Peer Association		-		.22**	.02	1.2	.21**	.02	1.23
Computer Proficiency	.53*	.22	1.69	.54*	.23	1.71	.53*	.24	1.70
Smartphone Ownership	.60*	.26	1.81	.48	.28	1.62	.46	.29	1.58
Hours (School related)	.06	.08	1.06	.08	.09	1.08	.09	.09	1.09
Hours (Video game)	02	.09	.97	01	.10	.99	01	.10	.99
Hours (Email)	18*	.08	.83	16	.09	.85	17	.09	.84
Hours (Instant messaging)	.22**	.07	1.25	.17*	.08	1.18	.17*	.08	1.18
Hours (Downloading & uploading files)	01	.09	.99	04	.09	.95	09	.09	.91
Family Structure	.27	.21	1.31	.34	.23	1.41	.35	.23	1.41
Age	.32**	.09	1.38	.23*	.09	1.25	.25**	.09	1.28
Gender	41	.29	.66	21	.31	.81	10	.32	.90
Constant		-10.82			-8.59			-10.10	
-2 LL		437.91			387.87			379.04	
Chi-square		77.52			127.56			136.38	
Nagelkerke R ²		.20			.31			.33	

 Table 10. Binary logistic regression models for 5 types of cyber deviance (n=779) (continued)

Unstandardized logistic coefficients, standard errors, and odds ratios are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

Table 10 illustrated the model examining computer hacking. A number of variables were found to be predictive of hacking behavior. First, low self-control and deviant peer association were predictive of hacking in all reduced and full models. This is consistent with prior research that individuals who have lower self-control and more frequently associate with deviant peers tend to engage in computer hacking (Holt et al., 2012; Marcum et al., 2014). Computer proficiency was a significant predictor (p<0.05) of hacking even after controlling other variables. Although this is consistent with prior finding that a higher level of computer skills is related to one's participation in software piracy (Hinduja, 2001), it must be noted that the current measure of hacking included in the study is focused on more simple forms of hacking such as the act of accessing another person's computer or files through password guessing. Time spent on-line using instant messaging was also significantly predictive (p<0.05) of hacking. Given that this sample was composed of adolescents who were in the process of learning about how to proficiently use technology, they were likely to interact with peers about simple forms of hacking techniques and knowledge via instant messaging or chatrooms.

Among the technology-related variables, there were relatively inconsistent relationships identified with the exception of *hours spent on-line using instant messaging*. This variable was significant in all reduced and full models for on-line harassment and hacking. Harassment can be conducted using various forms of computer-mediated communication. For example, a harasser or bully can send sexually explicit or threatening messages or images to a victim, or post vulgar, offensive comments about others in social media platforms (e.g. Facebook, MySpace). With most social media technologies allowing instant messaging among one another, youth are able to harass others on-line, individually and collectively. Although previous studies have found that time spent on-line for personal use unrelated to school or work may provide greater opportunities

to engage in deviant activities such on-line harassment (Hinduja & Patchin, 2009; Holt & Bossler, 2009), the current findings did not provide supporting evidence for the link between use and ownership of technology and cyber deviance.

Age was positively linked to computer hacking. As youth age they are likely to gain access to and be exposed to different types of technology. They may learn how to engage in deviant behaviors after spending time on-line on a regular basis or disseminating information through peer networks. For example, a youth may learn about Bit Torrent technology through interacting and sharing files with their peers, and, in turn, he or she is likely to continue their behavior of digital piracy (Holt, 2007; Holt & Copes, 2010; Morris & Higgins, 2010).

In summary, low self-control was significantly predictive of three forms of cyber deviance – on-line harassment, on-line pornography, and hacking. Deviant peer association was found to be consistently and significantly associated with all five specific forms of cyber deviance in all of the reduced and full models. These findings provided empirical support for hypotheses 1d and 2d that low self-control and deviant peer association were positively associated with specific forms of cyber deviance.

In comparing the models in terms of their explanatory power, the addition of the deviant peer association measure increased the R-squared values of the full models for all five types of cyber deviance – media piracy (12 percent to 27 percent), software piracy (15 percent to 27 percent), on-line harassment (17 percent to 24 percent), on-line pornography (36 percent to 44 percent), and hacking (20 percent to 33 percent). Overall, deviant peer association reflected a greater importance in predicting all five types of cyber deviance, compared to low self-control.

By assessing the change in the level of significance for low self-control in the reduced model and full model, no mediating relationships between self-control, deviant peers and cyber

deviance was found, except for on-line pornography. For on-line harassment and hacking, the significance level did not change from the reduced model to the full model. For the two types of digital piracy models, the effect of low self-control was non-significant in all models. For on-line pornography, while low self-control was statistically significantly related to on-line pornography at the 0.01 level in the reduced model, the effect of low self-control was significant at the 0.05 level in the full model. Thus, deviant peers may have played a minor mediating role in the link between low self-control and on-line pornography. This is also consistent with prior studies that have found a mediating role of deviant peer association in the relationship between low self-control and deviance both in the real world (Chapple, 2005; Longshore et al., 2004) and in cyberspace (Higgins et al., 2006; Higgins & Marcum, 2011; Holt et al., 2012).

Conditioning Link between Self-control and Deviant Peers

In order to examine whether the different levels of deviant peer association conditioned⁶ (or influenced) the effect of low self-control on deviance on-line and off-line, logistic regression models were run separately for those with low and high level of deviant peer association. There were two partitioned models for traditional deviance and two partitioned models for cyber deviance. The sample was partitioned by the mean of deviant peer association as 54.6% of all respondents provided zero values for this variable. Since the values for deviant peer associations ranged from 0 to 25, the mean and median of *deviant peer association* were 2.09 and 0 respectively. As a result, partitions of the sample were made based on the mean score in order to illustrate a "low" and "high" level of deviant peer association

⁶ Using an ordinary least square regression, I also tested an interactive effect of low self-control and deviant peer association by including an interaction term in the models. However, it was not significant for any deviance.

		Tradition	al Deviance			Cyber l	Deviance	
	Low (1	n=587)	High ((n=192)	Low (1	n=528)	High ((n=251)
	В	SE	В	SE	В	SE	В	SE
Low Self-Control	.11**	.02	.15**	.04	.06**	.02	00	.03
Computer Proficiency	.02	.17	44	.32	.23	.18	15	.33
Smartphone Ownership	01	.20	.57	.41	05	.22	.37	.42
Hours (School related)	03	.06	03	.12	05	.07	.07	.13
Hours (Video game)	.02	.06	.01	.14	.03	.06	.18	.13
Hours (Email)	03	.06	.12	.12	09	.07	22*	.14
Hours (Instant messaging)	.09	.06	.02	.10	.12*	.05	.19*	.11
Hours (Downloading & uploading files)	.15*	.06	18	.13	.23**	.07	.02	.13
Age	26**	.06	02	.11	.13*	.06	.35**	.10
Gender	11	.20	10	.43	39	.22	88*	.43
Family Structure	13	.15	07	.30	37*	.15	15	.33
Constant	1.	62		.31	-4.	20	-3	.80
-2 LL	727	7.49	18	7.92	607	7.94	18	1.37
Chi-square	83	.34	28	3.02	77	.18	32	2.35
Nagelkerke R ²	.1	18		20	.1	.8		23

 Table 11. Logistic regression models partitioned by deviant peer association for two general forms of deviance (n=779)

Unstandardized logistic coefficients and standard errors are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

In Table 11, two binary logistic regression models were conducted after the sample was partitioned by the level of deviant peer association. The models were partitioned into a subgroup of youth with low level of deviant peer association and another subgroup of youth with high level of deviant peer association. The effect of low self-control on traditional deviance in these two subgroups was found to be statistically significant (p<0.01).

Although low self-control was significant in both subgroups involved in traditional deviance, using a statistical Z-score test developed by Paternoster, Brame, Mazerolle, & Piquero (1998) allows one to examine if there are any significant differences between the regression coefficients for low self-control between the subgroups. After running a linear regression including the same set of independent and dependent variables, the Z-score test was conducted by placing regression coefficients into the formula that computes the Z-score value. In summary, the formula takes the difference between the two regression coefficients (b₁-b₂) as the numerator and the estimated standard error of this difference (square root of S.E b12 + S.E. b22) as the denominator. In this test, if the computed Z-score value using this formula exceeds the absolute value of 1.96, this indicates that there is a significant difference between the two coefficients at the 0.05 significance level (Paternoster et al., 1998). In Table 11, no significant differences were found between the regression coefficients of low self-control in the subgroup for the general scale of traditional deviance. For the general scale of cyber deviance, low self-control was significant in only one subgroup, and thus the Z-score test could not be applied.

Tables 12 and 13 presented the binary logistic regression models that were conducted to assess the conditioning effect of deviant peer association on specific types of traditional deviance

		Property	y Offense			Tru	ancy			Threa	tening	
	Low (1	n=528)	High (n=251)	Low (1	n=528)	High (n=251)	Low (1	n=528)	High (1	n=251)
	В	SE	В	SE	В	SE	В	SE	В	SE	В	SE
Low Self-Control	.12**	.02	.06*	.03	.12**	.02	.09**	.03	.10**	.02	.11**	.03
Computer Proficiency	03	.23	18	.27	.08	.26	14	.31	01	.29	.12	.31
Smartphone Ownership	.01	.27	.27	.34	23	.30	.95*	.37	.07	.35	.79*	.40
Hours (School related)	05	.08	11	.10	08	.09	21	.12	15	.11	06	.12
Hours (Video game)	.05	.08	10	.12	.03	.09	01	.13	.08	.11	04	.14
Hours (Email)	07	.08	.12	.11	03	.09	.02	.12	00	.10	13	.12
Hours (Instant messaging)	.16*	.07	.17*	.09	.11	.07	.11	.10	.20*	.09	.17	.10
Hours (Downloading & uploading files)	.09	.08	08	.11	.17	.09	12	.13	.09	.10	17	.13
Age	.05	.07	.06	.09	.32**	.09	.40**	.13	17	.09	.02	.11
Gender	.17	.27	94*	.38	.54	.30	09	.42	47	.34	-1.27*	.49
Family Structure	06	.19	.11	.26	.16	.21	26	.28	.15	.28	00	.32
Constant	-5.	.31	-2	.05	-10	0.64	-7.	53	-3.	.04	-3.	07
-2 LL	445	5.10	242	2.00	370).10	197	7.96	296	5.43	187	.68
Chi-square	60	.94	21	.64	78	.26	45	.05	35	.73	32	.54
Nagelkerke R ²	.1	7	.1	14	.2	23	.2	29	.1	4	.2	.3

Table 12. Logistic regression models partitioned by deviant peer association for six types of traditional deviance (n=779)

Unstandardized logistic coefficients and standard errors are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.
|--|

	Verbal Bullying				Physical Bullying				Relation Bullying			
	Low (n=528)		High (n=251)		Low (n=528)		High (n=251)		Low (n=528)		High (n=251)	
	В	SE	В	SE	В	SE	В	SE	В	SE	В	SE
Low Self-Control	.09**	.02	.09**	.03	.10**	.02	.09**	.03	.06**	.02	.06*	.03
Computer Proficiency	10	.17	57*	.28	.07	.18	.08	.28	.05	.18	38	.28
Smartphone Ownership	.01	.22	.48	.35	.23	.22	.22	.34	05	.27	.46	.35
Hours (School related)	.01	.06	.13	.10	.05	.06	.01	.10	.06	.06	.03	.10
Hours (Video game)	.08	.06	.04	.12	07	.06	.11	.12	00	.06	21	.12
Hours (Email)	03	.06	.06	.11	.06	.06	12	.11	.05	.06	.16	.11
Hours (Instant messaging)	.09	.06	.07	.09	.04	.06	.03	.09	.05	.06	.13	.09
Hours (Downloading & uploading files)	.11	.06	20	.11	.08	.07	18	.12	.07	.07	14	.17
Age	26**	.06	02	.09	30**	.06	.00	.09	24**	.06	25**	.09
Gender	50*	.21	14	.37	85**	.22	76*	.37	09	.22	29	.37
Family Structure	12	.16	.55*	.27	19	.17	25	.26	02	.17	.40	.26
Constant	1.17		-2.06		1.68		61		.41		2.69	
-2 LL	657.15		238.32		616.74		239.23		617.25		236.94	
Chi-square	72.14		27.52		78.05		25.92		36.26		29.14	
Nagelkerke R ²	.16		.18		.18		.17		.09		.19	

Unstandardized logistic coefficients and standard errors are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

using the subgroups. For all six forms of traditional deviance (property offense, truancy, threatening, verbal, physical, and relational bullying), low self-control was significant in both subgroups with low and high level of deviant peer association. Using the statistical Z-score test by Paternoster et al. (1998), Z-score values were computed for each type of traditional deviance. Because none of the Z-score values were above the absolute value of 1.96, the null hypothesis could not be rejected. The current study found no statistically significant differences between the coefficients of low self-control in the two subgroups for all six traditional deviance models. Hence, hypothesis 3a was not supported. Despite the empirical evidence for a conditioning role of deviant peers on the link between low self-control and deviance (Evans et al., 1997; Gibson & Wright, 2001), the current study did not confirm this finding.

For cyber deviance, only the hacking model demonstrated a significant effect of low selfcontrol in the two subgroups (see Tables 14 and 15). The z-score value was 0.56, suggesting there was no significant difference between the two estimates. The other four types of cyber deviance (media piracy, software piracy, on-line harassment, and on-line pornography) illustrated that the effect of low self-control was not significant in one of the subgroups or both. For the two types of digital piracy, it is not surprising since the effect of low self-control was already non-significant in all of the models prior to the subgroup analysis. Based on these results, deviant peer association did not play a conditioning role in the relationship between low selfcontrol and cyber deviance, providing no support for hypothesis 3b.

It should be acknowledged that research on the conditioning effect of deviant peers on the link between self-control and offending is mixed for deviance in the physical world and in cyberspace. Gibson and Wright (2001) found that high school students with lower levels of selfcontrol and higher level of exposure to delinquent co-workers were most likely to engage in

	Media Piracy				Software Piracy				On-line Harassment			
	Low (n=528)		High (n=251)		Low (n=528)		High (n=251)		Low (n=528)		High (n=251)	
	В	SE	В	SE	В	SE	В	SE	В	SE	В	SE
Low Self-Control	.01	.03	.00	.03	.01	.03	01	.03	.09**	.02	.03	.03
Computer Proficiency	.55	.29	.17	.27	.27	.27	02	.28	.20	.26	01	.28
Smartphone Ownership	11	.36	.67*	.33	77	.42	.38	.35	04	.32	.53*	.36
Hours (School related)	06	.11	.07	.10	.10	.10	02	.11	.05	.09	05	.11
Hours (Video game)	09	.10	20	.12	.08	.11	10	.13	.04	.09	.12	.13
Hours (Email)	.03	.11	.02	.10	.02	.11	02	.11	23*	.10	06	.11
Hours (Instant messaging)	.09	.09	01	.08	.10	.09	.08	.09	.23**	.08	.20*	.09
Hours (Downloading & uploading files)	.19	.11	07	.11	.17	.11	.05	.12	.19*	.10	16	.12
Age	.33**	.12	.17	.09	.02	.10	.08	.10	00	.09	.10	.10
Gender	.25	.37	03	.37	78*	.36	-1.68**	.45	23	.31	-1.08*	.42
Family Structure	.10	.26	02	.25	29	.24	29	.27	13	.22	17	.27
Constant	-9.75		-2.54		-3.88		40		-4.79		-2.53	
-2 LL	277.74		247.04		287.22		220.85		346.79		218.27	
Chi-square	29.67		13.08		30.23		23.57		44.65		23.29	
Nagelkerke R ²	.12		.09		.12		.16		.15		.16	

Table 13. Logistic regression models partitioned by deviant peer association for five types of cyber deviance (n=779)

Unstandardized logistic coefficients and standard errors are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

Table 13. (cont'd)

		On-line Po	ornography		Hacking				
	Low (n=528)	High ((n=251)	Low (1	n=528)	High (n=251)		
	В	SE	В	SE	В	SE	В	SE	
Low Self-Control	.06**	.02	00	.03	.09**	.03	.06*	.03	
Computer Proficiency	.12	.245	17	.31	.53	.38	.49	.30	
Smartphone Ownership	.32	.30	.13	.40	.00	.45	.99*	.38	
Hours (School related)	12	.10	05	.12	.14	.14	.10	.11	
Hours (Video game)	.22*	.10	.22	.14	13	.13	.07	.13	
Hours (Email)	09	.09	23	.13	14	.14	23	.12	
Hours (Instant messaging)	.00	.08	.29**	.11	.20	.11	.15	.10	
Hours (Downloading & uploading files)	.16	.09	15	.14	.02	.14	18	.13	
Age	.53**	.11	.80**	.14	.31*	.14	.25*	.12	
Gender	94**	.30	-1.20**	.43	12	.46	05	.42	
Family Structure	34	.18	.07	.27	1.04*	.51	18	.28	
Constant	-11.07		-11.72		-13	6.61	-6.76		
-2 LL	343.83		184.63		187.12		199.92		
Chi-square	88.91		81.51		25	.70	28.23		
Nagelkerke R ²	.27		.46			14	.20		

Unstandardized logistic coefficients and standard errors are presented; *p<0.05; **p<0.01; All χ^2 are significant at 0.01 level.

occupational offending. Their finding suggested that exposure to delinquent friends exacerbated the effect of low self-control on misbehaviors in the workplace.

Regarding the conditioning effect of deviant peers on cyber deviance, the majority of research examining the interaction between low self-control and deviant peer association focused on different types of digital piracy (Higgins, 2005; Higgins et al., 2006, 2007, 2008; Higgins & Makin, 2004; Higgins & Marcum, 2011). These studies did not find statistically significant differences between the regression coefficients based on the Z-score tests (Holt et al., 2012). Thus they suggested that low self-control may be more predictive of one's involvement in digital piracy if individuals are more frequently associate with deviant peers. More recently, Holt et al. (2012) investigated whether different levels of one's association with deviant peers condition the effect of low self-control on cyber deviance. Using the Z-score test by Paternoster et al. (1998), they found that deviant peer association conditioned the relationship between low self-control and participation in cybercrime in general.

Contrary to these findings, other studies have revealed that the effect of low self-control was less predictive of deviant behavior in groups consisting of more delinquent peers (Hinduja & Ingram, 2008; Meldrum et al, 2009). Specifically, individuals who associate with peers pirating music files engage in high levels of music piracy regardless of their level of self-control (Hinduja & Ingram, 2008). In sum, it is uncertain whether deviant peer association strengthens or exacerbates the effect of low self-control on individual deviance.

Type of Deviance	Z-score value	Significance			
Traditional Deviance	-1.031	Not Significant			
Property Offense	1.871	Not Significant			
Truancy	0.618	Not Significant			
Threatening	-0.098	Not Significant			
Verbal Bullying	0.000	Not Significant			
Physical Bullying	0.148	Not Significant			
Relational Bullying	0.122	Not Significant			
Cyber Deviance	-	-			
Media Piracy	-	-			
Software Piracy	-	-			
On-line Harassment	-	-			
On-line Pornography	-	-			
Hacking	0.561	Not Significant			

Table 14. Z-score test for the effect of low self-control in partitioned models

Table 14 summarized the level of significance as well as the z-score values for each type of deviance. Based on these results, low self-control came out to be statistically significant in both subgroups for all six types and a general scale of traditional deviance. However, there were no significant differences between the regression coefficients in the two subgroups for any of these deviance measures. For media piracy, software piracy, on-line harassment, and on-line pornography, the effect of low self-control was either non-significant in one of the subgroups or both subgroups. Overall, there was no significant evidence illustrating that deviant peer association conditioned the effect of low self-control on any of the 11 deviance types.

The current results are considered tentative due to a number of methodological explanations regarding on the conditioning effect of deviant peer association. First, the prevalence was low with severely limited variation in the distributions of specific forms of deviance, particularly for cyber deviance. There was no statistically significant difference between the effect for those with low level of deviant peer association and that for those with high level of deviant peer association. In the current sample, 80 out of 279 youth participated in hacking, and the number of youth engaged in hacking was smaller than 80 in the partitioned models.

Second, the use of a convenience sample did not allow for a representative sample of South Korean youth engaging in deviant activities. It is possible that the current sample primarily consists of youth who have not engaged in deviant behaviors, especially cyber deviance. When there is low prevalence of and limited variation in the dependent variables within the sample, it is difficult to perform a meaningful analysis.

Third, the inadequate measurement might have contributed to the insignificant effect of low self-control in the two subgroups. The question items for *deviant peer association* measured an individual's on-line peer associations. More than half of the youth (54.6%) did not have deviant peers with whom they associated in on-line spaces. Furthermore, it did not take into account an individual's deviant behaviors in the real world. Future research needs to create and include a measure that captures deviance in both on-line and off-line environment. Additionally, with regards to the measurement of low self-control, only nine items were used instead of the full 24 attitudinal-items from the original scale developed by Grasmick et al. (1993). Although this value was found to be fairly reliable (Cronbach's $\alpha = .81$), a full measure of low self-control may have been more robust than the current measure. Overall, the current findings on the conditioning effect of low self-control were not robust, which may be driven partly by the aforementioned methodological limitations.

The current study discovered a number of important findings. First, this study found low self-control and deviant peer association to be predictive of general and specific forms of deviant behavior on-line and off-line, demonstrating theoretical applicability of the general theory of

crime (Gottfredson & Hirschi, 1990) and social learning theory (Akers, 1998) beyond real world crime and deviance. Second, the present study explored and found a significant relationship between virtual peer association and deviance both in the physical and virtual world. This is consistent with prior studies that youth who interact with deviant peers on-line are more likely to engage in deviant activities off-line (McCuddy & Vogel, 2014; Meldrum & Clark, 2013). Considering that the measure of deviant peer association captured a youth's frequency of associating with friends engaging in on-line deviance, cyberspace provides an environment that exposes youth to peer deviance via computer-mediated communication.

For the two types of digital piracy, low self-control was not significantly associated with both media piracy and software piracy. Although a number of existing studies have found low self-control to be a significant correlate of digital piracy (Higgins, 2005; Higgins & Marcum, 2011; Higgins et al., 2007, 2008; Holt et al., 2012; Marcum et al., 2011), the current analysis did not support this relationship. The non-significant effect on media and software piracy may be largely due to the incomplete measure of low self-control included in the models.

For the most part, technology-related measures were not linked to traditional and cyber deviance. Even if there are constant opportunities to engage in deviant behavior, salient factors such as low self-control and deviant peer association played a major role in a youth's involvement in real world and cyber deviance. Interestingly, an individual's level of computer proficiency was found to be a significant predictor of only one of the 11 deviance measures in all reduced and full models for hacking (p<0.05). This finding is supported by prior studies that hacking requires a high level of computer skills to penetrate into computer systems by exploiting vulnerabilities of various operating systems (e.g. personal computer, mobile phone) (Holt, Strumsky, Smirnova, & Kilger, 2012; Rogers et al., 2006). Compared to the four other types of

cyber deviance, hacking may require a more advanced understand and ability to use computers. It can be interpreted that individuals with higher levels of computer skills were more likely to engage in hacking.

In terms of mediating or conditional relationship between low self-control, deviant peer association and deviance, no significant link was found based on the analyses. Only a minor mediating relationship was found for on-line pornography. In addition to the reasons stated above, a binary logistic regression as an analytic method is not well-suited to examine a mediating role of deviant peer association in the link between low self-control and deviance.

The following chapter presents a more elaborate discussion of the relationship between low self-control, deviant peer association, and deviance on-line and off-line. Conclusions and policy implications are also discussed in light of the current findings.

CHAPTER 5: DISCUSSION & CONCLUSION

This dissertation investigated the applicability of the general theory of crime (Gottfredson & Hirschi, 1990) and social learning theory (Akers, 1998) in explaining real world and cyber deviance. The analyses showed that low self-control and deviant peer association are predictive of involvement in deviance on-line and off-line in general and specific forms. The findings corroborated previous studies that both low self-control and deviant peer association are important determinants of deviance off-line (Pratt & Cullen, 2000; Akers & Jensen, 2006) and on-line (Bossler & Burruss, 2010; Higgins, 2005, 2006; Higgins et al., 2006, 2007; Holt et al., 2012; Skinner & Fream, 1997).

In addition, the current study explored a mediating and conditioning relationship between low self-control, deviant peer association, and deviance. Despite that there is a conceptual overlap between the general theory of crime and social learning theory as well as empirical support for the link between low self-control, deviant peers, and deviance (Higgins & Marcum, 2011; Holt et al., 2012), the current study did not find any evidence of whether this interactive effect occurs in a juvenile population. Based on the analyses, deviant peer association did not have a mediating or conditioning effect on the link between low self-control and deviance. The present study examined a mediating or conditioning relationship in order to explore the interaction between low self-control and deviant peer association using an adolescent sample. However, the current study found no significant evidence that deviant peer association mediates or conditions the impact of low self-control on any of the traditional or cyber deviance measures. Finally, this study also found evidence that technology use may be linked with deviant behaviors in the physical world, although weak, based on the bivariate and multivariate results. While very few technology-related measures were significantly linked to traditional deviance, a number of technology-related variables – time spent on-line using email, instant messenger, and downloading and uploading files – were consistently related to cyber deviance in general and in specific forms.

This section provides a detailed discussion of how the current findings relate to prior research on low self-control, social learning, and deviant behaviors. It describes and summarizes key study findings concerning the applicability of the low self-control and social learning perspectives in light of the prior literature on cybercrime. This section also outlines a number of hypotheses whether they were consistent with the propositions of the general theory of crime (Gottfredson & Hirschi, 1990) and the social learning theory (Akers, 1998). Furthermore, strengths and limitations of the study, suggestions for future research, as well as policy implications are presented below.

Effect of Low Self-Control on Traditional and Cyber Deviance

Due to the limited prevalence and skewed distribution of deviance measures, a binary logistic regression was used to examine effect of low self-control on traditional and cyber deviance. The binary logistic regression analyses confirmed that low self-control is positively associated with a general scale of traditional deviance (*hypothesis 1a*) and cyber deviance (*hypothesis 1c*). These findings were consistent with the larger literature on real world (Pratt & Cullen, 2000) and cybercrime offending (Holt et al., 2012) that low self-control affects an individual's participation in deviant behavior. The significant effect of low self-control in both real and virtual world appears to be substantively important because individuals with lower levels of self-control are more likely to participate in deviant behavior not only in the physical world but also in cyberspace. Since opportunities for deviance and offending are abundant in

cyberspace, individuals with low self-control are quite likely to seek immediate gratification. Particularly with simple types of digital piracy such as media piracy and on-line pornography, adolescents engage in these deviant behaviors as they are easy to partake and present instant gratification.

For specific types of traditional deviance, the current study found that low self-control was significantly associated with the six types of real world deviance – property offense, truancy, threatening, and the three forms of traditional bullying. These findings are supportive of prior findings that individuals with low self-control are more likely to engage in criminal behavior such as property offenses (Baron, 2003; LaGrange & Silverman, 1999; Longshore, 1998; Longshore & Turner, 1998) as well as traditional bullying among adolescents (Chui & Chan, 2014; Haynie et al., 2001; Unnever & Cornell, 2003). As hypothesized by the general theory of crime (Gottfredson & Hirschi, 1990), individuals with low self-control are more likely to engage in activities that offer immediate gratification and rewards for short term benefits. Overall, low self-control was predictive of traditional law-violating behaviors (Burton et al., 1998; Gibbs & Giever, 1995; Gibbs et al., 1998; Grasmick et al., 1993; Nagin & Paternoster 1993; Piquero & Tibbetts, 1996) as well as various types of imprudent behavior such as binge drinking, academic dishonesty, public profanity, and public flatulence (Cochran et al. 1998; Gibson, Schreck, & Miller, 2004; Higgins & Tewksbury, 2007; Reisig & Pratt, 2011). Consistent with the larger literature, the current findings supported that low self-control is positively associated with a specific form of traditional deviance (hypothesis 1b).

In addition to traditional deviance, the current study found that low self-control was a significant correlate of various types of cyber deviance. This finding substantiated the claim that low self-control is associated with youth participation in multiple forms of cyber deviance

(Donner et al., 2014). Low self-control was also found to be associated with three specific forms of cyber deviance – on-line harassment, on-line pornography, and hacking. These findings supported previous research demonstrating that youth with low levels of self-control are more likely to engage in different types of cybercrime and deviance such as illegal use of personal, sensitive information (Moon et al., 2012), viewership of on-line pornography (Buzzell et al., 2006; Holt et al., 2012), hacking (Marcum et al., 2014), and on-line deviance in general (Donner et al., 2014). It should be noted that previous studies on computer hacking showed mixed results on the effect of low self-control (Bossler & Burruss, 2010; Holt et al., 2012; Marcum et al., 2014), though further research is needed to examine more complex forms of hacking beyond password guessing.

Low self-control did not predict software or media piracy in the reduced and full models that controlled for deviant peer association and other demographic variables. These findings are inconsistent with previous research on digital piracy (Higgins, 2004, 2007; Higgins et al., 2008; Holt et al., 2012; Malin & Fowers, 2009). Since opportunities for digital piracy are ample and it offers immediate rewards and gratification, those with low self-control are more likely to pirate digital goods and files.

The non-significance of low self-control on the two types of digital piracy may have been a result of the incomplete measure of the concept of low self-control included in the models. The measure of low self-control was based on only nine items originating from the 24-item scale developed by Grasmick et al. (1993). Although the *Cronbach's alpha* value indicated a decent level of reliability (*Cronbach's* α = .81), this partial measure of low self-control did not capture all of six dimensions – impulsivity, simple tasks, risk-seeking, physical activity, selfcenteredness and volatile temper (Grasmick et al., 1993). Admittedly, the measure of low self-

control in the current study did not include the item for physical activity. Also, there were limited number of items measuring dimensions such as impulsivity, self-centeredness, and risk-taking. Considering that digital piracy can be relatively simple and easy to achieve and also offers instant gratification and access to pirated music, movie, and software files, the current model must consider the inclusion of the 24-item self-control scale. Further, it is possible that the omission of important constructs relevant to digital piracy, such as the rational choice (Higgins, 2007), may have led to a misspecification of the models.

Finally, it should be acknowledged that the prevalence of media and software piracy in this sample was 16 percent and 14 percent respectively. These rates are lower than that of rates of software piracy for the United States (19%) and for South Korea (40%) in 2011 (Business Software Alliance, 2012). It is possible that the non-significance of low self-control is due to the limited variability in digital piracy rates. For most part, the current findings provided only partial support that low self-control is positively associated with a specific form of cyber deviance (*hypothesis 1d*).

Effect of Deviant Peer Association on Traditional and Cyber Deviance

The binary logistic regression analysis revealed that deviant peer association was significantly associated with traditional and cyber deviance in general and across specific forms of behavior. Associating with deviant peers was the most consistent predictor of deviance across all models, consistent with prior studies on school vandalism, petty theft, interpersonal aggression, and drunkenness (Rebellon, 2006), substance use and general delinquency (Meldrum & Clark, 2013), theft and assault (Miller & Morris, 2014) as well as violent behaviors (McCuddy & Vogel, 2014).

Deviant peer association was also linked to specific and general forms of cyber deviance. This is consistent with the existing literature which finds that associating with deviant peers impacts one's involvement in cybercrime and deviance (Holt et al., 2012; Ricketts, Maloney, Marcum, & Higgins, 2014). The significant effect of deviant peer association, consistent across all models, suggested that associating with peers is a salient factor in explaining one's involvement not only in the real world but also in cyber deviance. In reality, on-line peer networks are used to facilitate criminal and illegal activities in any environment, especially with the emergence of social network sites as well as peer-to-peer technology to download, upload, and exchange files.

The current findings revealed a potential link between on-line and off-line behaviors in the context of youth deviance. First of all, the significant effect of virtual deviant peer association on traditional deviance illustrated a potential connection between on-line and off-line behavior. Van Wilsem (2011) illustrated that digital routine activities (e.g. using email, web search for information, on-line purchase, on-line chatting, visiting on-line forums) can lead to a risk of traditional threat victimization (operationalized as an experience of receiving a threat of victimized in the physical world), and that real world activities can influence one's risk of digital threat victimization.

Based on the current findings that associating with virtual peers influences one's participation in traditional deviance, it is possible that a particular behavior may be learned in cyberspace via peer networks and reinforced in the real world (Miller & Morris, 2014). While deviant values and behaviors are often learned via peer interaction in the physical world, they may be also acquired from their virtual peers. Meldrum & Clark (2013) found that time spent on-line socializing with peers increases one's risk of engaging in delinquent behaviors in the

physical, off-line environment. McCuddy & Vogel (2014) added that there is a strong association between exposure to criminal behaviors via on-line social networks and self-reported offending (both violent and non-violent) in the real world.

Unlike the physical world, technology allows individuals to be interconnected to each other at all times (Ito et al., 2008). For example, youth can maintain a relationship with their peers that is "always on" as long as the tools of social technology (e.g. instant messenger, texting, social networking sites) are active and accessible. While youth use technology to develop new or ongoing physical relationships, they also build social relationship with others with whom they share similar interests (Ito et al. 2010). Adolescents use computer-mediated communication to keep in touch with real-world peers and reinforce existing relationships with friends (Subrahmanyam & Greenfield, 2008). The current study added to the scarce knowledge about the intersection between virtual and real world in the context of how emerging technologies adopted by adolescents impacts their learning of deviant behaviors via peer interaction.

Technology-related and Demographic Correlates of Deviance

Only a few technology-related variables were associated with participation in specific and general forms of traditional and cyber deviance in the full models. For the general scale of deviance, no technology-related variables were linked to traditional deviance. Cyber deviance was significantly related to time spent on-line using instant messaging (p<0.05) and downloading and uploading files (p<0.01). For specific types of traditional deviance, time spent on-line using instant messaging was significantly associated with property offense (p<0.01) and threatening others (p<0.05). Also, time spent on-line using email was negatively related to truancy (p<0.05).

These findings may simply demonstrate that technology plays a role in facilitating opportunities for traditional offending.

For specific cyber deviance, time spent on-line using email was negatively linked to online harassment (p<0.05) and on-line pornography (p<0.05) in the full model. Time spent on-line playing video game was positively related to viewing on-line pornography in the full model, whereas time spent on-line using instant messaging was positively associated with on-line harassment (p<0.01) and hacking (p<0.05) in the full model. Chang et al. (2014) found that playing on-line games are significantly linked to unwanted exposure to on-line pornography as well as on-line sexual solicitation victimization. Prior research has argued that opportunities (operationalized as hours spent on using computers for on-line activities) played a significant role on one's participation in deviant and illegal behavior on-line (Holt et al., 2012; Moon et al., 2010).

Age was found to have a significant relationship with both deviant behavior in the physical world and in cyberspace. Specifically, age had a positive relationship with cyber deviance, but a negative relationship with traditional deviance. The direction of the relationship between age and traditional deviance was negative due to the robust negative effect of age on the three forms of bullying (physical, verbal, relational). This is consistent with the existing empirical literature that used nationally representative samples that younger adolescents are more likely to be involved in verbal, physical, and relational bullying (Nansel et al., 2001; Wang et al., 2009).

For specific forms of deviance, age was positively linked with on-line pornography, computer hacking, and media piracy as well as truancy, meaning that older adolescents are more likely to participate in these deviant activities on-line. Based on a study using a nationally

representative sample, truant adolescents are more likely to be older (Vaughn et al, 2013). Despite using college student samples, prior studies on digital piracy illustrated that younger individuals were more likely to engage in pirating digital music (Bhattacharjee, Gopal, Sanders, 2003; Ingram & Hinduja, 2008) as well as software (Hinduja, 2001, 2003). Considering that these studies are based on college samples, younger individuals are likely to be in their late teens. Additionally, the study using a juvenile sample by Holt et al. (2012) also found that age had a positive impact on media piracy in one of the models. Research on computer hacking has consistently shown that hackers tend to be younger (Jordan & Taylor 1998; Skinner & Fream 1997; Taylor 1999; Yar, 2005). It should be noted that the current sample is considered a group of "youngsters" that is consistent with the claim that most hackers are predominantly young males, starting in early adolescents and teen years (Sterling, 1994; Taylor, 1999). No significant effect of age was observed for on-line harassment, software piracy, and threatening as a form of verbal bullying.

Findings were mixed regarding gender differences and participation in deviant behaviors. In general, gender was non-significant for traditional deviance. This is inconsistent with the larger literature that boys are much more likely than girls to engage in delinquent behaviors (Baldry, 2003; Farrington, Jolliffe, Hawkins, Catalano, Hill, & Kosterman, 2009). Consistent with the prior studies (Wang et al., 2009), females were less likely to threaten others and bully others verbally and physically, compared to males.

No gender difference was found for property offense, truancy, and relational bullying. These findings were divergent from the literature indicating that boys are more likely to commit property crime, compared to girls. While the number of arrests for property offenses for boys was 107,312, the number for girls was 56,510 (Federal Bureau of Investigation, 2013). Rates of

school absenteeism for fourth and eighth grade students were generally equal across gender during the past two decades (National Center for Education Statistics, 2013). With regards to relational or social bullying, in general, girls are more likely than boys to experience indirect forms of bullying as bully-victims or victims (Bjorkqvist, 1994; Carbone-Lopez, Esbensen, & Brick, 2010; Wang et al., 2009). As indicated by the non-significant effect of gender on the general scale of traditional deviance, it is possible the boys and girls in the current sample of youth have equally engaged in real world deviance in general. Also, the prevalence of truancy and property offense was much lower than that of all three forms of traditional bullying. It is possible that a significant gender differences may not reflect the patterns or trends among youth residing in South Korea. To understand the prevalence and distribution of technology use among South Korean youth, additional research is needed on the use of technology across gender and age groups.

Boys were more likely to participate in cyber deviance generally, and in on-line harassment, viewing pornography, and software piracy specifically. No gender difference was found for media piracy and hacking. The current finding on media piracy diverged from the previous research on digital piracy showing that males are more likely to pirate digital goods such as music and software (Bhattacharjee et al., 2003; Hollinger, 1992; Higgins, 2006; Hinduja, 2001, 2003; Ingram & Hinduja, 2008; Skinner & Fream, 1997).

Typically, hacking is deemed as a male-dominated offense (Jordan & Taylor, 1998), and those within the hacker subculture harass and initiate attack against others based on their gender and other considerations such as level of computer skills and knowledge and on-line etiquette (Holt, 2007). Among the studies on hacking, Bossler and Burruss (2010) found that males were

more likely to engage themselves in the social learning process of hackers and, in turn, more likely to participate in hacking. On the contrary, the study by Holt et al. (2012) using a juvenile sample found no gender difference in individual's involvement in hacking. Based on existing studies, there is limited empirical evidence to support the gender difference in hacking.

Link between Low Self-Control, Deviant Peer Association, and Deviance

The general theory of crime by Gottfredson & Hirschi (1990) and the social learning theory by Akers (1998) have been supported by a great deal of empirical evidence as major determinants of deviant behavior in the real world and in cyberspace. Findings from the current study supported that both low self-control and deviant peer association are significantly predictive of deviant behaviors on-line and off-line in general and specific forms. Other than the insignificant effect of low self-control on the two types of digital piracy (media and software piracy), all of the models showed that these two theoretical correlates have statistically significant and positive association with both traditional and cyber deviance.

The current data did not provide support for the mediating or conditioning role of deviant peer association in the relationship between low self-control and deviance. For all six specific types and the general scale of traditional deviance, the effect of low self-control was statistically significant (p<0.01) in the reduced model, and remained at the same significance level in the full model. This relationship was stable for both reduced and full models (P<0.01) for on-line harassment, hacking, and the general scale of cyber deviance. Low self-control was statistically non-significant in the reduced and full models for the types of digital piracy.

The present study found only a minor mediating effect of deviant peers for the on-line pornography models. While the effect of low self-control on on-line pornography was

statistically significant at the 0.01 level in the reduced model, this effect was reduced to the 0.05 level in the full model that added the measure of deviant peer association. This reveals that there may be a potential mediating relationship between low self-control, virtual peers, and on-line pornography.

This study also explored the conditioning effect of deviant peers on the relationship between low self-control and offending by partitioning the sample into two subgroups and comparing the regression coefficient of low self-control in each subgroup. While low self-control was found to be significant in both subgroups for the six types and the general scale of traditional deviance as well as hacking, it was non-significant in one or both subgroups for other types of cyber deviance. For the deviance types where low self-control was significant in both subgroups, the z-score test by Paternoster et al. (1998) indicated that there were no statistically significant difference between the subgroups. The current analysis found no evidence that there is a conditioning relationship between low self-control, deviant peer association, and deviance. Although the interaction between low self-control and deviant peers remains uncertain, the present study failed to uncover the ability of deviant peer association to condition the effect of low self-control on deviance on-line and off-line.

The linkage between low self-control and peer association has been theoretically supported by Gottfredson and Hirschi (1990). They argued that individuals with low self-control are less likely to make conventional friends but rather more likely to associate with delinquent friends. As a result, their propensity to engage in delinquent acts increases (Schreck, Wright, & Miller, 2002). This assertion has received some empirical support. Prior research revealed that those with lower levels of self-control select themselves into a group of deviant or delinquent friends in the physical world (Chapple, 2005; Evans et al., 1997; Longshore et al., 2004; Mason

& Windle, 2002; Nagin & Paternoster, 1993) and in a cyber environment (Higgins et al., 2006; Holt et al., 2012; Wolfe & Higgins, 2009). Although there is consistent support for the two competing theories of offending, the evidence on the mediating relationship of low self-control, deviant peer association and deviance is still unclear due to a limited amount of studies using full measurement of social learning theory. Although studies of cybercrime have shown that reinforcement from peers as well as sources of imitation for digital piracy (Cooper and Harrison, 2001; Holt et al. 2010; Ingram and Hinduja 2008) and hacking (Holt, 2007; Jordan & Taylor, 1998), these components of the social learning process have been absent in previous examinations of digital piracy.

In addition to the fuller operationalization of social learning theory, analytic techniques, such as structural equation modeling, could be used to better assess the direct and indirect relationships between low self-control, deviant peer association, and deviance. Future research also need to incorporate a more powerful analytical technique such as structural equation modeling that can effectively assess the interactive or mediating relationship between low self-control, social learning and cyber deviance. Recently, scholars have utilized structural equation modeling as well as more robust measurement of social learning model in examining cybercrime offending such as software piracy (Burruss et al., 2013) and hacking (Bossler & Burruss, 2010). Despite using a partial operationalization of social learning constructs, research by Higgins et al. (2006) also found a mediating link between low self-control, social learning and movie piracy.

Although these empirical studies are beneficial to understand the mediation effect of social learning, they are limited to a single type of cyber deviance and crime. It does not inform our knowledge of the interaction between deviant peer associations and low self-control to explain cyber deviance beyond software piracy and hacking. In other words, the mediation may

or may not hold true for other types of cyber deviance such as on-line harassment, sexting, malware attacks or cyber deviance in general. Future studies need to further examine the interactive relationship between low self-control and social learning beyond digital piracy (Holt & Bossler, 2014).

Contribution of the Current Study

Though there are limitations to this study, there are several strengths which demonstrate its larger value. First, research to date on cybercrime and deviance have heavily relied on college student samples. This study added to the less developed literature on cyber deviance among adolescents. The findings from this study demonstrated whether low self-control and association with deviant peers can explain one's likelihood of being involved in cyber deviance as early as upper elementary grades. Secondly, given that the majority of studies on cybercrime have been primarily US college samples, the current study examined the generalizability of the general theory of crime (Gottfredson & Hirschi, 1990) and social learning theory (Akers, 1998) in non-Western contexts by utilizing a sample of adolescents. Considering the scant amount of research on cybercrime involving juvenile populations in non-Western cultures (Moon et al., 2010), this current study explored South Korea, with its high prevalence of Internet usage and ownership rate of mobile devices, as a venue for conducting research.

Finally, this study identified a potential link between on-line and off-line behavior among adolescents. Specifically, associating with deviant peers on-line was linked with general and specific forms of deviance in the physical world. This confirms the previous studies that exposure to and socialization with peers on-line is positively related to various forms of

traditional violent and non-violent behaviors (McCuddy & Vogel, 2014; Meldrum & Clark, 2013).

In addition to traditional face-to-face interactions, technology essentially changed the venue in which offenders communicate with each other and plan criminal activities. The majority of youth spend a sizeable amount of time using social networking sites or instant messaging, making it relatively effortless to have an unstructured discussion about potentially deviant or criminal activities with peers without proper supervision from parents or guardians. In fact, Underwood, Rosen, More, Ehrenreich, and Gentsh (2012) analyzed the content of adolescents' electronic communication on mobile devices, and found that youth tend to openly chat with their peers in profane and obscene language about various forms of deviant behaviors. Overall, the findings from this study provided empirical evidence concerning virtual peers as a significant correlate of participation in real world deviance and crime.

Study Limitations and Recommendations for Future Research

Despite the strengths of this study, a number of limitations must be kept in mind. First, the cross-sectional nature of the sample did not allow one to establish a causal relationship between the variables under study (Singleton & Straits, 2005). The inherent limitation of a cross-sectional design is that it cannot establish whether the cause precedes the effect because the data on the variables were collected at the same time (Kraska & Neuman, 2008). Hence, the study's cross-sectional survey design makes it impossible to examine if a causal relationship among self-control, deviant peer association and cyber deviance exists. In terms of threats to internal validity, *ambiguous temporal precedence* creates an uncertainty in determining whether self-control or deviant peer association (cause) precedes digital piracy (effect), or vice versa

(Shadish, Cook, & Campbell, 2002). Future studies need to utilize a longitudinal research design to disentangle the relationship between these variables and to improve the correlational findings of the present study.

Second, this study relied on a non-random, convenience sample. The use of this nonprobability sample limits the external validity of the current study, making it difficult to generalize its findings to a broader adolescent population. Because this type of sampling did not involve the process of random selection, it is not representative of the adolescent population in South Korea and presents two main weaknesses. First, non-probability samples are prone to investigator bias in the selection of subjects or units. Secondly, it is impossible to compute sampling error due to the fact that the variability of non-probability samples cannot be estimated based on the probability sampling theory (Singleton & Straits, 2005).

At the same time, cybercrime is a relatively new phenomenon, making it is generally difficult to obtain secondary data for cybercrime. Although some official statistics are available by the National Police Agency Cyber Bureau in South Korea, demographic characteristics of offenders, especially juvenile offenders, are not readily available. Another disadvantage of the convenience sampling is the difficulty of replicating the results. Because the collected sample is not representative of the study population, results may not be replicated under the same conditions using other samples (Singleton & Straits, 2005; Shadish, Cook, & Campbell, 2002). In future research, a random sampling can be used to acquire a representative sample, and hence improve the ability to generalize the study findings to a greater population (Maxfield & Babbie, 2011; Shadish, Cook, & Campbell, 2002).

Another limitation of the present study is that technology measures (e.g. computer proficiency, smartphone ownership) in the current study did not capture the wide range of

computer skills or the number of different technological devices from which young offenders may access the Internet for deviant computer use. Initially, these measures were selected to examine whether an individual's proficiency in using computers and ownership of mobile device influences his or her participation in deviant behaviors. Computer proficiency was an ordinal measure with four categories (unskilled, beginner, intermediate, advanced), though smartphone ownership was a binary measure only. Further, the current measure of computer proficiency may be a double barreled question item as it is focused on the ability to use software and to fix computer problems. This is not reflective of one's comprehensive computer skills and literacy. Future efforts can be made to incorporate a more robust measure of computer skills and literacy. Given the increasing usage of mobile devices such as smartphones or tablets among adolescents, there is a need to separately consider cyberspace- and mobile device-specific behaviors and to refine the existing measures (Holt et al., 2013). Future research needs to differentiate the technology use measures based on the different types of gadget or operating system.

Regarding the composite measure of deviant peer association, it captured only the peers who engage in deviant behaviors on-line. Although deviant peers in on-line and off-line settings can overlap, it is possible that this measure does not include the network of peers who engage in deviant activities in the real world. Given that peer association is one of the well-documented risk factors for juvenile delinquency (Warr, 2002), recent evidence suggests that the effect of being exposed to on-line peer networks and interacting with virtual peers are linked to off-line deviant behaviors (McCuddy & Vogel, 2014; Meldrum & Clark, 2013). Moreover, a qualitative account of the hacker subculture indicates that deviant norms and values shape the relationship between offenders both on-line and off-line (Holt, 2007). All of these suggest that deviant networks may be formed via on-line and off-line interaction with peers. Yet, it remains unclear

whether individual behaviors are affected by deviant associations that are established through online interaction, off-line interaction, or both. Future studies should further investigate which type of deviant association influences the likelihood of deviant behavior in the physical and digital world.

Another measurement-related limitation is that the current study did not use all four components of the social learning theory but rather only used the deviant peer association measure. All four concepts must be included to understand the dynamics of how each component operates in the underlying social learning process. The current study used an incomplete measure of self-control concept that composed of only nine items from the original 24-item scale developed by Grasmick et al. (1993). Its non-significant effect on the media and software piracy models may be attributable to the deficient measurement of concept of low self-control. These findings were contrary to the literature that low self-control is significantly linked to one's involvement in digital piracy even after controlling for differential peer association (Higgins, 2004, 2007; Higgins & Makin, 2004; Higgins et al., 2006, 2007, 2008, Wolfe & Higgins, 2009).

Although the Cronbach's alpha value indicated fair reliability, future research should use the 24-item scale to ensure a robust measure of low self-control. More importantly, without the full and accurate measures from the two theories, there is a possibility of model misspecification, especially considering the lack of research and knowledge of the interaction between social learning and low self-control in the context of cybercrime and deviance.

Additionally, the present study offered only a partial test of the social learning theory because it relied only on its single component, differential association. Based on the current finding, it is difficult to determine whether definitions favoring law-breaking, reinforcement from peers, or deviant models for imitation affected one's participation in deviant behavior.

Although the majority of studies on cyber deviance attempted to examine the social learning theory, only a few used all of its four components -- differential association, definition, differential reinforcement, and imitation (Burruss et al., 2013; Holt et al., 2010). Prior research on cyber deviance commonly included one or two components of social learning theory and found that differential association and/or definition to have a significant link with digital piracy and hacking (Higgins, 2005, 2006; Higgins & Makin, 2004; Higgins et al., 2007; Hollinger, 1992; Skinner & Fream, 1997).

In the study by Holt, Burruss, & Bossler (2010), the four components of social learning were examined to assess the full process model of the Social Structure Social Learning by Akers (1998) using a structural equation modeling. Specifically, they explored the theoretical relationships between each of the four components of social learning theory and the likelihood of engaging in software piracy. They found that of the four components differential association with deviant peers had the highest loading (0.88) on the social learning construct, indicating the importance of this component in explaining software piracy. Without all four components, it is not possible to understand the mechanism underlying the social learning process (Holt et al., 2010; Bossler & Burruss, 2010).

Furthermore, the analytic technique used in the current study, binary logistic regression, did not allow researchers to properly assess the interaction between the two theoretical variables, low self-control and deviant peer association. Future research can improve this limitation by using a structural equation modeling to examine the direct and indirect effect of low self-control and deviant peer association on cyber deviance.

The final limitation is concerned with the study's reliance on the self-reported survey data. Although self-reported survey may yield more honest responses on question items asking

about sensitive, personal information than interviews, sensitive topics (such as illegal, deviant behavior) may be prone to social desirability bias (Tourangeau, Rips, & Rasinski, 2000). There is a risk for social desirability bias if respondents have embarrassing information to report in the survey questionnaire (Tourangeau & Yan, 2007). To reduce this risk, the current survey questionnaire contained statements that provide assurances concerning the confidentiality of the responses that are given by participants. Moreover, the survey did not collect any identifiable information (e.g. name, address, birthdate, race) from the respondents. However, it is generally difficult to control or improve the misreporting of socially undesirable behaviors.

Policy Implications

Based on the findings of this study, policy implications specific to two criminological theories can be drawn to reduce youth participation in traditional and cyber deviance. In summary, the present study found that youth who have lower levels of self-control and more frequent association with deviant peers are more likely to take part in both on-line and off-line deviant activities. Strategies can focus on how to help youth to develop self-control and make good decisions when opportunities for engaging in wrongdoing are presented.

Parents need to closely monitor their children's activities with peers in on-line (Mesch, 2009) and off-line settings (Hay, 2001). For instance, parental mediation techniques, particularly evaluative mediation that utilizes open discussion regarding Internet usage, evaluation of web content, and setting rules for Internet use and permitted and forbidden websites for children, can serve as a protective factor for children's on-line misbehavior such as cyberbullying (Mesch, 2009). Further, prior research found that adolescents whose parents monitored and regulated

their on-line activities were less likely to disclose personal information (e.g. full name, e-mail address, instant message name, school name) (Rosen, 2007; Rosen, Cheever, & Carrier, 2008).

Existing studies have used proxy measures of parental supervision such as location of computer use within the household. Research has shown that locating the computer in a public place (e.g. living room, kitchen), where visibility of detecting deviant activities is high, can be a helpful way to monitor youth misbehaviors (Bossler, Holt, & May, 2012; Marcum, 2008; Marcum, Higgins, & Ricketts, 2010a). It allows parents to better monitor the type of deviant activities in which youth engage using computers, and to intervene when they participate in deviant behaviors (Bocji, 2004). If the computer location was in a private location, it would be more challenging to monitor their activities since the visibility of detecting a deviant activity is low. Other preventative measures such as use of filtering or security software was shown to be ineffective measure to protect individuals from cybercrime victimization (Bossler & Holt, 2009; Bossler et al., 2012; Ngo & Paternoster, 2011).

With regard to on-line victimization, monitoring presence of a parent or guardian in the room during one's Internet use influences the likelihood of receipt of sexually solicitation as well as non-sexual harassment (Marcum, Higgins, & Ricketts, 2010a; Marcum, Higgins, & Ricketts, 2010b). In addition, the study by Wolfe, Marcum, Higgins, & Ricketts (2014) found that two supervision-based routine activities, specifically school cell phone rules and family cell phone plan, to be significantly linked to receipt of sexually suggestive messages or images via texting. This study illustrated that adolescents whose cell phone contract is included in their family's cell phone plan are less likely to received sexually explicit images or videos on their mobile phone, compared to those with cell phone contracts independent of their family's plan. Yet, the study by

Moore, Guntupalli, & Lee (2010) revealed that parental regulation of Internet use and on-line activities was not significantly linked to on-line harassment victimization.

Parents exert considerable influence on adolescents' involvement in delinquent behaviors (Warr, 2002). Gottfredson and Hirschi (1990) assert that crime offers immediate, short-term benefits such as small monetary gain, brief sexual pleasure, or excitement. When opportunities for law-breaking are presented to individuals with low self-control, it is likely that they will be "unable to resist the easy, immediate gratification that crime and analogous behaviors seductively, and almost ubiquitously, present in everyday life" (Pratt & Cullen, 2000, p. 932). A person with low self-control is likely to be incapable of considering the long-term consequences and benefits associated with his or her acts. Given that ineffective parenting during early childhood contributes to low self-control (Gottfredson & Hirschi (1990), parents can serve as agents to develop self-control in youth but also influence their involvement in deviant activities.

Parents can educate their children about the costs and harms associated with deviant and criminal behaviors both off-line and on-line. Although individuals can recognize the costs as a result of participating in real world crime, it may be less apparent for cybercrime. Hinduja (2006) points out that unlike traditional street crime, two factors that may deter one's participation in deviant behavior is absent with digital piracy. First, there is not a tangible loss or harm that is visible to potential and actual perpetrator of digital piracy. Secondly, with cybercrime, youth may not be fully aware of the legal punishment that may deter them from engaging in wrongdoings.

This is particularly true for digital piracy. Using the bit-torrent technology and peer-topeer file sharing, adolescents could easily download music, movie, or software files and share with peers via the Internet, and believe that there is no harm being done with this behavior

(Higgins, 2004). Parents need to educate their children about seriousness of this behavior as well as consequences that one can suffer from intellectual property theft of digital goods. Parents also need to closely monitor their children's on-line behaviors and consistently sanction them if they engage in misbehaviors (Gottfredson & Hirschi, 1990). Hinduja & Patchin (2012) make recommendations for parents and educators to immediately inform the perpetrators of on-line harassment about the consequences for harassing and bullying other off-line and on-line. Often, youth who engage in on-line harassment are unlikely to realize the costs and benefits of their actions.

Based on prior research examining cybercrime victimization, increasing awareness and educating youth about dangers associated with on-line harassment and other victimization (e.g. malware, identity theft) may have a deterrent impact on their future behaviors (Bossler & Holt, 2009, 2010; Bossler et al., 2012; Holt & Turner, 2012). Individual awareness and knowledge can play a role in reducing and preventing one's involvement in cybercrime. Hence, developing and promoting programs that educate youth and children of the risks of engage in cyber deviance and associating with deviant peers on-line may help to decrease youth participation in cybercrime offending, as opposed to improving harsh punishments (Bossler & Holt, 2009; Bossler et al., 2012).

In addition to parents, teachers and school administrators can work together in create classroom structure that allows them to adequately monitor and regulate deviant use of computers, including socialization with deviant friends. They can also develop educational programs to educate the school youth concerning how their decisions to participate in deviant peer activities can negatively affect their lives in the short and long term. Helping youth to understand what constitutes appropriate behaviors when using the Internet or other CMCs can be

an important aspect of educating the children to be responsible citizens in cyberspace (Fleming, Greentree, Cocotti-Muller, Elias, & Morrison, 2006). Through classroom activities and instructions, teachers and schools can address some of the key issues that youth are facing in cyberspace such as on-line safety and privacy, copyright protection and intellectual property theft, and responsible use of technology. Parents and teachers must work in tandem to raise awareness about the costs and dangers associated with criminal and deviant behaviors on-line.

Peers are influential in whether an individual approves of and participates in deviant activity (Akers, 1998). Peer associations provide the environment for youth to not only observe and imitate behavioral models but also reinforce beliefs and attitudes that support the behavior. With regards to deviance in the real world, parents and teachers attempt to disrupt the association with deviant peers by physically separating the youth from their peers in the classroom and other school settings (e.g. playground). Parents can also limit their physical interaction with deviant peers during after school hours as well as in the evenings and weekends.

With the emergence of social media and other electronic communication, youth are able to socialize with peers on-line at any time and location. The measure of deviant peer association used in the present study consisted of items asking whether respondents had peers who engaged in different types of deviant activities on-line. Based on the consistent finding that association with deviant peers increases the odds of all types of deviance, parents and teachers need to keep track of both off-line and on-line peer networks.

For example, parents and teachers may be aware of the off-line peers of their children or students; they may not be aware of the on-line peers or individuals with whom the youth and children interact via the Internet. Given that there are various types of deviant influence (e.g. cyberbullies, pedophiles) in cyberspace (Jones et al., 2012, 2013; Mitchell et al., 2013) that pose

threats to the safety and privacy of children and adolescents, further attention should be given to the supervision of their time spent on-line, the types of their activities on-line, and the peers with whom they frequently interact. Since low self-control was not found to be linked with software and media piracy, policies should focus more on peer relations and advocacy for protecting intellectual property rights. Campaigns to create and encourage a culture that protects the intellectual works of others can promote public awareness about the consequences of digital piracy among young students.

Parents also need to monitor and regulate their use of social networking sites such as Facebook and Twitter in order to limit the opportunity to engage with deviant peers on-line. Research has shown that association with deviant peers and maintenance of social networking is a significant predictor of involvement in cybercrime (Bossler et al., 2012; Mesch, 2009). Specifically, parents could establish rules and guidelines, against socialization with deviant peers via the Internet and social media, by which they all abide. If they associate with deviant peers on-line, parents can apply sanctions for not complying with parental rules and guidelines. Hinduja & Patchin (2013) found that if a youth internalized that their deviant behavior will not go unpunished by parents or teachers, he or she is less likely to participate in cyberbullying. Further, teachers and school administrators can develop educational programs that promote the risks and consequences from "hanging out" with peers who engage in deviant or criminal activities on-line (Bossler & Holt, 2010). All of these aforementioned measures can be taken to discourage their association with deviant peers on-line. If associations with deviant peers on-line can be reduced, in turn, this can discourage youth participation in delinquent and criminal activity (Meldrum & Clark, 2013; Weerman et al., 2013). Policies should focus on effectively monitoring and limiting opportunities for virtual interaction with deviant peers.

Finally, the current sample represents a unique population consisting of adolescents residing in South Korea. An important factor needs to be considered to generate policies that are specific to the cultural contexts. In South Korea, there are two major on-line portal sites, *Naver* and *Daum*, which serve to provide essential functions (e.g. web browsing, keyword search) for computer users. These Internet portal sites are free of charge, but requires a national identity number to register for basic services such as email and other personalized services. For instance, an individual must enter his or her national identity number issued by the South Korean government in order to register and obtain a personal email account. This means that the identity of users of services from these on-line portals may not be anonymous and their personal information may be easily viewable by others.

In November 2011, the South Korean government implemented a shutdown policy that prohibits children and youth under 16 years of age to play on-line games from 10:30pm to 6am (Park & Ahn, 2010). During these hours, access to on-line games is blocked for all individuals aged under this age. Though this policy was recently revised so that the ban could be lifted at the request by the children's parents (Lee, 2014), it serves as an example to regulate and prevent addictive behavior on-line.

Given that opportunities for youth to engage in cyber deviance and crime is ample, government, industry and parents can collaborate to produce strategies that protects children and youth from being involved in deviance on-line. The government could also closely cooperate with the Internet service providers (ISP) to identify those who engage in illegal behaviors such as digital piracy and hacking. If the perpetrators are minors, the ISPs can notify the parents or caregivers about their children's wrongdoings. Through collaboration between law enforcement,

industry, ISPs, and parents, efforts can be made to deter youth from beginning or continuing their participation in criminal activities on-line.

With the incidents involving digital piracy and intellectual property theft, there have been worthwhile efforts to reduce digital piracy. Similar to the way that the Recording Industry Association of America (RIAA) targeted individual users for illegal file sharing of copyrighted materials, policies can aim to target the youthful Internet users and their parents to reduce incidences of digital piracy by charging heavy fines for the illegal acts. The government also could make the ISPs and Internet portal sites legally accountable for properly monitor illegal file sharing activities or other cybercrime activities. Although the effect of legal sanctions may be uncertain based on the temporary decrease in peer-to-peer file sharing traffic (Karagiannis et al., 2004), collaborative efforts can be made to develop strategies to deter youth participation in digital piracy as early as the start of adolescence. Given that Internet portals (e.g. Naver, Daum) requires citizens to submit their sensitive information such as their national ID card number, it would be less difficult to track their on-line activities in accordance with their IP addresses. Further, regulatory authority could be given to system administrators of the Internet portals to withhold on-line services if illegal and deviant activities are detected. For instance, if system administrators could identify youth who use substantial amounts of bandwidth for pirating digital files or receive reports of on-line harassment, they could inform the parents of the service users about their children's on-line misbehaviors. Selective removal of the users who engage in illegal activities may help to reduce cyber deviance (Bossler & Holt, 2010).

At the same time, government and industry faces the challenge of figuring out when and how the digital materials and files are being pirated and shared illegally. Further, those who engage digital piracy believe sharing pirated materials amongst themselves or with others to be a
normal and acceptable behavior (Holt & Copes, 2010; Morris & Higgins, 2008; Ingram & Hinduja, 2008). Within the Internet community, there are opposing views towards the idea of copyrighted protection as well as increasing support for the freedom of file sharing in cyberspace (Nhan, 2013). This tension between intellectual property owners and those who are committed to obtaining and sharing copyrighted digital materials without permission makes the enforcement against digital piracy to be more difficult (Holt, 2007; Holt & Copes, 2010). Digital piracy is likely to become more complex while technology becomes more sophisticated. As the techniques and tools used to facilitate digital piracy evolve, collaborative responses between law enforcement, Internet service providers, industry, and citizens must also evolve (Holt, Bossler, & Seigfried-Spellar, 2015).

Because offenders are short-sighted and unable to consider the long term consequences of their acts, intervention programs that aim to reduce the opportunities and rewards of deviant behavior can enhance the level of self-control. Gottfredson & Hirschi (1995) added that "programs that increase the difficulty, even minimally, with which crimes can be undertaken or that enhance the probability of immediate intervention will reduce crime" (p. 32). Considering the early exposure to technology at an increasingly earlier age, efforts to help youth to develop self-control and make good choices when faced with offending opportunities must be made early in life.

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