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Abstract

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Low self-control and cybercrime: Exploring the utility of the general theory of crime beyond digital piracy

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A B S T R A C T

While technological innovations over the last thirty years have markedly improved the ways in which people communicate and gather information, these advances have also led to computer crimes and related deviance becoming permanent fixtures in our society. In an effort to curtail internet offending, it is important for academics and practitioners alike to better understand why some individuals engage in cybercriminality. Criminologists have utilized several theories to investigate this type of deviance, including low self-control theory. However, the vast majority of this prior research has focused on a narrow scope of offending, namely digital piracy. The current study utilizes a sample of 488 undergraduate students to evaluate the theory's generality hypothesis by examining the extent to which low self-control predicts online deviance in general and beyond digital piracy more specifically. Study results support the generality hypothesis in that low self-control is related to non-digital piracy online deviance. Specific findings, policy implications, and directions for future research are discussed.

1. Introduction

Over the last three decades the global society has witnessed a number of advances in electronic technology (e.g., cellular phones, home computers, and the Internet). And, while these relatively new resources are used extensively and have become quite popular in the United States, these tools have also become avenues for crime and deviance, which pose a myriad of questions for criminologists and a number of problems for the criminal justice system. Additionally, the advent of these technologies has not only made "pre-existing" crimes available to commit in another forum (e.g., drug transactions, stalking), but it has also created a litany of new antisocial behaviors (e.g., creating and spreading malware) that were previously impossible if not for the new technology. It is no coincidence that since the beginning of the technology boom various computer-related deviant behaviors have increased considerably. These behaviors include, but are not limited to: hacking, digital piracy (i.e., illegal downloading and uploading of music and software programs), online-community exclusion and harassment, and using someone else's password without his or her permission.

In an attempt to better understand the factors that propel individuals to participate in cybercrime and online deviance, criminologists have looked to criminological theory to provide explanations for such behavior. These studies have included examinations of several mainstream theories, such as self-control theory, social learning theory, and routine activity theory (e.g., Higgins, 2005; Higgins, Fell, & Wilson, 2007; Hinduja, 2001, 2006; Moon, McCluskey, & McCluskey, 2010; Yar, 2005). Overall, this body of research suggests that traditional criminological theories are useful for explaining cybercrime and online deviance. However, the majority of these studies are limited in scope because the bulk of the cybercrime research only examines one form, e.g., digital piracy.

In recognition of this limitation, the current study seeks to contribute to the literature by providing an assessment of self-control theory's generality hypothesis through the exploration of the potential relationship between low self-control and a more comprehensive measure of online deviance. Specifically, the main objective of this study is to investigate whether an individual's level of self-control is significantly related to his or her involvement in online deviance beyond digital piracy. To this end, and

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building upon the existing literature linking self-control to online deviance (e.g., Foster, 2004; Higgins et al., 2007; Moon et al., 2010), the current study uses a sample of 488 undergraduate students from a large university in the southeast to examine one central research question: Does the generality hypothesis of self-control theory extend beyond digital piracy to explain a wider array of online deviant behaviors?

2. Literature review

2.1. Cybercrime

The growth of information technology has introduced a new form of criminality to the criminal justice system: cybercrime. Cybercrime can be broadly defined as "the destruction, theft, or unauthorized or illegal use, modification, or copying of information, programs, services, equipment, or communication networks (Perry, as cited in Rosoff et al., 2002, p. 417). In other words, cybercrime can be considered to be any form of online deviance utilizing technology, whether it is a computer, smart phone, or personal digital assistant (PDA). The development of cybercrime was not an instantaneous act, but rather involved an evolution of changes.

The first generation of cybercrime involves deviant acts characterized by the illegal exploitation of mainframe computers and operating systems. Generally, these behaviors involve crimes that were in existence before the creation of computers and the Internet, but these technological innovations provide another arena to commit them. These offenses have the intention of financial gain or destruction of restricted information, and are considered "low-end crimes" (Wall, 2010). Examples include using the Internet to learn how to construct a pipe bomb or make methamphetamine.

The second generation of cybercrime uses networks and is considered hybrid crime. In other words, it is criminality that is already in existence but has expanded and adapted through the use of the Internet (Katos & Bednar, 2008; Wall, 2010). Hacking and cracking are common forms of this generation, as they were a product of early "phone phreakers" who stole free long distance service from telephone companies. Dissemination of child pornography or sexual solicitation are also examples of this generation, as they occurred prior to the creation of the Internet but can now be performed in a different (and often more difficult to detect) manner.

Lastly, the third generation of cybercrime is identified by the nature of distribution and was solely developed by the creation of the Internet. These crimes would not be in existence if not for the Internet, as that is the only place they can occur. Dissemination of malware, such as viruses or Trojan horses, is an example of this generation of cybercrime.

Based on this continuum of cybercriminality, multiple forms of online deviance have emerged and are becoming a prominent problem for the criminal justice system. Identity theft is no longer a result of the physical apprehension of a person's credit card or license. Social security numbers, private passwords, and other personal information can be accessed online and used for fraudulent behavior. Sex crimes such as the production of child pornography, human sex trafficking, and even prostitution have become simplified with the use of the Internet. Furthermore, theft has taken on a new face as peer-to-peer networks and streaming has allowed copyrighted material such as songs, movies, and software to be illegally downloaded and used.

Prior studies of online deviance have uncovered several demographic correlates, such as age, biological sex, and race (e.g., Buzzell, Foss, & Middleton, 2006; Higgins, Wolfe, & Marcum, 2008; Khey, Jennings, Lanza-Kaduce, & Frazier, 2009). Specifically, research has found that younger individuals (e.g., Buzzell et al., 2006), males (e.g., Foster, 2004), and non-whites (e.g., Higgins & Makin, 2004) are more likely to engage in online deviance. While demographic factors are important in terms of understanding cybercrime, criminological theory also offers logical explanations for why people commit these types of offenses. Currently, the prominent theories used to explain cybercrime have been routine activities theory, social learning theory, and self-control theory. The current study examines cybercrime with a focus on the latter of the three criminological theories.

2.2. Gottfredson and Hirschi's general theory of crime

Gottfredson and Hirschi's (1990) self-control theory assumes that individuals are rational decision makers. This means that individuals weigh the consequences of their actions and will choose the actions that bring them the most pleasure and the least amount of pain. When the perception of pleasure from an action outweighs the perception of pain from the action the individual is likely to perform that action. Individuals who have low levels of self-control (i.e., an inability to see consequences of their actions) will find crime and deviance attractive because these individuals are "impulsive, insensitive, physical (as opposed to being mental), risk-taking, shortsighted, and nonverbal" (Gottfredson & Hirschi, 1990, p. 90).[1] Gottfredson and Hirschi (1990) state:

> The dimensions [characteristics] of self-control are, in our view, factors affecting calculation of the consequences on one's acts. The impulsive or shortsighted person fails to consider the negative or painful consequences of his acts, the insensitive person has fewer negative consequences to consider; the less intelligent person also has fewer negative consequences to consider (has less to lose).

They further suggest that there is a tendency for these six traits to coalesce in the same individuals. Alternatively stated, they argue that these six elements are considered to be a single, unidimensional latent trait.

One of the central tenants of the self-control theory is its generality hypothesis. In addition to their theory attempting to explain crime, it also claims to be able to explain *all* forms of deviance and imprudent behavior. Gottfredson and Hirschi (1990) suggest that individuals with low self-control are more likely to "smoke, drink, use drugs, gamble, have children out of wedlock, and engage in illicit sex" (p. 90). This wide range of antisocial behaviors is known as "crime equivalents" or "acts analogous to crime." To the theory's credit, an abundant amount of research has demonstrated that low self-control is related to these types of antisocial behaviors, such as academic dishonesty (Cochran, Wood, Sellers, Wilkerson, & Chamlin, 1998), bullying (Moon, Hwang, & McCluskey, 2011), sexual promiscuity (Jones & Quisenberry, 2004), drunk dialing (Reisig & Pratt, 2011), and risky driving (Forde & Kennedy, 1997). In sum, Gottfredson and Hirschi (1990) assert that individuals with low self-control engage in crime and deviance because they lack the capacity to consider the long-term consequences of their actions.

According to *Gottfredson and Hirschi (1990)* those who have the characteristics of low self-control, most likely have these

[1] It is important to note that Hirschi (2004) and Gottfredson (2006) have published parallel re-conceptualizations of self-control. They have argued that researchers have spent too much time and resources examining something that they do not understand – low self-control. To alleviate this problem, they have redefined low self-control to self-control (i.e., the ability to foresee the consequences of one's actions). With this redefinition, Hirschi (2004) and Gottfredson (2006) take two stances: (1) the characteristics are probably not necessary to understand self-control; thus, we present them here from a traditional perspective, and (2) the measurement of self-control differs by age but behavioral measures are still appropriate to use with juveniles.

characteristics as a product of ineffective parental management. Specifically, the theorists argue that parents are to consistently manage their child by performing four tasks. First, parents are to form an emotional bond with their child. Second, parents are to monitor their child's behavior to gather behavioral information. Third, parents are to analyze the behavior for deviance. Fourth, when parents suspect deviance, to correct the deviance, they are to apply non-corporal punishment. Parents are to perform these tasks consistently before the child is eight to ten years old. If this does not occur during this developmental period, the child is likely to have low levels of self-control and this makes them susceptible to criminal behavior.

2.3. Empirical research of Gottfredson and Hirschi's general theory of crime

The general theory of crime has received considerable theoretical and empirical attention since its inception, and a large body of research has demonstrated support for the relationship between low self-control and antisocial behavior (e.g., Cochran et al., 1998; Donner & Jennings, in press; Gibbs, Giever, & Higgins, 2003; Grasmick, Tittle, Bursik, & Arneklev, 1993; Miller, Jennings, Alvarez-Rivera, & Lanza-Kaduce, 2009; Pratt & Cullen, 2000). Furthermore, the theory has been supported in many empirical studies investigating the predictors of online crime and deviance (Foster, 2004; Higgins, 2005; Higgins, Wolfe, & Ricketts, 2009; Higgins et al., 2007; Hinduja, 2006; Holt, Bossler, & May, 2012; Marcum, Higgins, Wolfe, & Ricketts, 2011; Moon et al., 2010). For example, research from Hinduja (2006), which examined the potential relationship between three popular criminological theories (self-control, social learning, and general strain) and music piracy, found that low self-control was significantly related to music piracy. Relatedly, Higgins and colleagues (e.g., Higgins, 2005; Higgins et al., 2007, 2009; Marcum et al., 2011) have extensively studied digital piracy, and their research consistently finds a significant relationship between low self-control and pirating behavior among college students. Furthermore, research from Moon et al. (2010) has supported the relationship between low self-control and digital piracy among a longitudinal study of Korean middle school students.

However, a limitation to this breadth of support is that the large majority of online deviance studies only examined digital piracy.[2] And, while the relevant literature demonstrates the low self-control is positively related to digital piracy, it is important to more fully investigate the theory's generality hypothesis by examining other forms of online deviance. As such, this study seeks to provide better insight into the effect of low self-control on cybercrime and online deviance as a whole; and, if the generality hypothesis is to be supported then low self-control should be able to explain online deviance beyond digital piracy.

3. Current study

The literature reviewed above suggests that the research on cybercrime is extensive but limited with regard to scope. In an attempt to address this limitation, the current study utilizes a sample of 488 undergraduate students from a large university in the southeast to explore the extent to which low self-control predicts online deviance. Based on Gottfredson and Hirschi's (1990) theory, the current study examines two related hypotheses, which reflect the potential effect of low self-control on two cybercrime outcomes. First, it is hypothesized that low self-control will be significantly related to a seven-item variety index of online deviance. Second, because the central focus of this study is to examine cybercrime beyond digital piracy, it is hypothesized that low self-control will be significantly related to a five-item variety index of online deviance that does not include acts of digital piracy.[3]

4. Methods

4.1. Data and sample

The present study utilized survey data from undergraduate students at a large university in the southeast. The purpose of the research project, which was approved by the university's Institutional Review Board, was initiated in an effort to better understand the online habits and online deviance among college students. The survey instrument was distributed in several criminology and general social science undergraduate courses between September 2011 and November 2011.[4] The instructors of the courses introduced the project and survey to the students and also explained the voluntary nature of study participation. All respondents completed an informed consent document, and all responses were anonymous to discourage misreporting of deviant behavior and to protect each subject's confidentiality. A total of 809 students were exposed to the research project (e.g., administered the paper and pencil survey) and the final sample of consisted of 488 respondents with complete information on all of the measures used in the current study, which resulted in a 60% response rate.[5]

4.2. Measures

4.2.1. Dependent variables

The outcome variables are based on ten individual acts of online deviance. These items were chosen based upon prior research in online offending (Bossler & Holt, 2010; Higgins, 2005; Skinner & Fream, 1997) and, in particular, with attention to validating items that McQuade (2007) suggested were present in college student offending. Each item was collected as a frequency (count) variable, and respondents were prompted with the following question: "In the table below, indicate how many times you have engaged in the behaviors listed." The items include: (1) posting hurtful information about someone on the internet, (2) threatening/insulting others through email or instant messaging, (3) excluding someone from online community, (4) hacking into an unauthorized area of the internet, (5) distributing malicious software, (6) illegally

[2] Only a few studies have examined the relationship between low self-control and other forms of online deviance (Buzzell et al., 2006; Foster, 2004; Holt et al., 2012). These studies, however, are still limited in terms of their outcome variables. For example, Buzzell et al.'s (2006) study focused solely on downloading pornography, whereas the latter two studies focused primarily on digital piracy and online bullying.

[3] The five-item variety index contains five of the seven general cybercrime acts from the seven-item variety index. Specifically, the five-item variety index excludes the two digital piracy acts of illegally downloading and uploading copyrighted material so that cybercrime *beyond* digital piracy can be examined in addition to cybercrime *including* digital piracy.

[4] The surveys were administered in pencil and paper format and were handed out in the classroom. Thus, it was not possible to compare early and late respondents because the survey was not administered in an online format.

[5] Of the 809 students that were exposed to the project (e.g., administered the paper and pencil survey), 522 students returned the surveys. However, 20 of the surveys had substantial amounts of data missing, resulting in being dropped from the sample. Additionally, and based on a reviewer's comment, respondents over 30 years of age were excluded from the final sample as age outliers. The remaining 97% of the sample, for which the analyses in the current study are based on, was between 18 and 29 years old. This deletion, based on research that demonstrates generational differences in technological savviness (e.g., Bennett & Maton, 2010), resulted in the loss of 14 cases and thus yielded a final sample of 488 respondents. Importantly, and based on chi-square and ANOVA analyses, no significant differences were found on the study variables of interest between (1) those with missing data and those with complete data, and (2) those younger than the age of 30 and those 30 years of age or older.

downloading copyrighted files/programs, (7) illegally uploading copyrighted files/programs, (8) using someone else's personal information on the internet without his/her permission, (9) using the internet to facilitate a drug transaction, and (10) posting nude photos of someone else without his/her permission.

To adequately measure online deviance, two variety indexes were constructed. Each deviant act was originally collected by frequency; however, in order to properly examine online deviance more generally, each individual act was dichotomously recoded (0 = no prior participation in the behavior; 1 = prior participation in the behavior at least one time). Following the dichotomization, a summative index was then constructed by adding the (yes/no) re-coded cybercrime variables together, which created a cybercrime variety index. Methodologically, variety indexes are superior to individual frequency variables in terms of internal consistency, stability across time, and convergent validity (e.g., Bendixen, Endresen, & Olweus, 2003; Intravia, Jones, & Piquero, 2012), and variety indexes have been described as the best operational measure for a general propensity to offend (e.g., Wright, Caspi, Moffitt, & Silva, 2001). Based on bivariate correlation analyses (see below), seven of the ten acts were significantly associated with low self-control. Thus, a seven-item variety index was created to capture online deviance. Furthermore, in order to examine online deviance beyond digital piracy, a five-item variety index was created as well. Specifically, the five-item index includes the five non-digital piracy behaviors from the larger seven-item index.

4.2.2. Independent variable

The independent variable of interest is low self-control, and it was measured using the Grasmick et al. (1993) scale. Based on Gottfredson and Hirschi's (1990) six elements of self-control, the Grasmick scale is a 24-item attitudinal measure designed to capture the latent trait of self-control (see Appendix). Although the Grasmick scale has been criticized (e.g., Hirschi & Gottfredson, 1993; Marcus, 2004; Piquero, MacIntosh, & Hickman, 2000), it continues to be widely used, and empirical research has demonstrated that the scale is a reliable indicator of low self-control (e.g., Arneklev, Grasmick, Tittle, & Bursik, 1993; Hay, 2001; Piquero & Tibbetts, 1996).[6] In the current study, respondents were asked to indicate their level of agreeableness to the 24 items based on a five-point Likert scale (strongly disagree to strongly agree). Due to item wording, 13 of the items were reverse coded so that higher scores indicated a higher level of low self-control (alternatively stated, *higher* scores were indicative of *lower* self-control). The variable, *low self-control*, had a mean of 2.58 (SD = 0.38), a minimum value of 1.33, and a maximum value of 4.08. It also yielded a Chronbach's alpha of .75, suggesting reliable internal consistency.[7]

4.2.3. Control variables

Six control variables were utilized in this study. Specifically, Gottfredson and Hirschi (1990) suggest that age, biological sex, and race can have independent effects on deviance that are unaccounted for by self-control theory, and these variables have shown to be significant predictors of online deviance (e.g., Buzzell et al., 2006; Foster, 2004; Higgins & Makin, 2004). *Age* was a ratio-level variable indicating years of age. *Biological sex* was a dichotomous variable (0 = Female, 1 = Male). Race was coded as four dichotomous variables (*White*, *Black*, *Hispanic*, and *Other Race*) with White serving as the reference group. *College major*, a variable used in prior online deviance research (Higgins et al., 2007; Khey et al., 2009), was coded as 0 = Non-Criminology and 1 = Criminology. *Internet use* was used as a proxy for opportunity. Along with low self-control, Gottfredson and Hirschi (1990) contend that opportunity plays an important role in understanding variance in offending (e.g., Cochran et al., 1998; Grasmick et al., 1993; Longshore, 1998). This ratio-level variable asked participants to list their average daily hours of Internet use. Finally, a parent education variable was used because it too has implications for deviant opportunity. *Parent's degree*, a three-category ordinal variable (coded as 0 = Neither parent has college degree, 1 = One parent has college degree, 2 = Both parents have college degree) was utilized because family education is related to family socio-economic status (e.g., Kingston, Hubbard, Lapp, Schroeder, & Wilson, 2003), and wealthier families can more easily provide computer and Internet technology to their children (e.g., Orr, 2003; Willingham, 2012). Thus, students with access to personal computers, in theory, have a greater opportunity to engage in online deviance.

4.3. Analytic strategy

The analyses began with descriptive information for the overall sample and an examination of the prevalence of online deviance

Table 1
Sample characteristics.

Variables	*M*/% (SD)	Min	Max
Independent variable			
Low self-control	2.58 (0.38)	1.33	4.08
Control variables			
Internet use	5.18 (3.28)	1.00	20.00
Age	20.44 (2.33)	18.00	29.00
Sex	33.90% –	0.00	1.00
Race			
White	59.20% –	0.00	1.00
Black	14.90% –	0.00	1.00
Hispanic	05.70% –	0.00	1.00
Other	20.10% –	0.00	1.00
Major	55.30% –	0.00	1.00
Parent's degree	1.71 (0.77)	1.00	3.00
Dependent variables			
Posting hurtful information	0.56 (4.64)	0.00	100.00
Email/IM harassment	0.86 (5.77)	0.00	100.00
Excluding someone online	1.65 (16.48)	0.00	300.00
Hacking	2.28 (43.83)	0.00	1000.00
Distributing malware	0.05 (0.93)	0.00	20.00
Illegally downloading files	107.54 (514.07)	0.00	10000.00
Illegally uploading files	29.54 (151.34)	0.00	1200.00
Misusing someone else's personal information	0.24 (2.45)	0.00	50.00
Using internet for a drug transaction	0.05 (0.61)	0.00	11.00
Posting nude photos without permission	0.22 (4.41)	0.00	100.00
Online deviance: seven-item variety index	1.32 (1.25)	0.00	6.00
Online deviance: five-item variety index	0.52 (0.91)	0.00	5.00

[6] Although the concept of self-control has generally received empirical support as a predictor of antisocial behavior, researchers have argued that it is important to measure the construct correctly (e.g., Piquero, 2009). Gottfredson and Hirschi (1990) did not explicitly state how to measure self-control, but many studies of self-control theory have used attitudinal scales, which attempt to tap into the six elements of self-control.

[7] Upon recommendation of a reviewer, more attention was given to the Grasmick subscales. Correlational and regression analyses determined that the "physical activities" and "simple tasks" subscales were not related to cybercrime. A modified 16-item scale was constructed without these eight items. The reduced scale was incorporated into regression models and the coefficients, standard errors, and p-values were substantively similar. The only major difference between the full scale and the reduced scale was that the full scale had an alpha coefficient of .75, while the reduced scale had an alpha of only .66, which is not surprising as the modified scale is based on eight fewer items. As a result, we opted to retain the full scale because the regression results were *not* substantively different using the modified scale, the full scale demonstrated greater internal consistency, the full scale is more theoretically consistent with Gottfredson & Hirschi's conceptualization of low self-control as it taps into all six dimensions of low self-control as outlined and defined by the original theorists, and studies utilizing the Grasmick et al. scale have mainly utilized the full scale rather than a modified/reduced version (see e.g., Pratt & Cullen, 2000).

Table 2
Bivariate correlations among study variables.

Variables	LSC	Internet use	Age	Sex	Black	Hispanic	Other race	Major	Parent's degree
Posting hurtful information	.19**	.14**	.02	−.02	.06	−.07+	.11*	−.01	.06
Email/IM harassment	.17**	.10*	.04	−.06	−.01	−.05	.03	−.01	.02
Excluding someone online	.09*	.19*	.03	−.13**	−.02	−.02	.08+	−.05	−.03
Hacking	.09*	.03	.11*	.05	.05	−.04	−.05	.04	−.04
Distributing malware	.05	.04	.07	.10*	−.02	.04	−.02	−.07	.05
Illegally downloading files	.10*	.08+	.02	.08+	.11*	−.04	−.04	.06	.07
Illegally uploading files	.09*	.01	.04	−.01	−.04	−.02	.04	.03	.03
Misusing someone else's personal information	.09*	.06	−.03	.06	.09*	−.01	−.05	−.01	.01
Using internet for a drug transaction	.02	−.03	.13*	.04	−.05	−.01	−.02	.02	−.01
Posting nude photos without permission	.02	.06	.05	.05	.03	−.04	−.02	.02	.03
Seven-item index	.21**	.11*	.03	−.01	.06	−.06	.04	.02	.06
Five-item index	.21**	.14**	.05	−.05	.04	−.07	.06	−.01	.01

Note: LSC = Low self-control.
+ $p < .10$.
* $p < .05$.
** $p < .01$.

among the participants. The second stage of the analysis utilized bivariate correlations to explore whether low self-control or any of the control variables yielded significant associations with any of the outcome variables. Following this investigation, the third stage of the analysis involved an estimation of two negative binomial regression models within a multivariate context. Negative binomial regression models were appropriate for the variety indexes due to the nature and distribution of the outcome variables. Specifically, these models are designed to modify the Poisson regression model if the equidispersion assumption does not hold (MacDonald & Lattimore, 2010) as was the case in the current study.

5. Results

Table 1 summarizes the characteristics of the sample, and it provides descriptive information for the study variables. With respect to demographics, the overall sample had an average age of 20.44 years old, with the youngest participant being 18 years old and the oldest participant being 29 years old. Approximately two-thirds (66.10%) of the sample consisted of female participants and three-fifths (59.20%) of the sample were White. These demographic characteristics were largely representative of the total university population, which is 58% female, 69% white, and an average age of 22. In addition, more than half (55.30%) of the sample were majoring in criminology, and, on average, participants spent 5.18 hours online per day, with a minimum of one hour and a maximum of twenty hours.

In terms of online offending, the most common acts of deviance were illegal downloading and uploading.[8] On average, participants reported 107.54 instances of illegal downloading and 29.54 instances of illegal uploading. Additionally, the sample reported an average of 2.28 events of unauthorized hacking and 1.65 events of purposeful exclusion within an online community. For the variety indexes, the seven-item index yielded a mean of 1.32 and the five-item index yielded a mean of 0.52.

To assess whether or not low self-control was statistically associated with online deviance, a series of bivariate correlation analyses were conducted on the (yes/no) re-coded individual acts of cybercrime as well as for both variety indexes. The results (see Table 2) indicated that low self-control was positively and significantly correlated with seven of the ten individual acts of online deviance.[9] Low self-control was also positively and significantly associated with the seven-item variety index ($r = .21$, $p = .000$) and the five-item variety index ($r = .21$, $p = .000$). Internet use was positively and significantly correlated with four of the individual acts, as well as the seven-item variety index ($r = .11$, $p = .018$) and five-item variety index ($r = .14$, $p = .002$). In addition, several of the other control variables were significantly associated with some of the individual acts. For example, males were negatively associated with purposeful exclusion ($r = -.13$, $p = .004$); age was positively correlated with hacking ($r = .11$, $p = .010$) and using the internet for drug sales ($r = .13$, $p = .004$); and being Black was positively associated with illegally downloading software ($r = .11$, $p = .012$) and misusing others' information online ($r = .09$, $p = .049$). However, no control variable other than internet use was significantly associated with either of the two variety indexes.

While the bivariate results suggest that low self-control is significantly correlated to several of the individual acts of online deviance and both variety indexes, it was still important to investigate these relationships within a multivariate framework. The results presented here (see Table 3) reflect an investigation of the study's hypotheses that low self-control is significantly associated with online deviance controlling for relevant factors and, more

[8] Frequency analyses for the re-coded individual acts of cybercrime revealed that 13.0% of respondents had a history (i.e., at least one incident) of posting hurtful information about someone online; 13.4% had a history of email/IM harassment; 13.8% had a history of purposefully excluding someone from an online community; 9.1% had a history of hacking; 0.4% had a history of distributing malware; 60.7% had a history of illegally downloading files; 20.7% had a history of illegally uploading files; 4.1% had a history of misusing someone else's personal information online; 1.2% had a history of using the internet to facilitate a drug transaction; and 0.6% had a history of posting nude photos without permission.

[9] Low self-control was found to be uncorrelated with three types of cybercrime (distributing malware, using the internet for drug sales, and posting nude pictures without permission). One possible reason for this finding could simply be a statistical artifact. Or in other words, the level at which these three acts were committed by participants in the sample was much lower than the level at which the respondents committed the other seven acts of cybercrime. Thus, it is reasonable to surmise that a statistical relationship did not appear for these three acts because the individual sample sizes for these offenses were not sufficiently large enough. Additionally, one could also look to theory and prior research for a possible answer. Prior research has shown that low self-control does not predict certain forms of deviance, such as sophisticated white-collar crimes (e.g., Simpson & Piquero, 2002). Arguably, these types of antisocial behaviors require a certain amount of planning and skill, do not yield immediate gratification, and are not spontaneous. These traits are contrary to the depiction of individuals with low self-control that Gottfredson and Hirschi (1990) present in their theory. It is reasonable to assume that distributing malware, facilitating drug sales through the internet, and posting nude images without permission are qualitatively different than such offenses as posting hurtful information online and email harassment. The latter offenses, arguably, are more easily committed by individuals who are impulsive and shortsighted.

Table 3
Negative binomial regression results predicting frequency of online deviance.

Variables	Model 1: seven-item variety index				Model 2: five-item variety index			
	B	SE	*Z*	*β*	*B*	SE	*Z*	*β*
LSC	.57***	.11	4.88	.16	1.09***	.21	5.04	.43
Internet use	.03*	.01	2.50	.08	.07**	.02	3.14	.25
Age	.02	.02	1.14	.04	.06	.03	1.71	.15
Sex	−.03	.09	−.38	−.01	−.25	.17	−1.41	−.13
Black	−.03	.13	−.24	−.01	−.27	.24	−1.11	−.11
Hispanic	−.07	.11	−.64	−.02	−.20	.21	−.97	−.09
Other race	.09	.17	.52	.02	.15	.31	.50	.04
Major	−.01	.02	−.08	−.02	.02	.03	.59	.05
Parent's Degree	.06	.05	1.04	.04	.01	.10	.12	.01
Model information								
Likelihood Ratio χ^2 (DF)	33.66*** (9)				38.89*** (9)			
Psuedo-R^2	.02				.03			

Note: LSC = Low self-control.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

specifically, that it predicts online deviance beyond digital piracy controlling for relevant factors.

The first model, which examined the predictors of the seven-item variety index, demonstrated that two variables were significantly related to online deviance. Specifically, low self-control ($\beta = .16$, $p = .000$) was positively related to online deviance, while controlling for other variables. This provides support for the study's first hypothesis. Additionally, internet use ($\beta = .03$, $p = .013$) was positively related to online deviance, which suggests that opportunity is an important contributor as well. The second model, which examined the predictors of the online deviance beyond digital piracy, revealed that low self-control ($\beta = .43$, $p = .000$) was significantly related to the five-item online deviance index providing support for the second hypothesis as well. Furthermore, opportunity remained a significant predictor as internet use ($\beta = .25$, $p = .002$) was again positively related to online deviance. None of the other control variables were significantly related to either of the online deviance indexes.[10]

6. Discussion

The current study sought out to explore the association between Gottfredson and Hirschi's (1990) self-control theory and online deviance in general and beyond digital piracy more specifically. Utilizing a large sample of 488 undergraduate students from a large university in the southeast, the results suggested support for the current study's two central hypotheses. Key findings are elaborated on below.

With regard to the first hypothesis, the bivariate and multivariate results provided relatively robust evidence that self-control theory is a useful theoretical framework for explaining involvement in a series of online deviant behaviors such as posting hurtful information about someone on the internet, threatening/insulting others through email or instant messaging, excluding someone from online community, hacking into an unauthorized area of the internet, illegally downloading copyrighted files/programs, illegally uploading copyrighted files/programs, and using someone else's personal information on the internet without his/her permission. These findings are consistent with the larger literature that has reported a significant association between self-control and online deviance (Foster, 2004; Higgins, 2005; Higgins et al., 2007, 2009; Hinduja, 2006; Marcum et al., 2011; Moon et al., 2010).

Beyond the more general support shown for a link between self-control and online deviance, the current study's results also demonstrated support for the second hypothesis that has yet to have been considered in prior research. More specifically, while a series of prior studies have assessed and reported a significant association between low self-control and online deviance, their measurement of this construct has, for the most part, been narrowly defined as digital piracy (e.g., Higgins, 2005; Higgins & Marcum, 2011; Higgins et al., 2007, 2009; Marcum et al., 2011). In recognition of this restricted measurement of online deviance, the results from the current study evaluated the second hypothesis yielded support for the utility of self-control theory to be generalized as an explanation for a variety of online deviant beyond digital piracy alone. Furthermore, these results were illustrated net of controlling for several relevant factors that have been included in prior cybercrime research such as age, biological sex, race, and college major (Buzzell et al., 2006; Higgins et al., 2008; Khey et al., 2009) as well as accounting for the role of opportunity (e.g., Internet usage).

Despite these results, it is important to acknowledge a series of limitations that are worth considering when interpreting the results from the current study. First, the study draws on data from a convenience sample of college students from one southeastern university albeit a large university with a fairly large sample size ($n = 488$). Nevertheless, the degree to which these findings may apply to other small or mid-sized universities in other regions of the country is open for future empirical inquiry. Second, this sample (and the university from which it was drawn) has a rather large representation of female students and a noticeable population of Hispanic students, and as such, the extent to which these results hold for universities with different demographic characteristics deserves further study. Third, sample characteristics for the individual cybercrimes were based on the original count variable frequencies of respondents reporting how many times they had engaged in the particular acts. As such, the descriptive statistics for these variables may be somewhat inaccurate due to respondent error (e.g., memory recall, sheer volume of occurrences).[11] Finally, unfortunately, the current study was not able to account for other rival or competing criminological theories other than self-control

[10] In a subsequent series of multivariate analyses the results revealed that low self-control was significantly associated with each of the seven individual acts of online deviance net of control variables, with the exception of misusing someone else's personal information online.

[11] Importantly, bivariate correlations and regression estimates are not affected by this limitation because those analyses were based on re-coded individual acts (0 = no history, 1 = history of at least one incident) and variety indexes computed from the (yes/no) individual acts.

theory for explaining online deviance that have been investigated in prior cybercrime research (see Hinduja, 2006). Future research is encouraged to employ a similar and broad measurement strategy for online deviance such as the one used in this study and also include measures from criminological theories (e.g., social learning and strain theory) when determining to generalizability of the results illustrated here.

Taken together, the current study was able to demonstrate the efficacy of Gottfredson and Hirschi's (1990) self-control as a viable predictor of online deviance generally and for a variety of forms of online deviance in particular. We hope that the results from this study have provided a stepping stone for future research to further assess the applicability of our general criminological theories of crime for explaining cybercriminality in all of its various forms. If the evidence uncovered here is any indication of such a relationship then it appears that the generality hypothesis of Gottfredson and Hirschi's (1990) self-control theory has its application as an explanation of online deviance including and in addition to digital piracy.

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Appendix A

Items comprising Grasmick et al.'s (1993) Low self-control scale

Impulsivity
- I don't devote much thought and effort to preparing for the future.
- I often do whatever brings me pleasure here and now, even at the cost of some distant goal.
- I'm more concerned about what happens to me in the short run than in the long run.
- I much prefer doing things that pay off right away rather than in the future.

Simple tasks
- I frequently try to avoid things that I know will be difficult.
- When things get complicated, I tend to withdraw.
- The things in life that are the easiest to do bring me the most pleasure
- I dislike really hard tasks that stretch my abilities to the limit.

Risk seeking
- I like to test myself every now and then by doing something a little risky.
- Sometimes I will take a risk just for the fun of it.
- I sometimes find it exciting to do things for which I might get in trouble.
- Excitement and adventure are more important to me than security.

Physical activities
- If I had a choice, I would almost always rather do something physical than something mental.
- I almost always feel better when I am on the move than when I am sitting and thinking.
- I like to get out and do things more than I like to read or contemplate ideas.
- I seem to have more energy and a greater need for activity than most other people my age.

Self-centeredness
- I try to look out for myself first, even if it means making things difficult for other people.
- I'm not very sympathetic to other people when they are having problems.
- If things I do upset people, it's their problem, not mine.
- I will try to get the things I want even when I know it's causing problems for other people.

Temper
- I lose my temper pretty easily.
- Often, when I'm angry at people I feel more like hurting them than talking to them about why I am angry.
- When I am really angry, other people better stay away from me.
- When I have a serious disagreement with someone, it's usually hard for me to talk about it without getting upset.

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