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New Media Use and Rural Youth Substance Use

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University of New Hampshire, Durham

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New Media Use and Rural Youth Substance Use

BY

William Meub
B.S., University of New Hampshire, 2008

THESIS

Submitted to the University of New Hampshire
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the Requirements for the Degree of

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This thesis has been examined and approved.

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DEDICATION

To my wife Kerry, without you I am nothing, with you I can accomplish anything. For my parents, my mother who always made sure we tried our best, my father who taught me that learning is a lifelong endeavor.
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ABSTRACT

NEW MEDIA USE AND RURAL YOUTH SUBSTANCE USE

by

William Meub

University of New Hampshire, December, 2011

Data from the Coos county youth survey is used to examine new media use habits and explore the relationship between new media use and substance use among two cohorts of rural youth ($N = 657$). Specifically, I present descriptive information on new media usage, examine whether new media use is related to substance use and explore a possible moderation relationship between substance use and negative substance-use-related behavioral outcomes. Older adolescents reported more new media use than younger adolescents but there was no evidence of sex differences in usage. Greater new media use was found to be related to greater substance use, but not negative substance-use-related behavioral outcomes. This could reflect increased communication with family members and positive peer groups, often considered a protective factor against substance use. Finally, new media use did not moderate the relationship between substance use and negative substance-use-related behavioral outcomes.
CHAPTER I

INTRODUCTION

The relationship between media use and youth substance use has been the focus of intense study by researchers. A review of research on this relationship shows that media use is associated with youths' increased risk of smoking initiation, use of illicit drugs, and alcohol consumption. This relationship is strongest for tobacco use, and more moderate for illicit drug and alcohol use (Nunez-Smith et al., 2010). There is a marked gap in the literature, however, in regards to describing "new media" use, which is media technologies that have emerged in the latter part of the 20th century, and the relationship it may have with youth substance use.

In the current study I explore this relationship with a population of rural adolescents. The relationship between new media use and youth substance use in a rural population may be particularly important to explore due to the unique characteristics of rural areas, such as the distance youth must go to visit peers and social gathering areas and the ease of using new media technologies to communicate with peers (Lambert, Gale, & Hartley, 2008). While urban youth experience higher rates of substance use than rural youth, alcohol and stimulant abuse is especially high in rural areas (Van Gundy, 2006; Van Gundy et al., 2011). The ubiquity of new media in youth’s lives and opportunities for increased exposure to substance use activities, in the context of the unique attributes of rural substance use, makes consideration of the relationship between new media use and substance use a critical one.
Understanding the relationship between new media and substance use must begin with defining the boundaries of what constitutes new media. Media has been typically defined as the storage and transmission of data, specifically the storage or tools that facilitate these activities, traditionally print media, film, radio, and television. The singular form of media, medium, refers to the individual parts of the media and can be synonymous with mass media or news media ("media", n.d.). Accepted definitions of new media include "...digital information technology and their convergence in a networked environment... (Pavilik, 2006)" and "...products and services that provide information or entertainment using computers or the internet, and not by traditional methods such as television and newspapers ("new media", 2010)." Lister & Dovey (2003) state that new media is a term that has cultural, technological, and historical contexts. New media represents those technologies created or developed within the past 20 years, which are present in mainstream use, and those technologies which allow for social interaction in the media environment to an unprecedented degree. For the purposes of this study, new media is defined as digital information technologies of telecommunication and computing, as well as wireless and mobile devices, which fulfill a social need to interact and transact, impart information, provide services, and/or entertain.

Youth have taken to this new media environment to an unprecedented degree, with exponential increases in new media use in the past decade. The generation M² study (2010) of media use among 8 to 18-year-olds found that 20% of media consumption, an average of 2:07 hours per day per youth, occurs on mobile devices. Traditional use of media such as watching regularly scheduled programming on a television set has declined from 3:04 to 2:39 hours per youth per day. However, the proliferation of new ways to
consume television content, such as through mobile devices, led to an overall increase of daily television consumption by an average of 38 minutes per youth per day. Nearly two-thirds of youth own their own cell phone, one-third have a computer in their bedroom, and 84% of youth now have access to the internet. The use of new media is growing and is quickly overtaking forms of traditional media. Understanding how these technologies relate to behaviors such as substance use is critical in understanding how youth are developing today.

My examination of new media is aided by Bronfenbrenner's ecological systems framework (ESF). Proposed by Urie Bronfenbrenner, ecological systems framework states that human development occurs through the interaction between a developing individual and environmental influences. These factors include not only a person's biology and individual characteristics but also family, community, institutions, and norms and values of the culture at large (Paquette & Ryan, 2001). The extent to which these interactions have influence is dependent on how close or far it is to the individual. Specifically, the concept that the more proximal (near) an influence is to direct contact with individuals, the greater its developmental impact is a key tenet of ESF; the opposite is also true, the more distal (far) influences have less direct developmental impact on the individual (Bronfenbrenner, 1994). While I cannot test the relationship of old versus new media influence on substance use in the current study, I argue for the changing 'position' of media within Bronfenbrenner's model as one that is becoming increasingly more proximal to individual development (McHale, Dotterer, & Kim, 2009). An assumption of this 'proximal new media' construct is the social nature of new media use. Information transmitted via technology facilitated social interaction is a key difference between new
media and traditional media. If I find a relationship between new media use and substance use it would add evidence that new media use may be a proximal process.

The relationship between youth traditional media use and substance use is a well established one. Nunez-Smith et al. (2010) conducted a systematic review of 42 quantitative studies on the relationship between media exposure and tobacco, illicit drug, and alcohol use among children and adolescents. Of these studies, 83% found that media use was associated with an increased risk of smoking initiation, use of illicit drugs, and alcohol consumption. Additionally, it was found that among studies which examine the amount of media exposure, 67% of studies in the review reported an association with negative substance-use-related behavioral outcomes. The authors attribute this link to substance use in part to pro substance use social norms in media content. This relationship may exist due to substance use socialization processes such as observing peers engage in substance use behaviors in a new media context (e.g. seeing a friend make a substance use related post on Facebook).

New media use and substance use may be linked in that new media use allows for greater opportunity for communications, including communications around substance use. These communications may also come from anyone, anywhere, at any time, and may be received in places where previously communication may not have been possible. In the current study, for research question 1, I will explore if new media use is related to rural youths' frequency of substance use and negative substance-use-related behavioral outcomes. I posit that new media use, in much the same way as traditional media use, will be related to (1) substance use (i.e. alcohol, marijuana, and tobacco use) and (2) negative substance use related behavioral outcomes (e.g. contact with law enforcement).
Few studies have attempted to see how the relationship between media use and substance use differs by age. Media use, overall, drops slightly as youth grow older but increases in certain mediums, such as cell phone use (Roberts and Foehr, 2008; Kaiser Family Foundation, 2010). National surveys have found that substance use rises significantly over time from middle school to high school and tends to peak during the 12th grade. Additionally, negative behavioral outcomes rise significantly from middle school to high school (CDC, 2005; CDC, 2009; CDC, 2010). However, the absence of data regarding the relationship between new media use, substance use, and age makes the proposed examination within this project an exploratory one. Therefore, for research question 2, I ask whether the relationship between new media use and (1) substance use and (2) negative substance-use-related behavioral outcomes differs by age. I hypothesize that among two age cohorts of 7th and 11th graders these relationships will be stronger among 11th graders.

With regard to sex differences in media use and substance use, boys tend to use more media than girls; over an hour more on average per day, with most of this difference coming from video games (Kaiser Family Foundation, 2010). Additionally, national surveys have found that males are more likely than females to engage in substance use and to experience negative behavioral outcomes related to substance use (CDC, 2009). Extrapolating from these studies, research question 3 is whether the relationship between new media use and (1) substance use and (2) negative substance-use-related behavioral outcomes differs by sex. I expect that new media use will be a stronger predictor of substance use consumption and negative substance-use-related behavioral outcomes in males than females.
Greater new media use may increase the risk for substance use and negative substance use related behavioral outcomes in that new media may facilitate the inclusion of non-deviant peers into the behaviors or activities of deviant peers. This is because non-deviant peers may be influenced by substance-use-related communications sent by deviant peers. Research regarding the substance use content has shown that among college students, one-third reported having posted a picture depicting substance use on a social networking site (Morgan, Snelson, & Elison-Bowers, 2010) making it likely that most youth are at some point exposed to peer substance use in the context of new media use. This is what is called the ‘peer delinquency effect’ and is based on research which shows that peer influence has shown to be a strong predictor of substance use (Ferguson & Meehan, 2011).

New media communications between peers may facilitate inclusion of otherwise non-deviant peers in substance use behaviors. Youth may be more easily included in substance use behaviors when communications, especially about substance use, are quick, simple, ubiquitous, and accessed without the involvement of adults such as is characteristic of new media communications. Furthermore, those youth with greater amounts of new media use may be more likely to be exposed to deviant peers. For research question 4, I examine whether rural youth’s new media use may moderate the relationship between substance use and negative substance-use-related behavioral outcomes. I hypothesize that as new media use increases, the relationship between substance use and negative substance use related behavioral outcomes will strengthen.
Through the following literature review, ecological systems theory will be used to frame the discussion of new media use and rural youth substance use. The proposed study will address the following questions:

1. How is the frequency of new media use related to the frequency of rural youth’s (a) substance use and (b) negative substance-use-related behavioral outcomes?

   Hypotheses 1a: Greater new media use will be linked to greater substance use consumption.

   Hypotheses 1b: Greater new media use will be associated with greater negative substance-use-related behavioral outcomes.

2. Does the relationship between the frequency of new media use and rural youth’s (a) substance use and (b) negative substance-use-related behavioral outcomes differ by age cohort?

   Hypothesis 2a: There will be a stronger relationship between new media use and substance use for 11th grade students than for 7th grade students.

   Hypothesis 2b: There will be a stronger relationship between new media use and negative substance-use-related behavioral outcomes for 11th grade students than 7th grade students.

3. Does the relationship between the frequency of new media use and rural youth’s (a) substance use and (b) negative substance-use-related behavioral outcomes differ by sex?

   Hypothesis 3a: There will be a stronger relationship between new media use and substance use for males than for females

   Hypothesis 3b: There will be a stronger relationship between new media use and negative substance-use-related behavioral outcomes for males than for females.
4. Is the relationship between substance use and negative substance-use-related behavioral outcomes moderated by the frequency of rural youth's new media use?

Hypothesis 4: For those youth with greater frequency of new media use there will be a stronger, positive relationship between substance use and negative substance-use-related behavioral outcomes than for those youth with lower frequency of new media use.
Youth and New Media Use

Young people have taken to new media technologies to an unprecedented degree. In fact, the rise in media use overall among youth can be attributed to increases in new media use (Kaiser Family Foundation, 2010). Moreover, we are beginning to see youth shifting away from traditional media towards new media (Kaiser Family Foundation, 2010). The central task in the study of new media is defining and delineating the borders of what constitutes new media and examining what features make it a unique. Is new media simply new technologies or does it represent a fundamental shift in how humans communicate? I will identify what technologies are incorporated within the realm of new media and the characteristics of new media, specifically the facilitation of social interactions that are changing the place of media in the lives of individuals.

Understanding the changing place of media will be facilitated through ecological systems framework (ESF), specifically the proximal-distal influence concept and the concept of proximal processes.

**Defining new media.**

Defining new media is a task complicated by the variety of definitions which exist and a lack of universally accepted definition. These definitions have been remarkably varied, Pavlik (2006) described new media as “...digital information technology and their convergence in a networked environment...” Cambridge online dictionaries (2010)
defines new media as the "...products and services that provide information or entertainment using computers or the internet, and not by traditional methods such as television and newspapers." Lister & Dovey (2003) posit that new media represents those technologies created or developed within the past 20 years, which are present in mainstream use and which allow for social interaction in the media environment to an unprecedented degree.

Crosbie (2002) has argued that new media can be considered to be the third wave of human communications, the first being interpersonal communication and the second being mass medium communication. Interpersonal communication is defined as a communication where each participant has equal control over the content conveyed and where communications can be individualized to each participant’s unique needs. Typically, these communications are considered to be 'one-to-one' and examples would include speaking face-to-face with another person, telephone conversations, and written letters. Mass medium is a communication from one-to-many and is characterized as when the same content goes to all recipients, and the sender has absolute control over that content. Mass medium communication cannot be individualized to each recipient's unique needs and interests and recipients have no control over the content. Examples of mass medium communications would include public speeches, newspapers, and television news. New media is a third method of communications where many senders can communicate with many recipients. New media technologies allow for individualized messages to be simultaneously delivered to an infinite number of people and allow each person involved to share reciprocal control over that content (Crosbie, 2002).
Primarily, new media is defined as a group of technologies based on the interactions between individuals. Rice (1984) first proposed a definition of new media which included technologies that enable or facilitate user-to-user interactivity and interactivity between user and information. While this aspect has been present to some degree in media technologies prior to the development of new media, new media allows for participation in the media environment rather than just simple communication. Understanding new media as primarily social is key in identifying these interactions as proximal processes, those processes that directly influence development, as defined by ecological systems framework. Crosbie's (2002) definition of new media as many-to-many communication fits with new media as being primarily social. For example, telephone conversations have allowed individuals to interact interpersonally, but the advent of ‘smartphones’ allow for the sharing of information throughout a broad social network of individuals.

For this study, new media is defined as digital information technologies of telecommunication and computing, as well as wireless and mobile devices, which fulfill a social need to interact and transact, impart information, provide services, and/or entertain. Technologies which would meet this definition include the internet, cell phones, and online multiplayer video games. Activities involving, but not limited to, these technologies include e-mail, using online chat rooms, instant messaging, sending or receiving text messages, accessing networking sites (myspace, facebook, etc...), watching videos online, reading news online, and using the internet for entertainment in general.
Video games and new media.

The inclusion of video games into a definition of new media is questionable. After all, when an individual is playing a single player video game, are they engaging in communication with another individual or, more broadly, do video games fit within new media? These are important questions to consider as video games are increasingly utilized for entertainment by youth and the online social aspects of video games have been increasingly utilized. Video games have been called the 'black sheep' of the new media family because of this 'digital divide' of use (Payne, 2005). Arguably, video games also deserve this label of ‘black sheep’ in that they have been one of the few technologies of computing where social interaction has been relegated, until very recently, to a group of individuals playing in the same room on the same device.

However, social interactivity in games has existed since the advent of computer based gaming in the 1970's, but was not available to the average consumer until the early 1990's with the rise of home-based internet services (Koster, 2000). Since then, single player games have often been packaged with a social or player vs. player component, but not always. Therefore, it is important to differentiate between single player experiences, which involve no communication or simulated communication within the game, and the social experience an individual receives when engaging in online multiplayer contexts. Defining new media is tied to this social aspect of use, therefore video games, when examined in a single player context, should not be included. However, if a video game features a social component, where the individual interacts with other individuals, then it should be included. For this study, online multiplayer video games were included because of this social interaction aspect.
New media use by youth.

Media use is rising among youth in the United States, driven largely by use of new media. This is according to the generation M\textsuperscript{2} study (2010), which is a comprehensive national study that examines media use in youth. Media use in the past five years has risen over one hour on average per day per youth from about 6:21 hours in 2004 to nearly 7:38 hours in 2009. Multi-tasking while engaging in media use, using more than one medium at a time, increased total use to nearly 10:30 hours during this 7:38 hour period. In other words, the total media use by youth did not exceed 7:38 hours but the combined use of more than one medium at a time increased overall media exposure. Television and music account for 4:39 and 2:31 of that time respectively, computer and video game use account for 1:29 and 1:13, and another 2:07 hours of media use now occurs on mobile devices. Youth tend to use new media primarily to socialize; 25% of time youth spend online with a computer is on average devoted to social networking and youth spend 2:08 hours talking and texting with others on a cell phone.

Important, also, is that traditional media such as television or music is increasingly being consumed on mobile devices with the average youth spending 56 minutes using media in this way. Youth watching regularly scheduled programming on a television set declined by 25 minutes per day, between 2004 and 2009, but because of new avenues of television consumption, such as viewing television programming online, television content consumption increased overall by 38 minutes. Youth have more access to new media technologies as well, with more than 76% percent of youth reporting iPod/MP3 player ownership, 66% reporting cell phone ownership, and 29% reporting laptop ownership. Internet access has increased from 74% in 2004 to 84% in 2009
among young people, with 60% reporting access to high-speed internet (Kaiser Family Foundation, 2010). Youth are using media in ways never seen before and at unprecedented rates. Additionally, the nature of media use has changed: simply measuring exposure to media is no longer sufficient to measure use when youth are engaged in multitasking activities.

New Media use by rural youth.

Rural youth also have access to and use new media technologies to a great degree. Over 90% of participants, in a study of 2000 rural youth, have an internet connection in their home and over half of rural youth spend between one and three hours online daily. Nearly nine out of ten respondents indicated they have a cell phone and 24% of these youth use new media more than three hours per day and are considered "heavy users" (National Telecommunications Cooperative, 2009). Rural youth are an important population to study when considering new media use because for many, new media may be the easiest method of communication with peers and family. This is due sparse population density, no easy access to social areas and gathering places characteristic of urban and suburban areas, and an absence of resources that would allow youth to travel to meet their peers (Lambert, Gale, & Hartley, 2008).

New media and Ecological Systems Framework (ESF).

Understanding the importance of new media use by rural youth is aided by ecological systems framework. First introduced by Urie Bronfenbrenner in a series of papers through the 1970's, ESF was a response to the focus of most developmental psychology up until that point as the study of the strange or exceptional in human development. Bronfenbrenner was a highly productive psychologist and, in addition to
formulating ecological systems theory, was the founder of the head start program, a national program to provide education, health, and social services to the poor. The focus of ESF on "real-life settings" with "real-life implications" was significant. Currently, many studies are informed by ecological systems framework (Russo, 2011).

**Proximal processes and the proximal distal influence concept.**

Two key concepts of ESF are proximal process and proximal-distal influence. These concepts are helpful in understanding the importance of new media in the lives of adolescents. The proximal process construct is made up of five distinctive properties: (1) for development to occur, the person must engage in an activity, (2) the activity must take place on a regular basis, over an extended period of time, (3) activities must take place long enough to become "increasingly more complex" over time, (4) there must be initiation and response in both directions, and (5) can involve both interpersonal interaction or interaction with objects or symbols (Bronfenbrenner, 1999). McHale, Dotterer, and Kim (2009) give a concise and relevant description of the concept of proximal-distal influence as one where individuals are "...subject to contextual forces ranging from proximal influences... to increasingly distal (and abstract) contextual forces." Proximal influences can be described as the interaction between humans and the persons, objects, and symbols in the immediate environment, in which proximal process takes place. Distal influences can be described as the customs, beliefs, and practices of the individual’s society, these influences may affect development are not easily measured (Shulenberg & Maslowsky, 2009). Traditionally, mass media has been a distal process and interpersonal communication has been a proximal process. New media may represent a distal influence but may also provide a context for proximal influences and processes.
**New media as a proximal process.**

New media may best be seen as a proximal process because information and communications critical to development are relayed to youth in ways qualitatively different than that of traditional media. Historically, media consumption has been relatively passive. In the recent past, individuals selected the media that appealed to them such as a television show, book, or movie but rarely were they part of the media environment they consumed. Traditionally, media was part of the exosystem (Bronfenbrenner, 1994), providing a linkage between processes or settings. The exosystem is defined as a collection of systems, one of which does not contain the individual.

As part of the exosystem, media has typically been viewed as an indirect process filtered by microsystem members such as peers, family, and institutions with which individuals have direct contact. New media is a particularly paradoxical phenomenon because with new media, individuals are now a part of the media, therefore, media is no longer just an exosystem construct. The advent of the internet, social media, and increasingly mobile means of communication has aided in shifting of the mass media from the exosystem to also be part of the microsystem. New media acts as both a contextual factor, but also a proximal process, as part of the immediate environment with which interaction occurs on a regular basis over extended periods of time.

**ESF, new media use, and substance use.**

ESF is important for the study of the relationship between new media and substance use. As noted, new media represents a fundamental change in the nature of individual interactions with their environment. This change is one that is dependent on
face-to-face interactions with others and is more how individuals experience their environment. New media likely has changed how youth interact with, experience, and think about substance use in many ways that are different from youth in a pre-new media environment. These changes include the quickness of new media communications (texting and email), that new media technologies can be accessed from anywhere (cell phones, smart phones, and laptops), and the abundance of information accessible through new media technologies (the internet). All of these factors create an environment where exposure and access to substance use can happen instantaneously from anywhere and without the supervision of adults. In light of the prevalence of new media use among rural youth (National Telecommunications Cooperative, 2009) and the unique qualitative characteristics of rural areas, it is important to understand the relationship that new media has with rural youth substance use.

**Substance Use in Youth**

In measuring substance use in youth, one must consider a variety of issues. For example, substance use does not always result in negative outcomes for youth. Therefore, a study of substance use in youth should include measures that assess the frequency of substance use, as well as the negative behavioral outcomes associated with use (Van Gundy & Rebellon, 2010). Substance use, in some ways, is part of growing up for many youth, with 72.5% of high school students nationally reporting having ever used alcohol and 41.8% reporting using alcohol in the past 30 days before being surveyed. Marijuana use is also relatively frequent with 38.6% of students reporting ever using in their lifetimes (Centers for Disease Control and Prevention, 2009). Some substance use
appears to be normative in nature as these youth do not all experience negative outcomes due to use.

Substance use and negative substance-use-related behavioral outcomes are measured separately to identify specifically whether youth who use new media are experiencing life circumstances characteristic of the DSM-IV criteria for substance abuse. I have included two measures because of work done by Van Gundy and Rebellon (2010) who emphasize the importance of differentiating between substance use and negative substance-use-related outcomes as some substance use may be normative. The DSM-IV substance abuse criterion, which make up the negative substance-use-related behavioral outcome scale, are defined as a maladaptive pattern of substance use leading to impairment or distress occurring within a 12 month period. These impairments are defined as: recurrent substance use which results in a failure to fulfill obligations at work, school, or home, recurrent substance use in situations where it is physically hazardous for example driving while impaired. Lastly, recurrent substance use is related to legal problems, such as arrests and continued substance use despite persistent or recurrent social or interpersonal problems (American Psychiatric Association, 2000).

Media and substance use.

Content analysis of traditional and new media has shown that substances are portrayed prominently. In a study of substance use content in prime-time television, four consecutive episodes from 42 top-rated sitcoms and dramas found that alcohol was mentioned or seen in 77% of all episodes, tobacco 22%, and illicit drugs 20% (Christenson, Henriksen, & Roberts, 2000). While research on new media is limited, content analysis of new media communications has found that substance use related
media is prevalent on social networking and video sharing websites. Among college students, one-third reported having posted a picture depicting substance use on a social networking site (Morgan, Snelson, & Elison-Bowers, 2010).

Several systematic reviews have been done on the subject of traditional media and substance use, most recently by Nunez-Smith et al. (2010). The authors reviewed 42 quantitative studies on media exposure and tobacco, illicit drug, and alcohol use among adolescents. Over 80% of quantitative studies concluded that greater media exposure is associated with increased tobacco, illicit drug, and alcohol use. This relationship was especially strong for media and tobacco use, but was also moderately strong for illicit drug and alcohol use. New media use and negative substance-use-related outcomes have been shown to be associated as well. Ko et al. (2008) found that in a study of 2,114 Taiwanese high school students, those who met the criteria for internet addiction also had problematic alcohol use. It is expected that a similar relationship will be found between new media and substance use as has been found in traditional media. In the current study, I will examine alcohol, tobacco, and marijuana use together in this study.

Research has shown that increased traditional media use is related to increased alcohol use among adolescents. The relationship between media use and alcohol use has been examined extensively in the literature. For example, Van den Bulck and Beullens (2005) examined whether viewing entertainment media, such as television programs and music videos, increased alcohol consumption in youth. They found that viewing both music videos and television significantly predicted later consumption and that television viewing habits can be seen as a significant predictor of alcohol consumption while going out. Other work has focused on entertainment media and access to entertainment
technologies as a predictor of alcohol use. Work done by Miller, Lykens and Quinn (2007) has also shown that watching television and reading the newspaper were significant predictors of alcohol use. Additionally, watching television had a positive significant effect on both alcohol use and abuse.

Media use, substance use, and age.

Studies of the relationship between media use and substance use differing by age do not exist. However, due to increased access to new media technologies, exposure to more delinquent peer influences, and greater freedom to engage in substance use behaviors (Young et al., 2002) this relationship should be stronger as youth grow older. Research on media use and age shows that media use in youth peaks around 11-14 years of age and drops slightly as youth enter high school, with a gradual decline after age 16. Music content and cell phone use are one of the few kinds of media use that increase through middle school and high school. Additionally, texting in high school is significantly higher in high school students compared to middle school students with the average 15-18 year old texting 1:51 hours compared to 11-14 year old texting 1:13 hours (Kaiser Family Foundation, 2010).

Current research demonstrates that substance use generally increases across adolescence. For example, reports from 7th grade youth found that 37.2% of youth have had a drink of alcohol, 27.2% have tried cigarette smoking, and 9.7% have tried marijuana (Centers for Disease Control and Prevention, 2005). Among high school youth, 72.5% have had a drink of alcohol and 41.8% have had a drink of alcohol on at least one day during the 30 days before the survey. 46.3% of high school youth have tried cigarette smoking and 36.8% of students have tried marijuana (Centers for Disease
Control and Prevention, 2009). Negative substance-use-related behavioral outcomes have been found to be more prevalent among older adolescents. Research demonstrates that 15 to 17 year olds reported higher incidence of agreement with DSM-IV substance use dependence criteria (Kilpatrick et al., 2003). Research regarding this sample has shown that younger respondents exhibited lower odds of problem substance use overall (Van Gundy, Stracuzzi, Rebullon, Tucker, & Cohn, 2011).

The relationship between new media use and substance use would be stronger because older adolescents experience more freedom and independence, this coupled with higher levels of new media communications could overall increase substance use. This is because of increased reception of communications from deviant peers and other pro-substance use sources combined with more autonomy associated with being older could result in increased substance use overall. Extrapolating from the above work, it is likely that new media use and substance use will be higher in the 11th grade than in the 7th grade. It is also reasonable to predict that the relationship between new media use and substance use and new media use and negative substance use related behavioral outcomes will be stronger for the 11th than the 7th grade age cohort.

**Sex differences in media use and substance use.**

Sex differences regarding new media use and substance use have been examined. However, male and female differences in the relationship between new media use and substance use are unknown. Media use among males and females has been shown to differ slightly in total, with males using on average 11:12 hours of media and females using 10:17 hours per day, including time spent using two or more media concurrently. Key differences in new media use between males and females are evident primarily in the
area of video game use. Boys tend to play video games on average for 1:37 hours per day whereas girls play for about 49 minutes per day. Additionally, while girls tend to use cell phone games and handheld player games nearly as much as boys, boys spend on average 56 minutes with console games, far more than girls who play games for only 14 minutes (Kaiser Family Foundation, 2010).

National data shows that males and females exhibit the similar rates of trying alcohol (70.8% for males versus 74.2% for females), cigarette smoking (46.3% for males and 46.1% for females), and marijuana (39.0% for males and 34.3% for females, CDC, 2009). Wallace et al. (2002) found, however, that alcohol use, tobacco use, and marijuana use among boys exceeds that of girls. Negative substance-use-related behavioral outcomes were found to be higher in males than females. Kilpatrick et al. (2003) found that incidence of substance abuse/dependence criteria for youth aged 12 to 17 were 8.2% for boys versus 6.2% for girls nationally. Research regarding this sample has shown that there is no significant difference in substance use between male and female respondents (Van Gundy et al., 2011). I believe the relationship between new media use and substance use would be stronger for males because males generally experience more freedom and independence than females (Bumpus, Crouter, McHale, 2001), this coupled with higher levels of new media communications could overall increase substance use, in much the same way as age. Taken together, I expect that the relationship between new media use and substance use and new media use and negative substance-use-related behavioral outcomes use will be stronger for males than females.
Path model of new media use, substance use, and negative substance use related behavioral outcomes.

In the proposed study, I will explore whether new media use has a moderating effect on the relationship between substance use and negative substance-use-related behavioral outcomes. Because of the nature of new media use and its characterization as social interaction, there is reason to believe that new media use will moderate the relationship between substance use consumption and negative substance-use-related behavioral outcomes. Within ESF, peers, family members, and others are thought to be the drivers of development within individuals. New media, as a social facilitator of peer communication, may also play a role in communicating substance use messages between peers. These technologies may offer greater opportunity for contact between peers and exposure to substance use and delinquent behaviors. Therefore, those adolescents who engage in higher amounts of new media use may engage in increased and problematic substance use.

During adolescence, peer groups tend to become a safe haven for adolescents where they can test new ideas and practice the social skills necessary for adulthood. Early adolescence is marked by a peer group consisting of non-romantic friendships, such as 'cliques', gangs, or clubs. Often adolescents’ decision making skills develop more slowly than strength and independence and because of their strong need for peer approval, they may be enticed to do things they normally would not do. Adolescents’ focus on the peer group coincides with their greater desire for autonomy and individuation from parents. These desires may decrease closeness and increase conflicts between children and parents (Mannheim & Zieve, 2011).
While the research on the developmental impact of new media communications between adolescents is limited, speculation has been varied. Subrahmanyam and Greenfield (2008) have suggested that the virtual world could serve as a 'playing ground' for developmental issues from the real world for adolescents, including identity and autonomy. Examining the effect new media has on the important tasks of adolescence, such as establishing interpersonal connections and constructing identity, is an important first step. Regarding interpersonal connections, new media allows peers access to each other in contexts which are qualitatively different than traditional contexts. These new media contexts may allow for easier miscommunications, a lack of the usual cues that accompany adolescent interactions such as facial or body language cues, and perhaps lower inhibition regarding what is communicated to peers. The effectiveness of these peer-driven proximal processes are contingent on several factors. Akers (2000) posited that the processes that (1) occur early in the life of the individual; (2) occupy more of the individual’s time and last longer; (3) occur often; and (4) involve others are more important or have close relationships with the individual, have greater effects on behavior. New media facilitates all four of these features of influential behaviors and in a way that is instantaneous and accessible from anywhere.

In establishing this moderation model it is important that the pieces of this model are related to each other, a requirement laid out by Baron and Kenny (1986). First I will confirm a relationship between substance use and negative substance-use-related behavioral outcomes. The literature shows that substance use and negative substance use related behavioral outcomes are strongly related (Nunez-Smith et al., 2010; Kilpatrick et al., 2003; Young et al., 2002). The DSM-IV criterion upon which these substance-use-
related negative behavioral outcomes are based upon measures of substance abuse which cannot be present without substance use (American Psychiatric Association [DSM-IV-TR], 2000).

As noted, substance use and new media use may be related to one another through exposure to substance use content and through social interaction aspects of new media use. These quick and instant communications allow for peers to communicate with each other more easily and these communications can now come from anywhere, anyone, and at any time. Mobile devices are the most obvious example of how this occurs, text messaging has become a ubiquitous means of communication between individuals where previously communication was not permitted or feasible. New media allows for non-deviant peers to be included and contacted by deviant peers more easily regarding substance use behaviors and activities. These communications are outside the scope of control of adults and are easily sent and received. With increased inclusion into substance use behaviors, negative substance-use-related behavioral outcomes are also to be increased. To conclude, new media can act as a moderator of substance use consumption and negative substance use related behavioral outcomes because when used in higher amounts it increases the probability of exposure to peer influence and peer delinquency, thereby strengthening the relationship between substance use and negative outcomes.
CHAPTER III

METHODS

Sample

In 2008, 657 seventh ($n = 316$) and eleventh graders ($n = 341$) from nine public schools of five districts in a northern New Hampshire county were surveyed. This sample represented a 78% response rate. 327 were female and 324 were male and the majority of participants were white ($n = 603$). Due to the use of passive consent, I am unable to determine whether the non-participating students were refusals or absentees (see Table 1). This sample was examined previously by Van Gundy et. al (2011).

Procedure

Selection of respondents.

All public schools in Coos County, New Hampshire, with seventh and eleventh grade students were included in the study. After approval by the school superintendents and school boards, a letter including passive consent notification was sent to all parents of youth being surveyed. Parents had the option of not having their son or daughter participate in the survey by contacting the school or returning a form attached to the letter.

Survey administration

Upon arranging a time for data collection, the research team encouraged each school to provide a data collection locale allowing the research team to seat students with at least one empty seat separating each student from other students. Prior to the beginning of survey administration, one member of the research team instructed students that they
were to remain silent for the duration of the survey administration and to raise their hands if they have any questions during the survey administration. In addition, students received a passive assent form prior to survey administration and were asked to sign their name if they choose not to participate. During the administration of questionnaires, at least one member of the data collection team roved the locale to answer any questions that students had. These procedures helped to ensure the confidentiality of each student's responses and expedited the survey administration.

Upon the completion of their questionnaires, students turned their questionnaires into a non-roving member of the research staff, who wrote that student's pre-assigned identification number on their survey before putting it into a box. None of the surveys had student names on them and, when not being used for survey administration, the list of student identification numbers remains under lock and key separate from the completed surveys. Questionnaires took between 45 and 60 minutes on average to complete. Students received a $10 gift certificate to a local business or nearby chain retailer as compensation for their participation.

**Measures**

**Age Cohort**

Age cohort was measured using one item. Youth were asked to select their age from a choice of 11th grade (coded as 1, \( n = 341 \)) or 7th grade (coded as 0, \( n = 316 \)).

**Sex**

Sex was measured using one item. Youth were asked to select their sex from a choice of male (coded as 1, \( n = 324 \)) or female (coded as 0, \( n = 327 \)).
Mother's education

Mother's education was measured using one item. Youth were asked to select their mother's or female guardian's level of education: less than high school, high school, some college education, associate degree, bachelor's degree, graduate or professional school (Ph.D., M.D., M.A.). Due to the large number of categories and the infrequency of some of the categories, youths' answers were collapsed into three groups: less than high school (n = 35), high school (coded as 1, n = 199), some college education, associate degree, bachelor's degree (coded as 2, n = 370), and graduate or professional school (coded as 3, n = 32).

New media use

New media use was measured using a 13-item scale. Item selection for this scale was based on several widely accepted definitions of new media: "New media is defined as digital information technologies of telecommunication and computing, as well as wireless and handheld devices, which fulfill a social need to interact and transact, impart information, provide services, and/or entertain (Pavilik, 2006; "new media", 2010; Lister & Dovey, 2003)." Participants were asked how often they had used certain technologies within the past month using the following 0 to 4 point scale: never in the last month, once or twice, at least once a week, or at least once a day. Items for this scale included "Used internet networking sites (MySpace, Facebook, etc.)?" and "Used a cell phone?"

Exploratory factor analyses were conducted and items from the new media use measure were subjected to Principal Components with Varimax rotation. Examination of the scree plot, eigenvalue size of the first factor (5.09) which accounted for 39.13% of variance plus the addition of another factor did not add a significant amount of the total
variance accounted for, suggested a one factor solution for this data. Based on the results of the factor analysis, items were summed ($\alpha = .87$). See Appendix A for full scale.

**Substance use**

Substance use was assessed using a 3-item scale, which asks participants to identify in the past 6 months, how often have they used each of the following substances for non-medical reasons. Substances included (1) alcohol, (2) tobacco/cigarettes, and (3) marijuana/hashish. Youth were asked to select from the following 0 to 6 point scale: no times, 1-2 times, 3-5 times, 1-3 times per month, 1-2 times per week, or 3-4 times per week, nearly every day. Similar to approaches measuring substance use that have been used by Van Gundy and Rebellon (2010), youth were grouped into two categories where users were coded 1 and nonusers are coded 0. This use/no-use scale is necessary in avoiding statistical problems that arise due to infrequent substance use among the sample surveyed (Van Gundy et al., 2011). Any indication of use was coded as 1.

**Negative substance use related behavioral outcomes**

Negative substance-use-related behavioral outcomes (NSURBO) was measured using a 15-item scale, based on the DSM-IV criteria for substance abuse (American Psychiatric Association [DSM-IV-TR], 2000). Participants were asked to select from the following 0 to 4 point scale in regards to how often a given situation related to substance use has happened in the last 6 months: never, rarely, sometimes, or often. Items included events such as, "I was under the influence of alcohol or drugs at school or work" and "I had problems with the law because of my alcohol or drug use." ($\alpha = .89$). Youth were grouped into two categories where those who showed any indication of NSURBO are coded as 1 and those showed no indication of NSURBO are coded as 0. This use/no-use
scale is necessary in avoiding statistical problems that arise due to infrequent substance use among the sample surveyed (Van Gundy et al., 2011). See Appendix B for scale.
CHAPTER IV

RESULTS

Analysis

The goals of this project were to explore the relationship between new media use and substance use, differences in the relationship between new media use and substance use by age and gender, and the possibility of new media use moderating the relationship between substance use and negative substance-use-related behavioral outcomes for rural youth. Preliminary analyses included evaluating mother’s education as a control for my second, third and fourth research questions and examining differences in new media, substance use, and negative substance-use-related behavioral outcomes by age cohort and sex. Next, I addressed research question 1 by examining new media use and its relationship to substance use and negative substance-use-related behavioral outcomes. For research questions 2 and 3, I explored whether these relationships varied by age cohort and sex. Finally, for research question 4, I evaluated the hypothesis that new media use is a moderator of the relationship between substance use and negative substance-use-related behavioral outcomes. The data were analyzed using the SPSS statistical package, version 19.

Preliminary Analyses

Control variables were included on the basis of these preliminary analyses and literature. This study and other work shows age plays a large role in determining substance use and negative substance use related behavioral outcomes. For example,
substance use experimentation has been found to be higher in older adolescents as has the incidence of agreement with DSM-IV substance dependence criteria (Center for Disease Control, 2009; Kilpatrick et al., 2003). This study and national studies have shown that males exhibit higher incidence of substance abuse criteria than girls. Researchers have attributed this to greater independence and freedom given to adolescent males and also a greater propensity for risk taking (Kilpatrick et al., 2003). Current research has shown that socioeconomic status as indicated by parental education is closely related to substance use. Bachman, O'Malley, Johnston, Schulenberg, & Wallace (2011) found that for white students especially, the predominant ethnic make-up of this study, parental education is strongly related to substance use.

Analyses were conducted to determine whether mother education was related to substance use or negative substance-use-related behavioral outcomes, as a precursor to inclusion in research questions 2, 3 and 4 as a control variable. The relationship between mother education and substance use was examined through chi-square analysis which showed no relationship \( \chi^2 (2, N = 636) = 1.33, p = .52 \). The relationship between mother education and negative substance-use-related behavioral outcomes was also examined through chi-square analysis. This analysis showed no relationship \( \chi^2 (2, N = 636) = .48, p = .78 \).

Turning to descriptive information about the sample, overall, older participants reported higher scores across the variables in this study than did younger participants (see Table 2). Eleventh graders used more new media than did 7th graders. An independent samples t-test analysis showed that 11th graders \( (M = 1.71, SD = .62) \) reported greater frequency of media use than did 7th graders \( (M = 1.39, SD = .75) \), \( t(653) = -5.89, p < \)
Like new media use, 11th graders tended to engage in greater substance use than 7th graders and also experienced more negative substance use related behavioral outcomes. Eleventh graders ($M = 0.56, SD = 0.50$) reported greater incidence of substance use than did 7th graders ($M = 0.08, SD = 0.28$), $t(655) = -15.08, p < .001$, and 11th graders ($M = 0.41, SD = 0.50$) did not differ significantly regarding negative substance-use-related behavioral outcomes compared to 7th graders ($M = 0.39, SD = 0.49$), $t(655) = -0.55, p = .58$.

Males and females were similar in most respects with the exception of negative substance use related behavioral outcomes (see Table 2). Females ($M = 1.61, SD = 0.63$) and males ($M = 1.51, SD = 0.77$) did not differ significantly in their new media use, $t(647) = 1.81, p = .07$. Additionally, females ($M = 0.32, SD = 0.47$) and males ($M = 0.35, SD = 0.48$) did not differ significantly regarding substance use, $t(649) = 0.91, p = .36$. Males ($M = 0.42, SD = 0.50$) did not differ significantly regarding negative substance use related behavioral outcomes compared to females ($M = 0.38, SD = 0.49$), $t(649) = -1.30, p = .20$.

**Research Question 1**

Hypothesis 1a: Greater new media use will be linked to greater substance use.

The relationship between new media use and substance use was examined by an independent samples t-test to compare if the means of new media use for substance users versus non-users were statistically significant. The test revealed a significant difference between the means of the two groups with substance users ($M = 1.69, SD = 0.69$) reporting greater frequency of new media use than did non-substance users ($M = 1.49, SD = 0.03$), $t(653) = 3.368, p = .01$.

Hypothesis 1b: Greater new media use will be associated with greater negative substance-use-related behavioral outcomes.
The relationship between new media use and negative substance-use-related behavioral outcomes was examined by an independent samples t-test to see if the means of new media use for participants who experienced NSURBO's versus participants who did not were statistically significant. The test did not show a significant difference between the means of the two groups with NSURBO participants \((M = 1.57, SD = .71)\) reporting similar frequency of new media use when compared to non-NSURBO participants \((M = 1.55, SD = .70)\), \(t(653) = -.41, p = .68\).

**Research Questions 2 and 3**

Hypothesis 2a: There will be a stronger relationship between new media use and substance use for 11th grade students than for 7th grade students.

Hypothesis 3a: There will be a stronger relationship between new media use and substance use for males than for females.

A logistic regression was conducted to examine whether the relationship between substance use and new media use differed by age cohort and/or sex controlling for mother's education (see Table 3). Although preliminary analyses showed that mother's education was unrelated to substance use and negative substance-use-related behaviors, I decided to include mother's education level as a control variable anyway because it consistently has been shown to be a reliable measure of socioeconomic status and related to youth substance use (Bachman, O'Malley, Johnston, Schulenberg, & Wallace, 2011). An interaction term between new media use and age cohort and new media use and sex was created initially by centering the new media use variable (Aiken & West, 1991). A statistically significant interaction term will show that the relationship between new media use and substance use differs by age cohort and/or sex. The logistic regression
analysis revealed that age cohort was a significant predictor of substance use ($B = 2.63, p < .001$) and the model was significant ($p < .001$). However, the interaction terms between new media and age cohort and new media and sex were non-significant (See Table 3).

Hypothesis 2b: There will be a stronger relationship between new media use and negative substance use related behavioral outcomes for 11th grade students than 7th grade students.

Hypothesis 3b: There will be a stronger relationship between new media use and negative substance use related behavioral outcomes for males than females.

A logistic regression was conducted to examine whether the relationship between new media use and negative substance-use-related behavioral outcomes differed by age cohort and sex, controlling for mother’s education. An interaction term between new media use and age cohort and/or sex was created by first centering the new media variable. A statistically significant interaction will show that the relationship between new media use and negative substance-use-related behavioral outcomes were different by age cohort and/or sex. The logistic regression analysis showed that none of the variables included were a statistically significant predictor of substance use, however the model was significant ($p < .001$). The interaction terms between new media and age cohort and new media and sex were non-significant (See Table 4).

**Research Question 4**

Hypothesis 4: For those youth with greater frequency of new media use there will be a stronger, positive relationship between substance use and negative substance
use related behavioral outcomes than for those youth with lower frequency of new media use.

Hypothesis 4 was tested via a path model using logistic regression to examine the moderating effect of new media use on the relationship between substance use and negative substance-use-related behavioral outcomes. An interaction term between new media use and substance use using a centered new media use variable was created. The dependent variable was negative substance-use-related behavioral outcomes. Additionally, the analysis controlled for age cohort, sex, and mother's education level. The logistic regression analysis showed that new media use did not moderate the relationship between substance use and negative substance-use-related behavioral outcomes. However, age cohort \((B = -.96, p < .001)\) and substance use \((B = 1.96, p < .001)\) were found to be significant predictors of negative substance-use-related behavioral outcomes (See Table 5).
CHAPTER V
DISCUSSION

Research on new media use and substance use has been extremely limited. The aim of this study was to conduct preliminary research on the relationship between new media use and substance use in a rural area, to see if this relationship differed by age cohort and/or sex, and whether new media use moderates the relationship between substance use and negative substance-use-related behavioral outcomes. Based on research from traditional media use and substance use it was believed that new media use and substance use would be related (e.g., Nunez-Smith et al., 2010). This study supports the hypothesis that greater new media use is related to greater substance use but new media was not found to be related to negative substance-use-related behavioral outcomes. New media use represents a new context in which to study adolescent development and to gain understanding of the importance of new media use by rural youth.

Descriptive analyses showed an age effect with 11th graders engaging in more new media use than 7th graders. This is in line with national studies (Kaiser Family Foundation, 2010) which demonstrate that new media use among youth rises as they get older, peaking at about 16 years of age. That older youth engage in more new media use is not surprising given that greater freedom and independence affords older youth new opportunities to communicate and socialize with peers in a new media environment. Other descriptive analyses indicated that males and females were not significantly different in regards to new media use. This finding failed to replicate previous research. Kaiser Family Foundation (2010) reported that boys use, on average, almost an hour
more of media each day than girls, with the majority of the difference coming from console video games. Perhaps the reason why no gender differences were found in this study is related to the survey items included in my new media use scale. My new media use scale only asks about online multiplayer video games and not console video games which tend to be single-player oriented and used more often by males (Koster, 2000).

Substance use and negative substance-use-related behavioral outcomes were found to be higher in older adolescents. Eleventh graders exhibited higher rates of substance use and negative substance-use-related behavioral outcomes than did 7th graders. This replicates what has been found in national studies (Centers for Disease Control and Prevention, 2005; Centers for Disease Control and Prevention, 2009). Additionally, 11th graders also experienced more negative substance-use-related behavioral outcomes than did 7th graders. This finding is also in line with national studies which have shown that older adolescents tend to have a higher incidence of agreement with DSM-IV substance use criteria, ostensibly negative substance-use-related behavioral outcomes (Kilpatrick et al., 2003). I also found that males’ experienced more negative substance-use-related behavioral outcomes than did females. This is in line with Kilpatrick et al. (2003) who report that males, on average, experience higher rates of agreement with DSM-IV criteria for substance abuse, upon which the negative substance-use-related behavioral outcome scale is based. These data are also confirmed by prior studies of this sample (Van Gundy et al., 2011).

A significant finding of this study was that there was a relationship between new media use and substance use in rural youth in that greater new media use was associated with greater substance use. This finding replicates what is known about the relationship
between traditional media use and youth substance use. In the current study, substance users used more new media use overall, approximately 12% more, than non-users. Nunez-Smith et al. (2010), in a comprehensive review of research, found that in 80% of the studies included in their review, greater media exposure was related to increased alcohol, tobacco, and drug use by youth.

There are several possible explanations for the relationship between new media and substance use. New media may be acting in the same way as traditional mass media, possibly influencing youth through pro-substance use media messages like drug and alcohol advertising online (Scull, Kupersmidt, Parker, Elmore, & Benson, 2009). Youth also may be influenced by deviant peers during new media communications and interactions (Ferguson & Meehan, 2010), such as seeing a friend make a public pro-substance use post on a social networking website. Another explanation for my finding is that new media interactions are hard to characterize. For example, at times new media use may look like the use of traditional media. Take the example of ‘Hulu’, a video hosting website where users can watch television programming, is almost a complete amalgam of the traditional media experience of television use. However, new media use can also look like interpersonal interaction at times, such as instant messaging between friends. New media use can also look like Crosbie's (2002) concept of many-to-many communication, such as a mass messaging of friends customized via a computer program to fit their personal information. Additional difficulties arise when considering the fluidity of change by which these interactions occur (Crosbie, 2002).

While it is important to show that a relationship may exist between new media use and substance use in youth, the exact nature of this relationship cannot be known until we
are able to tease apart the types of interactions youth are having in a new media environment. For example, new media use may relate to substance use but is that because heavy new media users are being exposed to pro-substance use messages from friends, messages from online advertising, or some other source? We cannot simply measure the amount of exposure to media anymore and know exactly what processes are present that could be influencing youth, this is the dilemma in assessing the developmental impact of new media use. Measuring the amount of time youth spend engaging in various types of new media use activity and how they spend their time will help us pinpoint the exact way in which new media use may be influencing youth to engage in substance use.

In terms of research questions 2 and 3, the examination of age and sex differences in the relationship between new media use and substance use, I found that there was none. However, it should be noted that both new media use ($B = 2.63, p = .07$) and the new media X age cohort interaction variable ($B = -.62, p = .06$) approached significance. It is possible that different types of new media use could have masked a relationship between the various kinds of new media use and substance use. Follow-up analysis revealed that when cell phone use and internet use were analyzed as individual items in an analysis with new media, and age cohort was significant ($B = -.92, p = .01$). It could be that cell phone use was masking a relationship between internet use and substance use. Future analyses could assess the validity of items comprising the composite new media variable. It is possible that future research on new media and substance use may be more fruitful by focusing on individual ‘types’ of new media such as ‘internet use’, ‘cell phone use’, and ‘video game use.’ Separation of these categories can be made on a theoretical
basis, such as Crosbie's (2002) definition of new media communications. Cell phone use and video game use could be categorized as a mixture of both interpersonal, mass media, and new media communications, while internet use is more easily categorized as a primarily many-to-many communications technology. These distinctions will be important when assessing the developmental impact of new media technology on adolescence.

As a part of my work, analysis were run to explore whether there may be a moderation or path relationship between new media use, substance use, and negative substance-use-related behavioral outcomes. Unfortunately, this type of relationship was not found in the current data; new media use does not moderate the relationship between substance use and negative substance-use-related behavioral outcomes. There are several possible explanations for this finding. It is important to concede that a relationship may not exist between the three variables. However, greater new media use was found to be related to greater substance use and substance use was found to be a significant predictor of negative substance-use-related behavior outcomes. Why then is there no moderation relationship between new media use and negative substance-use-related behavioral outcomes?

While increased communication between deviant peers is possible leading to the relationship between new media use and substance use, it is also possible that increased communication with family members, often considered a protective factor, could result from increased new media use and lower the probability of negative substance-use-related behaviors. Higher new media use could expose youth to more substance-use-related socialization processes. Contact with delinquent peers has been shown to be one
of the major contributors to substance use in youth (Ferguson & Meehan, 2011).

Research done by Tobler and Komro (2010), however, found that adolescents who experienced low levels of parental communication and monitoring experienced greater substance use overall. New media use may increase communications not only with risk factors such as delinquent peers but also with protective factors such as parents. So, while new media use may be related to experimentation regarding substance use, it could also inhibit or discourage substance abuse or at least prevent youth from experiencing negative outcomes. Further research is needed in this area to determine what percentage of time youth spend communicating alternatively with peers, family members, and delinquent peers.

Guided by ESF, in the current study I viewed new media as a proximal process rather than a distal process as traditional media has typically been categorized. As a proximal process, new media adheres to the four distinctive properties of proximal processes: (1) For development to occur, the person must engage in an activity, (2) the activity must take place on a regular basis, over an extended period of time, (3) activities must take place long enough to become "increasingly more complex", (4) there must be initiation and response in both directions, (5) proximal process can involve both interpersonal interaction or interaction with objects or symbols. Anecdotally, we can see in the life of the average tech savvy adolescent as their interactions with new media regularly likely meets some or all of these criterion. In contrast to traditional media, new media allows engagement in an activity, regularity of interaction, increasing complexity, initiation and response; and unlike traditional media, it allows for interpersonal interaction and interaction with objects or symbols. Moreover, face-to-face contact, a
necessity for proximal processes according to ESF (Paquette & Ryan, 2001), now is moderated and facilitated by technology for a great deal of interpersonal interactions.

However, in some ways new media use still resembles a distal process and is part of the exosystem. The exosystem is an environmental domain which "...comprises the linkage and processes taking place between two or more settings, at least one of which does not contain the developing person" (Bronfenbrenner, 1994). In his original model, Bronfenbrenner included family social networks, parents’ workplace, and neighborhood community contexts as part of the exosystem. As much as new media facilitates inclusion of the individual, it contains elements which negate individual inclusion. For example, consider visiting a website that collects news stories and organizes them according to user interests, the individual, while determining the content they are exposed to, is none the less not a part of the website. The individual is consuming information in a way that is fundamentally identical to traditional mass media, which exists in the exosystem.

New media use may also create a new type of mesosystem between individuals and the members of the microsystem. New media connects microsystem members and facilitates their associate processes, which may or may not include the individual. The microsystem can be described as those linkages with which the individual is directly part of and can drive development such as the family, school, peer group, and workplace. Outside of the microsystem but still within the exosystem, is the mesosystem which has been described as a 'system of microsystems'. The mesosystem facilitates communications between microsystem constructs such as communications between home and school, and school and workplace. New media no longer appears to be solely an
exosystem construct or really part of the mesosystem either. Thus, new media may exist in its own system.

Pioneering the classification of new media within the ecological model, Stewart (2009) referred to this new system in which to place new media as the 'nanosystem'. The nanosystem exists to facilitate communication between microsystem members (Stewart, 2009). Stewart (2009) first referred to a nanosystem while discussing the trauma of children from war-affected countries. He described the nanosystem as a "...close interpersonal relationship or network that is integral to connecting the individual to the microsystem." This definition can be adapted to the technologies of new media which are playing an increasingly important role in facilitating communications between individuals and microsystem members. The nanosystem facilitates communications between individuals and members of the microsystem. This communication influences development and could be considered proximal processes as defined in ESF. This new theoretical concept could bridge the gap and incorporate new media technologies into Bronfenbrenner's original model. The extent of new media use by youth is such that we cannot ignore the impact of new media on adolescent development.

Limitations

There were several limitations of this study that could be addressed in future research. Study limitations include the findings not being able to be generalized to other youth populations in more urban and suburban areas. Rural youth tend to be different from their urban and suburban counterparts in that there is sparse population density, no easy access to social areas and gathering places characteristic of urban and suburban areas, and limited transportation resources that would allow youth to travel to meet their
peers (Lambert, Gale, & Hartley, 2008). This is a limitation to engaging in substance use as a great deal of substance use experimentation happens in social situations (Botvin, Malgady, Griffin, Scheier, & Epstein, 1998). Additionally, rural youths' odds of substance use are lower than their urban counterparts. Other research on this sample has shown that this is the case with regard to both substance use and substance abuse behaviors (Van Gundy et al., 2011). Furthermore, current research has indicated that rural and urban new media users may differ in their new media use habits. For example, rural social media users tend to have less online friends than urban users and their online friends tend to live closer to them (Gilbert, Karahalios, and Sandvig, 2010). Comparing the new media use habits of urban versus rural youth will also be an important undertaking in future research.

This study was limited in its exploration of the construct of new media use. A more comprehensive examination of new media use could be undertaken by including more technologies and more technology use behaviors in future questions. For example, only one question was asked regarding video games despite video gaming being a large part of media use for many youth, especially for males (Greenberg et al., 2010). Additional improvements to this scale could include creating a more easily comparable measure, such as measuring new media use in hours per day as is done in national surveys (Kaiser Family Foundation, 2010). Finally, this survey is cross-sectional and limits my ability to measure change over time, relegating my analysis to a static point. Cross-sectional survey design also makes it difficult to make causal inference (Levin, 2006). For example, new media use may be related to substance use but inferring the
opposite relationship, that substance use may be related to new media use may be
difficult.

Applications

Several practical applications for this study are evident. This research could be
used to inform substance-use interventions for youth, by suggesting the inclusion of new
media exposure. For example, many parents may see new media use as harmful, and
while substance use experimentation does appear to be related, it does not appear to be
indicative of being at risk for substance abuse. If a relationship between new media use
and substance use experimentation was found, it could allow for targeted interventions of
those already at risk for substance use. This could be especially relevant for rural youth
populations who face challenges in access to prevention and substance use treatment
services (Van Gundy, 2006). Therapists and substance-use-treatment professionals could
limit or suggest limiting use of new media technologies for those recovering and/or
experimenting with substance use. The role that impulsive and instant communications
play as part of new media use in substance use and abuse could be a key feature of
substance use treatment in the future.

This study left many questions as to the nature of the relationship between new
media use and youth substance use. How are youth using new media, are they interacting
with friends mostly or family members? What are youth talking about when engaging in
social interaction via new media use? Is it substance use related? Does exposure to
substance use related communications go hand in hand with heavy new media use? All
of these questions must be answered if we are to accurately understand the relationship
between new media use and substance use.
Conclusions

Media use as one factor in a youth's decision to engage in substance use has been explored extensively by researchers (Nunez-Smith et al., 2010). With the advent of new media technologies that facilitate communication, the influence of peers in a youth's decision to engage in substance use must be reevaluated (Ferguson & Meehan, 2011). This is an especially critical task in regards to rural youth considering the prevalence of use of new media use (National Telecommunications Cooperative, 2009) and lack of substance use treatment and prevention resources (Van Gundy, 2006) in rural areas. New media use may play a two-part role in an adolescent's decision to engage in substance use, that of a risk factor, increased contact with deviant peers (Ferguson & Meehan, 2010), and that of a protective factor, increased contact with family (Tobler & Komro, 2010).

This study shows that new media use is related to substance use. This represents a step forward in understanding not only the role that technology can play in a youth's decision to engage in substance use but also the role of technology in adolescent development. However, these findings should be regarded as only preliminary research. This relationship could indeed be due to a new and previously unexamined peer interaction process, it could be due to socialization process similar to those studied in traditional media contexts (Nunez-Smith et al., 2010), or some other correlated construct not taken into account.

Is the use of new media having a developmental impact on youth? These data suggest that this may be so and the amount of new media use youth today use must be having some impact on development. Future studies should focus on several areas on
new media use, both on the qualitative and quantitative nature of new media communications. For example the types of interactions youth are having online with friends and the subjects discussed. Research must also be timely and conducted frequently. With the exponential growth of new media use in the past decade, research done even 5 or 6 years ago may be invalid. Today, many adolescents now use social networking websites to communicate and have easier access to the internet through mobile devices, something uncommon in 2004 (Kaiser Family Foundation, 2010). As a field, the study of new media use will not progress as long as the focus is on only the negative aspects of new media use such as 'sexting' and 'cyberbullying'. Future research must also include a full appreciation of the developmental impact of new media use including both its positive and negative aspects.

To conclude, this research demonstrates that new media use may have a developmental impact on youth substance use experimentation, that older adolescents differ significantly in the amount of new media use they engage in compared to younger adolescents, and that new media use may have no relationship to negative substance-use-related behavioral outcomes. The new media environment is changing rapidly. The developmental tasks of adolescence are primarily social ones, never before has a generation encountered such a marked change in how people interact. Educators, parents, and researchers of adolescence must understand not only what risks exist in this environment but also how these tools can be used to reach young people and assist them in this life transition.
References


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Appendix A

New Media Use Scale

How often you have used the following technologies in the past month?

*Participants were asked to score each example of technology use on the following scale:*

0 - Never in the last month

1 - Once or twice

2 - At least once a week

3 - At least once a day

*Participants were given the following technology-use examples:*

1. Checked your e-mail?

2. Used a cell phone?

3. Used chat rooms on the internet?

4. Used instant messaging (IM)?

5. Used the internet at home?

6. Used the internet at school?

7. Sent or received text messages on a cell phone?

8. Used internet networking sites (myspace, facebook, etc.)?

9. Watched videos online?

10. Read news on the internet?

11. Used the internet for homework or educational purposes?

12. Played online multi-player games?

13. Used the internet for fun?
Appendix B

Negative Substance Use Related Behavioral Outcomes Scale
Circle the number that shows how often each has happened to you in the last 6 months only.

Participants were asked about how often a given negative substance-use-related behavioral outcome has occurred over the last six months on the following scale:
0 - Never
1 - Rarely
2 - Sometimes
3 - Often

Negative substance use related behavioral outcomes scale given included the following:

1. I was under the influence of alcohol or drugs at school or work.
2. I missed school or work because of my alcohol or drug use.
3. My alcohol or drug use caused problems with my friends.
4. My alcohol or drug use caused problems with my family.
5. I used more alcohol or drugs than I meant to use.
6. I wanted to quit or cut down on my alcohol or drug use.
7. I was under the influence of alcohol or drugs when I could have gotten hurt physically (life while swimming, climbing, using a knife, crossing against the traffic, driving, etc.)
8. I accidentally hurt myself while using alcohol or drugs.
9. I stopped or cut down on important things (like sports, hobbies, work, or seeing friends and family) because of my alcohol or drug use.
10. I was suspended from school because of my alcohol or drug use.
11. I had problems with the law because of my alcohol or drug use.
12. My alcohol or drug use caused problems with my emotions or nerves.
13. My alcohol or drug use caused problems with my physical health.
14. I spent a lot of time getting over the effects of alcohol or drugs.
15. I did not perform well on important tasks (like schoolwork, chores, sports, or work) because of my alcohol or drug use.
Appendix C

University of New Hampshire
Research Conduct and Compliance Services, Office of Sponsored Research
Service Building, 51 College Road, Durham, NH 03824-3585
Fax: 603-862-3564

23-Jan-2008

Rebellon, Cesar J
Sociology, Horton SSC
Durham, NH 03824

IRB #: 4072
Study: Panel Study of Coos County Youth
Approval Date: 03-Oct-2007

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study with the following comments:

Researchers may initiate the project but they may not collect data until they have a Certificate of Confidentiality in hand. Once obtained, please send a copy to the IRB for the file.

Approval is granted to conduct your study as described in your protocol for one year from the approval date above. At the end of the approval period you will be asked to submit a report with regard to the involvement of human subjects in this study. If your study is still active, you may request an extension of IRB approval.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, Responsibilities of Directors of Research Studies Involving Human Subjects. (This document is also available at http://www.unh.edu/osr/compliance/irb.html.) Please read this document carefully before commencing your work involving human subjects.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

Julie F. Simpson
Manager

cc: File
**Tables**

Table 1

*Participant Demographic Data*

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*Descriptive Data for New Media Use, Substance Use, Negative Substance-Use-Related Behavioral Outcomes by Age Cohort and Sex and Summary of Independent Samples t-tests*

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Note: ***p<.001
Table 3

*Hypotheses 2a and 3a: Summary of Logistic Regression Analysis Predicting Substance Use by New Media Use*

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Hypotheses 2b and 3b: Summary of Logistic Regression Analysis Predicting Negative Substance Use Related Behavioral Outcomes by New Media Use

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