

**MEDIA USE BY CHILDREN AND ADOLESCENTS WITH AND WITHOUT
DEPRESSION: GOING IT ALONE?**

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MEDIA USE BY CHILDREN AND ADOLESCENTS WITH AND WITHOUT DEPRESSION: GOING IT ALONE?

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University of Pittsburgh, 2010

Using experience sampling methodology this paper compares youth with and without Major Depressive Disorder (MDD) in their social and asocial uses of electronic media (EM) and non-electronic media (NEM). In addition this study examines whether recovery from depression is accompanied by changes in media use. The media use and companionship of 108 participants, 47 MDD and 61 non-depressed Controls, were recorded through telephone report. Results show that youth with MDD used EM more in an asocial context than did the Control group both during the depressive episode and after recovery from depression. In addition, NEM use was significantly higher for the Control group than the MDD group after recovery. Time spent with asocial EM is considered as a consequence of the depressive episode and as an aid to recovery supporting the *social risk hypothesis* of depression. Asocial media use is also considered to be a possible hindrance to recovery. Implications for treatment are discussed.

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PREFACE

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1.0 INTRODUCTION

This investigation of media use compares youth with and without Major Depressive Disorder (MDD) in their social and asocial uses of electronic media (EM) and non-electronic media (NEM). One can watch television alone or with others. One can isolate oneself with headphones or go to a public concert. One can anonymously play solitaire online or chat online with friends or strangers. One can read a book alone in one's bedroom or peruse a magazine in the living room with a friend. Each of these media can be a social experience either physically or virtually, but each can also easily and effectively be used in social isolation. What do the choices made by children and adolescents to use media socially or asocially mean in relation to psychological health? Might the choice to use media asocially be the result of or indicative of depression and what is its relationship with recovery from depression?

Research has indicated that media can be used to manage mood both qualitatively and quantitatively (Carpentier et al., 2008; Helregel & Weaver, 1989; Wegener & Petty, 1994; Zillmann, 1988a). Experiments have been conducted linking media exposure to moods and behaviors (Agliata & Tantleff-Dunn, 2004; C. A. Anderson et al., 2003; Christakis & Zimmerman, 2007; Harrison & Fredrickson, 2003; Johnson, Cohen, Smailes, Kasen, & Brook, 2002; Leung & Lee, 2005; Olson, Kutner, & Warner, 2008; Olson et al., 2007). Media consumption has been described both in terms of time spent and social context (R. C. Anderson, Wilson, & Fielding, 1988; Bertocci et al., 2008; Hofferth & Sandberg, 2001; Larson, Kubey, & Colletti, 1989; R. Larson, M. Raffaelli, M. H. Richards, M. Ham, & L. Jewell, 1990; Livingstone, 1999; Roberts, Foehr, & Rideout, 2005). This investigation of media use fills a gap

in both the media literature and the psychopathology literature by comparing the social context of media use by youth with and without depression and after recovery from depression.

Major Depression (MDD) is a psychological disorder that afflicts youth and has a clear social component associated with it. Depressed individuals tend to withdraw from social intercourse and activities (American Psychiatric Association, 1994) and to prefer solitary experiences (R. W. Larson, M. Raffaelli, M. H. Richards, M. Ham, & L. Jewell, 1990). In addition, the popularity of media and its characteristic as both a social and an asocial tool make it a good choice for examining the social and asocial activities of youth. Given these characteristics of depression, that childhood and adolescence are especially important times for developing social skills and for developing and maintaining friendships, and given that the use of media during these developmental periods is common, examination of the social context of media use between youth with and without depression is in order. The tendency for depressed individuals to experience a withdrawal from social activities in general, suggests that a disorder such as depression may be associated with the use of media in an asocial context.

The goals of this dissertation are to examine and compare the social and asocial use of media in the everyday lives of children with and without depression and to consider these uses in relationship to early onset depression, relapse and recovery. The research questions were do youth who are depressed use electronic media (EM) and non-electronic media (NEM) differently than non-depressed youth both in terms of overall use and in social context and how do these comparisons of behavior change after recovery from depression.

In order to put this study and hypotheses into the context of the larger literature, research areas of media, depression, and social development are reviewed. Media literature includes the

extent of EM and NEM use by youth. In addition, a body of literature demonstrating the relationships of media use with psychopathology is discussed. This literature is put into context through a description of the dominant theory of media consumption called the *Uses and Gratifications* theory. The *Uses and Gratifications* theory of media use theorizes that media use is a choice made by selective users.

A review of depression research includes a detailed description of depression in youth and known correlates to depression focusing specifically on the social development of youth and the relationship of development with depression. The literature is described in relation to the *Social Risk Hypothesis* of depression and neuroimaging data supporting this theory. The *Social Risk Hypothesis* of depression is an evolutionary approach to social isolative behavior and affective neuroscience findings lend support to the hypothesis (Forbes, 2009; Forbes & Dahl, 2005; Henriques & Davidson, 2000; Siegle, Steinhauer, Thase, Stenger, & Carter, 2002; Siegle, Thompson, Carter, Steinhauer, & Thase, 2007). The discussion focuses on causal and consequential mechanisms of media use in relation to social context.

1.1 DEFINITIONS OF TERMS

Media – The term media in this paper refers to electronic mass media (TV, radio, video games and computer) and non-electronic mass media (newspaper, magazines and books). It does not include communication media such as email, Instant Messaging (IMing), text messaging or social networking sites.

Major Depressive Disorder (MDD) – An extended state of sadness that has been

clinically diagnosed by mental health professionals. Symptoms of MDD occur for the majority of time for at least two weeks and include feelings of excessive sadness or irritability, lack of enjoyment in activities that were once enjoyed, gaining or losing weight, poor sleep, feelings of helplessness and hopelessness, psychomotor agitation or retardation, and thoughts or actions related to suicide (American Psychiatric Association, 1994).

Social risk hypothesis – Theory posited by Allen and Babcock that suggests an evolutionary response to the socially isolative behavior exhibited by depressed individuals. The theory suggests that when an individual is at risk for social isolation due to his/her maladaptive depressive behavior he/she protects him/herself by instead exhibiting a lack of desire to participate in social interactions and interpersonal relationships (Allen & Badcock, 2003).

Uses and Gratifications theory- Theory of media use proposed by Katz that suggests people use media to fulfill a need (Katz, Blumler, & Gurevitch, 1973). The needs can be personal, social, economic, familial, or a variety of other demands.

Social Context – Performing an activity with at least one age equivalent companion/peer. Social context includes both physical and virtual interactions.

2.0 REVIEW OF THE LITERATURE

2.1 EXTENT OF MEDIA USE

Exposure to EM in the United States is extensive. In a comprehensive cross-sectional survey of 2065 children in the United States it was found that 99% of children and adolescents between 8 and 18 years have at least one television in their homes and half of them have a television in their bedrooms (Roberts, 2000; Roberts, et al., 2005). This survey also noted that the majority of children and adolescents also have a videogame console (70%) and a computer (69%) in their homes (Roberts, 2000; Roberts, et al., 2005). In fact, when one recognizes that uses of media are often part of multitasking (as when one listens to music while doing homework and watching television) child and adolescent EM use is estimated to be 8.5 hours per day (Roberts, et al., 2005). This is more time spent with any activity other than sleeping.

The magnitude of NEM use is less clearly examined in the literature and sometimes neglected in favor of a focus on EM, but its use may be an important consideration in psychological health. In a study of reading literacy 67% of Scottish 15 year olds reported reading for at least 30 minutes per day for pleasure, the majority of them reading newspapers and magazines (Executive, 2004). Alternatively, in a study of US children birth-12 years 42% of respondents report reading for pleasure 1 hour 15 minutes per week, which is about 10 minutes per day (Hofferth & Sandberg, 2001). In another study of 5th graders in the US, reporters indicated an average reading time of 10.4 minutes per day (R. C. Anderson, et al., 1988). This is substantially less time spent with NEM than with EM. This discrepancy in time spent may have implications for mental health and should not be ignored in research on media use.

Media in this study were looked at from both an electronic and a non-electronic perspective. Electronic media (EM) included the use of television, music, computer use such as surfing the Internet, and playing videogames. EM use has been implicated in changes in mood and behavior in youth (C. Anderson, 2004; C. Anderson & Bushman, 2001; C. Anderson & Dill, 2000; C. Anderson & Ford, 1987; C. A. Anderson, Berkowitz, et al., 2003; C. A. Anderson & Bushman, 2002; C. A. Anderson, Carnagey, & Eubanks, 2003; D. R. Anderson et al., 2001; Barlett, Harris, & Baldassaro, 2007; Bartholow & Anderson, 2002; B. Bushman & Anderson, 2002; B. J. Bushman & Anderson, 2001; Greitemeyer, 2009; Slater, Henry, Swaim, & Anderson, 2003; Weinstein & Mermelstein, 2007). Instant Messaging (IMing) and email are forms of personal communication similar to the telephone. This type of interaction is different from ingesting mass media and was therefore not part this analysis.

Non-electronic media (NEM) included reading of books, newspapers, and magazines. The differentiation between electronic and NEM was an important one especially considering the degree to which youth choose EM over NEM (R. C. Anderson, et al., 1988; Roberts, et al., 2005).

2.2 THEORIES OF MEDIA CONSUMPTION

EM use in the United States is pervasive. But the question of why people choose to use any type of media remains unanswered and probably varies considerably across individuals and genres. Historically, consumers of EM were thought of as passive recipients of media (Morley, 1995; Ruddock, 2001, 2007; Webster & Phalen, 1997; Wilson, 2009). The idea that there are mass

audiences who passively absorb media has been altered to consider more active, selective media users. Theorists modified their views of media users and currently see users as selective in not only the type of media, but also the genre within the media type that is used (Morley, 1995; Ruddock, 2001, 2007; Webster & Phalen, 1997; Wilson, 2009).

The current *uses and gratifications* approach to media consumption proposes that media are used for a purpose and that purpose is dependent upon the consumer (Blumler, 1979; Katz, et al., 1973; Ruggiero, 2000). The theory holds that consumers of media do so to fulfill a need. The need can be personal, social, economic, familial, or a variety of other demands. The sources of gratification can be derived from the content of the media, the exposure to the media (i.e. written, audio, visual, combination), or the social context that typifies the media (Katz, et al., 1973). It is the need that is gratified by the media use. For example, one woman may watch the evening news to be aware of current events around the world (Blumler, 1979) while a farmer may watch to learn if a frost is forecast and he should cover his saplings. A middle aged man may watch educational programming to learn something (Blumler, 1979) while a teenager may watch it to do a science report. One senior citizen may use the Internet so that he can talk about the Internet with peers but another may use it to communicate with her grandchildren (Xie, 2007). A man may listen to Jazz music with his friend because the friend likes Jazz and the friend may listen because of her enjoyment of Jazz. The gratifications belong to the user as does the underlying need.

The *uses and gratifications* approach to media use predicts that depressed children and adolescents use media to fulfill an individual need. The need is individual and has a variety of antecedents such as information seeking, entertainment seeking, affective state management, and

control of arousal (Ruggiero, 2000). These needs may be related to traits of the individual and a further examination of the association between media use and depression will help to clarify this relationship.

2.3 MOOD, SOCIAL, AND SOLITARY ACTIVITY IN YOUTH

The developmental period from childhood to adolescence is characterized by changes in choice of companionship and emotional responses to companionship. Through the use of experience sampling, evidence has shown that as children and adolescents age they spend increasingly less time with their families and more time alone and with peers (Larson, et al., 1989; Larson & Richards, 1991). Larson and Richards (1994) report that, as adolescence emerges, time with peers is both increasingly desired and increasingly emotional, both positively and negatively. Alternatively, time with parents is reported as comforting, irritating, and boring and time spent alone is reported by youth as involving negative emotions but also as cathartic (Larson & Richards, 1994). In addition, Larson reports that youth use time alone to aid in recovery from the challenging social experiences of the day. However, spending more than 25% of one's time alone is related to maladjustment.

These relationships between behavior and social development are supported by brain imaging studies that examine the social brain. Studies show continued development of the prefrontal cortex and the superior temporal sulcus, areas of the brain implicated in social tasks such as emotion processing, during childhood and adolescence. The development of the social brain is in the form of growth, pruning, and reorganization of these areas (Blakemore, 2008).

The decrease in reported time spent with parents by youth is reflected in the reported social use of electronic media. In a cross sectional descriptive study of youth, reports of television and computer time in an asocial context increased and these media times with parents decreased with age (Livingstone, 1999). The statistical significances of these reported differences in time spent in social contexts were not computed. Additionally, adolescents report using video games in social isolation (Olson, et al., 2007). Larson et al showed, through experience sampling methodology, that there was no significant difference in reported time spent with media between the depressed and non-depressed youth, however, the depressed groups reported a greater desire to be alone (R. Larson, et al., 1990). This paper will expand on the previous research on social companionship by comparing the use of media with peers and alone by depressed and non-depressed youth.

2.4 MEDIA USE AND MOOD AND ANXIETY DISORDERS

Depression. Depression is a disorder of regulating mood. It is therefore important to discuss the relationships found in the literature between media use and both current mood and the regulation of mood. The relationship of media use with mood is a newer area of research and it is limited in scope. A commonly used theoretical perspective called Mood Management Theory has been used to examine mood variations among media users. Mood Management examines the way people use media to change or maintain current moods. This perspective theorizes that people use media to maintain positive moods and to change negative moods, and this perspective holds true for psychologically healthy adult participants (Wegener & Petty, 1994; Zillmann, 1988a, 1988b; Zillmann, Hezel, & Medoff, 1980). Expanding on Mood Management theory to

incorporate mood disorders such as depression, Carpentier and colleagues (2008) examined adolescents with findings that were complementary to the healthy adult outcomes (Carpentier, et al., 2008). Using a regression analysis the authors reported, from an examination of adolescents with and without depression, that television and movies were used to sustain the current mood (Carpentier, et al., 2008). One finding that differed between adults and children is that boys were more likely to use media when their moods were neutral; the authors suggested that this behavior was perhaps a defense against boredom. These findings support the healthy adult data but suggest a further investigation into media use by children and adolescents with mood variations.

Additional media research on depression was completed by Primack and associates (2008). In a study of 4142 adolescents in grades 7 -12 at time 1, an association between self-reported television use in adolescence and the development of depression in young adulthood (7 years later) was reported for males (Primack, Swanier, Georgiopoulos, Land, & Fine, 2008). The authors stated that males' television use in adolescence increased their likelihood of developing depression 7 years later (odds ratio = 1.08) with each hour increase of television use. This finding supports the hypothesis that EM use would be higher for the depressed group. The social context of this media use was not explored.

Depression has also been an independent variable in media studies involving online computer use. Two studies found that time spent online was unrelated to depression or anxiety symptoms among adult participants (Campbell, Cumming, & Huges, 2006; Gross, 2004). Campbell and colleagues (2006) examined the correlations with time online of chat users versus non-users for 188 online participants. They found that despite spending significantly more time online, chat users did not report an increase in depressive, anxiety, or stress symptoms

(Campbell, et al., 2006). These similarities in use time online cultivate the question of other differences between groups with and without psychopathology such as social context of use.

Lastly, NEM use has been negatively associated with depression. Bertocci (2008) found that magazine use was significantly greater for non-depressed participants than for depressed ones. This suggests several possibilities: (a) A protective factor associated with magazine use, (b) Depressed participants do not enjoy magazine use, (c) Depressed participants have difficulty concentrating, which interferes with magazine use, or perhaps (d) Depressed participants do not use magazines because they feel badly afterward. This difference did not hold for participants with bipolar disorder or anxiety disorders. Perhaps this is due to the necessity of active choice required by NEM, while participation in the main form of EM (i.e. TV) is more passive, making it a more appealing option to depressed individuals. The relationship between NEM and depression will be explored in this analysis.

Anxiety disorders. Anxiety disorders and EM have also been examined in the literature. Several investigators have found a relationship between exposure to terrorist images and anxiety symptoms of Post-Traumatic Stress Disorder (PTSD). After the Oklahoma City bombing in 1995 and the September 11, 2001 attacks in New York City and Washington, DC several studies found associations between watching television images of the attacks and their aftermath and symptoms of PTSD. (Jennifer Ahern et al., 2002; J. Ahern, Galea, Resnick, & Vlahov, 2004; Pfefferbaum et al., 2003; Pfefferbaum et al., 2000). These symptoms were present despite participants living far from the actual attacks (Pfefferbaum, et al., 2003; Pfefferbaum, et al., 2000).

This body of literature on relationships between media use and mood points to a need for a more comprehensive examination of media use by youth with depression. These relationships will be explored in this analysis.

2.5 DEPRESSION IN YOUTH

MDD is a significant issue in childhood and adolescence. It is estimated that 14-25% of adolescents and 2-6% of children suffer from MDD (Angold & Costello, 1993; Kessler, Avenevoli, & Merikangas, 2001; Lewinsohn, Rohde, & Seeley, 1998). MDD is more common during adolescence than during childhood and both occurrences are referred to in the literature as early onset of the disorder. The prognosis for an early onset of depression can be an increased risk for the following; suicide (Brent et al., 1993), substance abuse (Weissman et al., 1999), suicidal ideation, smoking, binge eating and missing school (Glieb & Pine, 2002) and an increased risk for lifelong recurrence of depression (Lewinsohn, et al., 1998).

In addition, there is a developmental risk posed by depression for the child and adolescent. The creation and maintenance of friendships is an important component of development during childhood and adolescence (Erikson, 1968; Larson, et al., 1989; Larson & Richards, 1991; Steinberg & Morris, 2001). Symptoms associated with the onset of an episode of depression during this important period of development can alter the trajectory of the social development of the child. In addition, identity development is an important aspect of adolescence (Erikson, 1968; Steinberg & Morris, 2001). During this period youth are questioning their relationships with others both romantic and non-romantic, their existences in the world, and their futures. The negative thoughts and feelings that accompany an episode of

depression, such as hopelessness, thoughts of self-criticism, and physical changes can be particularly painful and damaging to the identity development of the adolescent. MDD is not only detrimental to the long term physical and psychological health of the individual but it also poses significant problems in functioning and health during an episode of depression. These problems manifest as diagnostic symptoms and clinically observed behaviors related to the disorder.

Diagnostic symptoms of MDD include feelings and behaviors such as excessive sadness or irritability, lack of enjoyment in activities that were once enjoyed, gaining or losing weight, poor sleep, feelings of helplessness and hopelessness, psychomotor agitation or retardation, and thoughts or actions related to suicide (American Psychiatric Association, 1994; Kaufman et al., 1997). In addition to these diagnostic symptoms, a decrease in both social interaction and interpersonal relationships are behaviors often exhibited by children and adolescents suffering from depression (Ferster, 1973; Forbes & Dahl, 2005; Klinger, 1975; R. W. Larson, et al., 1990).

It is these, non-diagnostic, but frequently clinically observed behaviors which are correlated with depression and which will be the focus of this report. These non-diagnostic behaviors provide the clinician with additional information concerning the course and development of MDD. Identifying additional observable behaviors, such as increased time alone with media, may give parents and practitioners more information for early detection and may perhaps be an observable behavior that contributes to early improvement or worsening of the disorder.

Additionally, clinicians have been looking for ways to improve treatment for depression for several decades (Brent et al., 1998; Kennard et al., 2009). Common therapies used in the

treatment of depression include Cognitive Behavior Therapy (CBT), Psychopharmacological treatments, and group therapies. These treatments are effective for 50% - 70% of those suffering from MDD (Birmaher et al., 2000; Brent et al., 1997; Wood, Harrington, & Moore, 1996). In a previous study by this author it was shown that magazine use was positively correlated with psychological health (Bertocci, et al., 2008). This finding suggests a possible protective quality to some media use behaviors. A further examination of media use behaviors in the current analysis, especially in conjunction with social context, will aid in a better understanding of these relationships.

2.6 CORRELATES WITH MAJOR DEPRESSION

While symptoms for depression have been identified and diagnostic rating scales validated many questions remain as to the cause, course, development, and outcomes of the disorder in individuals. Identifying and understanding the specific differences in thoughts, behaviors, neurologic structure and neurologic functioning associated with depression will aid in a better understanding of this disorder.

Psychosocial theory and neuroscience studies have identified cognitive and behavioral correlates of depression. Because experimental studies that show causation are not possible with disorders such as depression, outcomes from the current literature identify correlations with the disorder. Correlations include behaviors and neurological differences that often accompany an episode of depression. Assumptions about underlying causal relationships are examined in the review to follow.

Depressed individuals tend not to enjoy activities and they often do not participate in pleasurable activities (Forbes & Dahl, 2005; Forbes, Williamson, Ryan, & Dahl, 2004; Joiner, Lewinsohn, & Seeley, 2002; Rottenberg, Kasch, Gross, & Gotlib, 2002; Silk, Steinberg, & Sheffield Morris, 2003). These correlates are related to symptomology of depression and theories of depression focus on these behaviors as either the cause or the result of the depressive episode (Allen & Badcock, 2003; Beck, 1987; Joiner, et al., 2002; Lewinsohn, 1974; Nesse, 2000; Oatley & Bolton, 1985; Price, Soman, & Gardener, 1997).

In addition, neurological differences have shown significance between depressed and non-depressed individuals; showing differences in the functioning of the brains of depressed individuals from the brains of individuals who have never been depressed (Forbes et al., 2009; Henriques & Davidson, 2000; Siegle, et al., 2002; Siegle, et al., 2007). It is believed that the amygdala is the part of the brain responsible for emotional responses while the dorsolateral prefrontal cortex (DLPFC) has executive functioning of emotional responses (Siegle, et al., 2007). In a study of 58 adults (18-55 years), amygdala activity in response to negative words has been shown to be significantly increased and longer lasting for depressed individuals (Siegle, et al., 2007). This same study showed that the DLPFC activity was decreased in the depressed group. These findings suggest that depressed individuals have an abnormally elevated and sustained response to negative stimuli; they think about the negative stimuli more and for a longer time than the non-depressed participants do. In addition, in a study of 33 adults, a decreased response to reward was detected in the prefrontal cortex for the depressed participants. This is the area of the brain that is believed to be associated with complex social behaviors such as friendships (Henriques & Davidson, 2000). Forbes speculates that this malfunction in reward

processing is more characteristic of early depressive episodes (Forbes, 2009) and would therefore have a greater relationship with early onset of the disorder. In an fMRI study of 43 children and adolescents depressed participants showed differing effects in the caudate, striatum, dorsolateral prefrontal cortex, and medial prefrontal cortex in response to reward (Forbes, et al., 2009). These findings suggest that depressed individuals have an abnormal response to rewarding and positive stimuli. Several reports also suggest that low positive affect is more characteristic of depression than high negative affect (Forbes & Dahl, 2005; Forbes, et al., 2004; Joiner, et al., 2002; Joiner & Lonigan, 2000; Siegle, et al., 2002). Contrary to popular belief it appears that depressed people do not experience being very sad (high negative affect) but instead they experience being less happy or joyful (low positive affect). This is an important distinction because it suggests, along with the decreased response to reward and increased and sustained activity in response to negative stimuli, that depressed individuals have difficulty experiencing positive events as a catalyst for high positive affect. It has been hypothesized that those suffering from MDD fail to successfully interact with and respond to positive and neutral stimuli, especially social stimuli (Allen & Badcock, 2003; Steger & Kashdan, 2009). In addition, it has been shown that depressed individuals respond to amusing stimuli significantly less positively than non-depressed individuals do (Rottenberg, et al., 2002). In social context one might see the depressed individual failing to enjoy and respond accordingly to a joke or movie or a “fun” social interaction.

It is speculated in the literature that this failure to respond appropriately to pleasant stimuli may play a role in an avoidance of interactions with positive stimuli including social stimuli (Allen & Badcock, 2003; Pietromonaco & Rook, 1987). Why would an inappropriate

response lead to avoidance of social interactions? One potential outcome of a failure to respond to amusing stimuli in the context of social interaction and interpersonal relationships is a negative response from peers and comrades. Given that close friendships, peer affiliation, and romantic relationships are among the most cherished goals of adolescence, these are ones that generate strong positive affect; affect that is difficult for depressed individuals to exhibit and experience. Therefore, these social goals are at particularly high risk for suffering from neglect by depressed youth due to the social risk that they engender. When considering these negative and detrimental implications of a failure to react positively to social interaction and interpersonal relationships one can easily imagine that depressed individuals may seek out situations that do not require a positive response, and avoid those situations that are associated with a positive response. Perhaps this gravitation toward situations that are not socially demanding is an attempt at self-preservation.

This idea is not a new one. It has been suggested in the literature and current neuroimaging and psychosocial data lend support to this *social risk hypothesis* (Allen & Badcock, 2003; Davey, Yücel, & Allen, 2008; Dunn, 2009; Forbes, et al., 2004; Klinger, 1975; Nesse, 2000). This hypothesis presents an evolutionary response to social rejection positing that when an individual is at risk for social rejection from the larger group, he/she protects him/herself by limiting social risk and instead exhibiting a lack of desire to participate in social interactions and interpersonal relationships (Allen & Badcock, 2003; Davey, et al., 2008). The *social risk hypothesis* suggests that the failure by children and adolescents with MDD to react positively to social interaction and interpersonal relationships is associated with a desire to be involved in low risk situations that do not require a positive response and do not require

interaction with others. Indeed, it has been shown that depressed children and adolescents have significantly less social interaction than do non-depressed ones (R. W. Larson, et al., 1990).

When done in an asocial context media may be a low risk activity that does not require a positive response, for the depressed, socially withdrawn individual. This limiting of social risk also has important implications for social development during childhood and identity development during adolescence. If a child or adolescent who is depressed is not participating in the appropriate social activities for his/her developmental period because he/she is in self-preservation mode he/she may not have the experiences and resources needed to successfully develop an identity, friendships, and romantic relationships vital to these developmental periods. Media may be a socially acceptable activity for depressed youth with little social risk but with potentially substantial developmental risk involved.

The current analysis examines the social interaction with peers of children and adolescence with and without depression. These social interactions can be both physical and on-line and avoidance of social activity manifests itself in the use of media without a social component, that is, alone. This characterization does not negate the possibility of media used for social outcomes, only that this depressed subset of the population successfully use media as a socially acceptable behavior for passing time for non-social activities.

2.7 SOCIAL RISK HYPOTHESIS OF DEPRESSION

Major Depression has been examined from many theoretical backgrounds including, but not limited to, evolutionary, cognitive, and social cognitive perspectives. Each of these approaches provided us with ways of thinking about aspects of depression. The *social risk hypothesis* was

an evolutionary perspective that incorporates both psychosocial and neurobiological responses to depression. This theory examined specific behavioral and neurological outcomes of a depressive episode, particularly social isolation (Allen & Badcock, 2003). Allen and Badcock suggested that those suffering from depression have difficulty responding appropriately to social stimuli due to neurological changes in the brain. According to this theory, the depressed person self isolates in order to protect him/herself from being rejected by the group. It is this *social risk hypothesis* and the neurological differences correlated with depression that support these research hypotheses. These observable differences in the daily behaviors of children and adolescents, with and without MDD, can be used to broaden the understanding of this complex and pervasive disorder.

2.8 ON THE USE OF ECOLOGICALLY VALID MOMENTARY ASSESSMENT (EMA)

EMA is a valuable method of data collection because it eliminates the bias and degradation of memory associated with recall (R. W. Larson, et al., 1990). It has been shown to be effective with a variety of populations including children and adolescents with and without mood disorders (Axelson et al., 2003; R. W. Larson, et al., 1990; Silk, Steinberg, & Morris, 2003; Weinstein & Mermelstein, 2007), children and adolescents with problem eating (Rofey et al., 2009), and in studies examining physical activity in children (Dunton, Whalen, Jamner, & Floro, 2007). In addition it has been demonstrated to be effective in eliciting a variety of responses from participants including subjective states, such as mood (Axelson, et al., 2003; R. W. Larson, et al., 1990; Silk, Steinberg, & Morris, 2003), activity and behaviors (Axelson, et al., 2003; Silk, Steinberg, & Morris, 2003), and social context (Dunton, et al., 2007).

2.9 PROPOSED WORK

The literature on media use is varied and touches on the relationships between media use and a broad range of behavioral, psychological, and health related issues. In addition, a recent report by Olson (2010) presented a description of the motivations reported by youth for their media uses. However, a direct and detailed look at the circumstances surrounding the choices youth make in real time and how these choices differ by mental health status had not been examined. Additionally, an exploration of both EM and NEM in the same group of young people in real time has not been done. Moreover, the shortage of data on media use and depression, a relatively common and impairing disorder in children and adolescents, points to the importance of examining both EM and NEM use in such youth.

Through the use of Ecologically Valid Momentary Assessment (EMA) (Csikszentmihalyi & Larson, 1987; Larson, 1989; Larson & Csikszentmihalyi, 1983; Larson, et al., 1989; R. W. Larson, et al., 1990) the use of media by children and adolescents is examined, especially how the use of media in social context differs between these diagnostic groups. A group of participants with Major Depressive Disorder (MDD) and a similar Control group are compared looking at overall use of both EM and NEM and at the social circumstances surrounding the choices youth make in their use of media. In addition, changes in overall use and changes in the social circumstances of media use that occur in the MDD group after treatment and recovery from depression is explored.

3.0 METHOD OF STUDY

3.1 DESIGN

This study is repeated measures, short-term and longitudinal, with a comparison group design. Utilized in this study is Ecologically Valid Momentary Assessment, an experience sampling method developed by Larson (Larson & Csikszentmihalyi, 1983). The purpose of this investigation was to examine and compare the use of multiple types of media and the peer related social conditions surrounding these uses in a sample of children studied during an episode of depression and during treatment for MDD. The sample was compared with a group of children without psychopathology. Two modes of media were considered, EM comprised of television, radio, video game and computer use, and NEM comprised of book, newspaper and magazine use. The analysis was in terms of proportion of the time used overall, alone, and in social context. See Appendix A. Statistical post treatment comparisons were also completed in order to test for any change in media use after recovery from a depressive episode.

3.2 METHODS

3.2.1 Introduction

The purpose of this investigation of media use in children and adolescents is twofold, (a) to assess media use and social interaction in children and adolescents, with and without depression and (b) to observe change in social interaction during media use in children with depression after treatment and recovery for depression.

3.2.2 Participants

The data used in this study were part of a larger project affiliated with the Child and Adolescent Depression and Anxiety Study at the Western Psychiatric Institute and Clinic in Pittsburgh, PA, Neal Ryan, MD and Ron Dahl, MD co-principal investigators. The study was funded by the National Institute of Mental Health (NIMH). Participants were recruited by the University Center for Social Urban Research (UCSUR) and by radio and newspaper advertisements run in the surrounding areas. Most of the participants are white (88%), 7.4% are black, 2.8% biracial, .9% Hispanic, and .9% Indian. The sample consisted of 68 female and 40 male participants. See Table 1 for complete analysis of demographic variables.

The physical development of the participants was determined by physical exam and categorizing Tanner stages of pubertal development (Tanner, 1962). Stages ranged from 1 to 5 on two measures of physical development breast/gonad (BG) and pubic hair growth (PH). Scores were collapsed with a 1 or 2 rating indicating prepubertal development and greater than 2 rating as pubescence.

Socioeconomic status (SES) was determined using the Four Factor Index of Social Status (Hollingshead, 1975). The Hollingshead is a scaled score with a range of 8-60.

Participants' mental health status was diagnosed using the *Schedule for Affective Disorders and Schizophrenia – Present and Lifetime version (K-SADS-PL)* (Kaufman, et al., 1997). Of the initial pool of 163 participants, 13 of the participants were diagnosed with MDD, 34 had co-morbid MDD and anxiety disorders, 60 participants had other disorders (e.g., bipolar or anxiety disorder) and 61 participants had no current or past mood or affective disorders. The 60 participants with alternative diagnoses were excluded from the analysis leaving 108

participants 47 MDD and 61 non depressed Controls for this investigation.

3.2.3 Hypotheses

Hypothesis 1: Prior to treatment children and adolescents with MDD (a) will use more EM, (b) will use these media more in a solitary context, and (c) will spend a smaller portion of their media use time with peers than will the Control group. See Appendix C.

Hypothesis 2: Prior to treatment, children and adolescents with MDD (a) will use less non- EM, (b) will use these media more in a solitary context, and (c) spend a smaller portion of their media use time with peers than will the Control group.

Hypothesis 3: Post treatment, the recovered subgroup of the MDD group and the Control group will be similar in EM use, NEM use, and the social context of media use. In addition, the level of depression after treatment will predict change in media use and social context of media use within the entire MDD group.

Table 1: Demographic Characteristics of the Sample

	MDD n=47	Control n=61	test	Statistic
Pubertal development			$\chi^2=0.781$	ns
Pre/Early	17	28		
Mid/Late	26	32		
Age (years)	12.83 (2.79)	12.61 (2.64)	$t_{(103)}=-0.674$	ns
Race (n=108)			$\chi^2=10.16$	p <.001
White	36	59		
Non white	11	2		
Sex (n=108)			$\chi^2= 0.057$	ns
F	29	39		
M	18	22		
SES	35.85 (11.15)	44.73 (11.86)	$t_{(99)}= 3.84$	p<.01

Note: SES = Hollingshead score range 9-61

3.2.4 Measures

EMA calls. On each call, participants answered questions in six domains: (a) location/activity at the moment of call; (b) media use and its perceived emotional quality; (c) social context (presence and identity of other people); (d) mood; (e) anticipated future events and (f) significant events during past 24 hours. Not all items were asked on each call to minimize the interruption to the participant's life.

Participants were asked at every call to identify any media they were using; media in this study consisted of television, music, Internet, videogames, newspaper, books, or magazines. Social networking sites were not mainstream in the popular culture during the time when these data were collected; therefore, this type of social interaction is not included in this analysis. Participants, however, did indicate if they were text messaging versus surfing the Internet. Since text messaging is akin to using the telephone, as opposed to ingesting media, text messaging was not included as a form of media use.

If participants were using media, they additionally rated its affective attributes (e.g. how happy, sad, violent, sexy, scary, boring, and fun the media are on a scale of 1, *very slightly or not at all*, to 5, *extremely*). If participants were using more than one medium, they were asked about the medium that was most important to them at that time.

In addition participants were asked about social context. This social context could be face-to-face interaction or on-line interaction. Participants were asked on each call "*Who were you interacting with before the phone rang?*" These data were then coded as parents, siblings, friends, non-relative adult, or grandparents. Coding allowed for up to 4 companions.

These media use data and social context data were aggregated into new variables

indicating the proportion of time spent using either electronic or NEM (electronic: television, radio, computer, videogame or non-electronic: books, magazine, and newspaper) overall, alone, or with peers during each weekend of the study. These calculated proportions were used in the analysis. It is our contention that media use with a sibling is consistent with a friend, so these two categories of people were combined as peer. Other companion groups such as parents and other adult relatives were not considered to be the same social interactions and were not included. In addition, other variables that were not relevant to the current study (mood, future events, pleasant events, etc.) were not included in the analyses.

Data were collected for five weekends, every two weeks, over the course of eight weeks (Baseline, week 1, week 3, week 5 and week 7). See Appendix A. Baseline and week 7 data were used for analysis.

Depressive Symptoms. Depressive symptoms were assessed using two forms, the Clinical Global Impressions Scale (CGI) and the Mood and Feelings Questionnaire (MFQ), with different reporters, to lessen single source error.

CGI. The Clinical Global Impressions Scale (CGI) is a clinician-rated Severity (CGI-S; all 5 time points) and Improvement (CGI-I; last 4 time points) scale used widely in treatment of depression in youth (Guy, 1976). The CGI-S is a single-item 7-point scale, with lower scores reflecting less severity. CGI-I is a single item 8-point scale of improvement of depressive symptoms, with lower scores reflecting greater improvement. The CGI scales have been used in large and rigorous randomized controlled trials of psychosocial and pharmacologic treatments for adolescent depression e.g., (March, Entusah, Rynn, Albano, & Tourian, 2004; Rohde et al., 2008). Clinicians administering the CGI-S and CGI-I compared and discussed their ratings

during training, but formal reliability was not computed for ratings. For this analysis, post treatment recovery was defined using a combination of CGI improvement scores and CGI severity scores reported by the therapist. A CGI-improvement score of 1 (very much improved since initiation of treatment), 2 (much improved since initiation of treatment) or 3 (minimally improved since initiation of treatment) in conjunction with a CGI severity score of 1 (normal, not at all ill) or 2 (borderline mentally ill) for each participant on the final week of the EMA data was considered to be recovered for this analysis. Preliminary analysis indicates that 15 of the 47 MDD participants recovered to the previously described levels and can be considered to be clinically improved.

MFQ. Adolescents completed the Mood and Feelings Questionnaire (MFQ) (Angold, Erkanli, Silberg, Eaves, & Costello, 2002), a psychometrically sound self-report and parent-report measure of depressive symptoms that has been used widely in research on adolescent depression. The total self-report score was included in analyses.

3.2.5 Diagnostic measures

K-SADS-PL. Diagnoses were determined through administration of the K-SADS-PL (Kaufman, et al., 1997). Each participant and a parent (or guardian) were interviewed separately by a bachelor's-level research specialist trained according to local diagnostic reliability standards. Reliability for depressive and anxiety diagnoses was greater than 90% and was maintained through monthly, department-wide diagnostic reviews. A child psychiatrist provided best estimate diagnoses. All participants were in a current episode of MDD.

3.2.6 Procedures

Participants were given a modified, answer only, cellular telephone. In their regular home and social environments participants received telephone calls from a trained research associate 12 times over the course of 4 days (Friday through Monday). The weekend was chosen because it is the time when adolescents have the greatest amount of free time and Control over their activities and companions. See breakdown of call times and days in Table 2. In order to not interfere with school time, calls on Fridays and Mondays were limited to after school hours (4 p.m. and 10 p.m.). On Saturdays and Sundays participants received 4 calls between 11 a.m. and 10 p.m. The study allowed for participants to have special “blackout times” during which they did not receive phone calls. Allowable blackout times were for events such as participation in academic or sporting events that prohibited cell phone use. Participants were also given leeway if they were busy at the moment the phone was ringing. Participants who did not initially answer their phone received a second call approximately 10 minutes later. Participants earned a bonus each weekend for completing all 12 calls; those who completed all 60 calls over the course of the study earned \$250. If they missed calls the bonus was lessened by predetermined, set increments. The equipment was dropped off at each participant’s home on Thursday and picked up the following Tuesday.

3.2.7 Missing data

Data analysis indicated a missing data rate of 12.9%. Distribution of missing data was positively skewed with a median of 6.0 and a range of 0-52. The groups were not different in the rate of missing data ($t_{(106)} = -1.66$ *ns*).

The hypothesis testing for this analysis will use the proportion of the completed calls made over the weekend when media was used. Therefore, missing data will not be a statistical issue.

3.2.8 Treatment

Treatment for the MDD group began at week 1 and lasted for 8 weeks. Treatment options for the depressed sample were (a) antidepressant medication (b) Cognitive Behavior Therapy (CBT) or (c) a combination of medication and CBT. The parent of the depressed child made the decision as to which treatment option the child would use. Twelve of the participants chose the medication only option. Choice of treatment was not related to pubertal development, gender, race, SES, symptom level (all F s ≤ 1.5 , all X^2 s ≤ 2.3 , p s $> .30$). Treatment was provided by 6 therapists. CBT was provided through the Services for Teens at Risk (STAR) Clinic at Western Psychiatric Institute and Clinic, and it was tailored to each participant and guided by techniques developed by Brent and colleagues (Brent, et al., 1997). CBT was provided by trained PhD psychologists and masters-level social workers or nurses. Pharmacotherapy was provided by child psychiatrists assisted by psychiatric research nurses.

Table 2: EMA Call Schedule

Call Day	Call Time				Total
	11:00-1:00	1:00-4:00	4:00-7:00	7:00-10:00	
Friday			X	X	2
Saturday	X	X	X	X	4
Sunday	X	X	X	X	4
Monday			X	X	2
Total	2	2	4	4	12

For pharmacotherapy, participants were scheduled to have face-to-face, weekly meetings with the treating psychiatrist and a psychiatric research nurse for the first month of the study. During appointments, psychiatrists observed clinical worsening or improvement and possible side effects. On the first, third, fifth and seventh weeks of treatment, meetings lasted approximately 15 minutes. On the second, fourth, sixth, and eighth weeks of treatment, participants had a 60-min appointment that also included standard self-reports and clinician rating scales. Medications used in pharmacotherapy were citalopram or fluoxetine. Starting doses were the smallest that were likely to be tolerated by all participants and would be considered the minimum therapeutic dose. If participants did not show significant clinical improvement after 2 weeks and were tolerating the age-corresponding dose, the dose was then increased to what is likely to be therapeutic for the majority of participants. After 4 weeks, if the participant was not responding to this dose, the treating psychiatrist increased the dose as

tolerated. In addition, if a participant had an initial brief, but non-sustained response to fluoxetine (e.g., was much improved at week 2 but regressed back to baseline on subsequent visits), then the psychiatrist increased the fluoxetine dose as tolerated. The dose of medication could be reduced at any time for side effects at the discretion of the treating psychiatrist.

3.3 DATA ANALYTIC PLAN

3.3.1 Data Coding

Dichotomous qualitative demographic data (sex, pubertal development, and race) were coded as quantitative data and analyzed using chi square tests. Quantitative demographic data (age and SES) were analyzed using independent sample t-tests.

Media use data were coded into categories using proportions of the total calls made each weekend (12) as the dependent variables for each analysis. The categories of media use include (a) EM use overall, (b) EM use alone, (c) EM use with peers, (d) NEM use overall, (e) NEM use alone, and (f) NEM use with peers. See Appendix A for breakdown of categories.

3.3.2 Demographic Testing

The MDD and comparison groups differed on race and SES. The MDD group has a higher proportion of nonwhite participants and a lower SES than the Control group. See Table 1. Demographic differences were tested for significance with the dependent variables. Analysis showed that Race was significantly correlated with one of the dependent variables. However, since the correlation was $< .20$ it is statistically unimportant to the analysis.

SES was correlated with five of the dependent variables. SES is a continuous variable and was used as a covariate in all analyses. See Table 3.

3.3.3 Assumption Testing

Both ANOVA and Regression analysis have data assumptions related to the validity of the results. The testing of those assumptions, and the transformations used to address violations of those assumptions are discussed.

Normality. It is assumed for both ANCOVA and Regression Analysis that the residuals of the data are normally distributed around the mean. For baseline week data the proportion of overall EM use, EM use alone, EM use with a peer and NEM use overall were all normally distributed. The proportion of NEM use alone, and with peers were all positively skewed. For week 7 data the proportion of overall EM use, EM use alone, and EM use with a peer were normally distributed. The proportion of NEM use overall, NEM use alone, and NEM use with a peer were all positively skewed. In order to account for this non-normality the data were transformed using the arcsine function. Data analyses were completed using transformed data. Means and standard deviations were reported using non-transformed data.

Table 3: Correlation Testing of Significant Covariates

	Race (n=108)	SES (n=102)
EM use	$r = .185$	$r = -.386^{**}$
EM use alone	$r = .141$	$r = -.272^{**}$
EM use with peer	$r = .305^{**}$	$r = -.239^*$
NEM use	$r = -.184$	$r = .237^*$
NEM use alone	$r = -.136$	$r = .246^*$
NEM use with peer	$r = -.070$	$r = .026$

* $p \leq .05$ (2-tailed)

** $p \leq .01$ (2-tailed)

3.3.4 Hypothesis Testing

Hypothesis 1 posits that prior to treatment children and adolescents with MDD will use more EM and use these media more in a solitary context. Data for this hypothesis were analyzed using analysis of covariance (ANCOVA), comparing the proportion of calls that participants in the MDD and Control groups reported using EM and reported using EM alone and with a peer. See Appendix C.

Hypothesis 2 suggests that prior to treatment children and adolescents with MDD will use less non EM and use these media more in a solitary context. Data for this hypothesis were analyzed using ANCOVA comparing the proportion of calls that participants in the MDD and Control groups reported using non EM and reported using non EM alone and with a peer.

Hypothesis 3 proposes two ideas. First, that post treatment, the recovered subgroup of the MDD group and the Control will be similar in EM use, NEM use, and the social context of media use. Data for this hypothesis were analyzed using ANCOVA comparing the Control group and a recovered subgroup of the MDD group on the proportion of calls in week 7 that participants reported using EM, NEM and each type of media in solitary context, and each type of media in peer social context.

Second, this hypothesis suggests that the change in level of depression with treatment (operationalized by residualized depressive symptom score) will predict change in media use and change in social isolation of media use within the entire MDD group. There is evidence that MDD is a continuum, meaning that there is a range of symptoms that wax and wane during treatment to a point of recovery. A regression analysis was done to probe for this change in behavior for the depressed group after treatment. Using regression, the residual MFQ score

(baseline to the final week of the study) was used to predict the change in media use and the social context of media use.

4.0 RESULTS

4.1 HYPOTHESIS TESTING

4.1.1 Test of Hypothesis 1

Hypothesis 1: (a) Prior to treatment children and adolescents with MDD will use more EM, (b) use these media more in a solitary context, and (c) will spend a smaller portion of their media use time with peers than the Control group will.

Data from this study showed some support for hypothesis 1. The depressed participants used similar amounts of EM as did the Control group. Looking more closely at the social companionship of the two groups during EM use the data indicated that the depressed group spent significantly more time using EM in social isolation than did the Control group. However, there was no difference between the groups on EM use with a peer. See Table 4 for means, standard deviations (SDs), f and p values.

4.1.2 Test of Hypothesis 2

Hypothesis 2: (a) Prior to treatment, children and adolescents with MDD will use less non-EM, (b) use these media more in a solitary context, and (c) spend a smaller portion of their media use time with peers than the Control group will.

The data showed that hypothesis 2 was not supported. No statistical difference between the depressed and non-depressed groups in use of NEM overall, alone, or with a peer was found.

See Table 4 for means, SDs, f and p values.

Table 4: Means and SDs of Media Use: Week B

Media Use	MDD group (n=42)	Control group (n=60)	Statistic	p
EM use overall	0.55 (0.21)	0.41 (0.20)	$F_{(1,99)} = 3.52$	.064
EM use alone	0.25 (0.16)	0.14 (0.14)	$F_{(1,99)} = 7.48$	.007
EM use with peer	0.15 (0.11)	0.16 (0.12)	$F_{(1,99)} = 1.78$	.186
NEM use overall	0.01 (0.03)	0.03 (0.06)	$F_{(1,99)} = 1.08$	.302
NEM use alone	0.01 (0.02)	0.02 (0.04)	$F_{(1,99)} = 0.87$	.355
NEM use with peer	0.00 (0.00)	0.01 (0.03)	$F_{(1,99)} = 2.72$	.102

Note:

Untransformed mean and SDs reported.

Statistic computed using transformed data

Reported in proportion of 12 calls completed over the course of baseline

weekend

Covariate: SES

A large number of participants reported zero NEM use ($n = 84$). To further test these relationships, a chi square analysis of the counts of NEM use was calculated. See Table 5. During the baseline weekend, there was no significant difference between the Control group and the MDD group on NEM use in any social context. During week 7 significant differences were shown in the counts of NEM use overall and in an asocial context but not on use with a peer.

4.1.3 Test of Hypothesis 3

Hypothesis 3: (a) Post treatment, the recovered subgroup of the MDD group and the Control group will be similar in EM use, NEM use, and the social context of media use. (b) In addition, the level of depression after treatment will predict change in media use and social context of media use within the entire MDD group.

Hypothesis 3a was supported by the data on several elements. The data indicated that for EM use the MDD-Recovered subgroup of the depressed sample reported using EM to a similar degree as the Control group, both overall and with peers. However, the MDD-Recovered group continued to spend significantly more time using EM in social isolation.

NEM use was non-significant for across groups and contexts. See Table 6 for means, SD, f and p values. It is interesting to note that the MDD-Recovered group reported using zero NEM during the weekend. In order to examine the significance of a lack of NEM used by the MDD-Recovered group, a chi square analysis of the data was done. Results indicated that reports of the use of NEM differed for overall use. The frequency of NEM use alone and with a peer was not significant. See Table 7.

Table 5: Means and SDs of Media Use: Week 7

	MDD-Recovered group (n=13)	Control group (n=60)	Statistic	p
Media Use				
EM use overall	0.47 (0.26)	.40 (0.20)	$F_{(1,70)} = 1.04$	.311
EM use alone	0.25 (0.20)	.12 (0.15)	$F_{(1,70)} = 6.82$	.011
EM use with peer	0.13 (0.12)	.15 (0.15)	$F_{(1,70)} = 0.20$	.656
NEM use overall	0.00 (0.00)	.04 (0.07)	$F_{(1,70)} = 1.96$	.166
NEM use alone	0.00 (0.00)	.02 (0.06)	$F_{(1,70)} = 0.90$	.347
NEM use with peer	0.00 (0.00)	.01 (0.02)	$F_{(1,70)} = 0.45$	.506

Note:

Untransformed means and standard deviations reported.

Statistic computed using transformed data

Reported in proportion of 12 calls completed over the course of baseline weekend

Hypothesis 3b suggests that change in the level of depression (self-report of MFQ) over time will predict change in media use and change in social isolation of media use within the entire MDD group.

Hypothesis 3b was not supported by the data analysis. The data showed no significant predictive quality of the residualized change score for MFQ on change in media use from pre- to post-treatment for the depressed participants. MFQ is a self-report measure of depression. See Table 8.

Table 6: Frequency of Non-electronic media Use, by Group, with Chi Square

	MDD	Control	χ^2	p
NEM Use	(n=47)	(n=61)		
Week B				
Overall			2.586	.109
No	40	44		
Yes	7	17		
Alone			3.193	.075
No	44	50		
Yes	3	11		
With Peer			3.201	.075
No	47	57		
Yes	0	4		

Table 7: Frequency of Non-electronic media Use, by Group, with Chi Square

	MDD- Recovered (n=15)	MDD-Non- recovered (n=32)	Control (n=61)	χ^2	p
Week 7					
Overall				10.485	.005
No	15	30	44		
Yes	0	2	17		
Alone				5.136	.077
No	15	30	50		
Yes	0	2	11		
With Peer				3.201	.202
No	15	30	57		
Yes	0	0	4		

Table 8: Change in Media Use Post Treatment predicted by residualized MFQ score: MDD

Group Only

Change in Media Use	R²	β	t Statistic	F Statistic
Change in EM use overall	.01	.53	t ₍₃₃₎ = .24	F _(1,33) = .48
Change in EM use alone	.00	.02	t ₍₃₃₎ = .02	F _(1,33) = .00
Change in EM use with peers	.01	-.71	t ₍₃₃₎ = -.13	F _(1,33) = .38
Change in NEM use overall	.02	-3.70	t ₍₃₃₎ = -.25	F _(1,33) = .80
Change in NEM use alone	.01	2.42	t ₍₃₃₎ = .06	F _(1,33) = .20
Change in NEM use with peers	**	**	**	**

Note:

** No depressed participants reported using NEM with a peer during the final week of the study.

n = 47

4.2 SECONDARY ANALYSIS

4.2.1 Test of Secondary Analysis

Secondary analysis was performed in order to more closely examine the differences among the Control group, Depressed at baseline that did recover group (*MDD-Recovered*), and Depressed at baseline that did not recover group (*MDD-Non-recovered*).

Hypothesis 4:

At baseline week: Participants in the *MDD-Recovered* will be similar to the *MDD-Non-recovered*, and different from the Control group on their use of media and social context of media use.

At week 7: Participants in the *MDD-Recovered* will be similar to the Control group on their use of media and social context of media use by week 7. The *MDD-Non-recovered* will use more EM and more in social isolation than the other two groups at week 7.

Hypothesis 4 at baseline week was partially supported by the analysis. Results of secondary analysis for the Baseline week data indicated a significant difference among the three groups on EM use alone. The three groups were similar on EM use overall, EM use with a peer, and all NEM use and social context use. See Table 8 means, SD, *f* and *p* values.

Post hoc tests of EM use alone at baseline using the Bonferroni procedure show that the Control group reported significantly less EM use in social isolation than both the *MDD-Recovered* and the *MDD-Non-recovered* groups. In addition, the two MDD groups are not significantly different from each other.

All other media use and social context were not significantly different across groups.

Table 9: Means and SDs of Media Use for Three Groups: Week B

Media Use	MDD- Recovered (n=13)	MDD-Non- Recovered (n=26)	Control group (n=60)	Statistic	p
EM use overall	0.55 (0.21)	0.55 (0.21)	0.41 (0.20)	$F_{(2,95)} = 1.71$	.186
EM use alone	0.28 (0.18)	0.23 (0.15)	0.14 (0.14)	$F_{(2,95)} = 3.97$	.022
EM use with peer	0.15 (0.10)	0.14 (.12)	0.16 (0.12)	$F_{(2,95)} = 1.39$	.253
NEM use overall	0.02 (0.04)	0.01 (0.03)	0.03 (0.06)	$F_{(2,95)} = 0.37$	.695
NEM use alone	0.01 (0.03)	0.00 (0.02)	0.02 (0.04)	$F_{(2,95)} = 0.50$	.606
NEM use with peer	0.00 (0.00)	0.00 (0.00)	0.01 (0.03)	$F_{(2,95)} = 1.25$	.292

Note:

Untransformed mean and SDs reported.

Statistic computed using transformed data

Reported in proportion of 12 calls completed over the course of baseline weekend

Covariate: SES

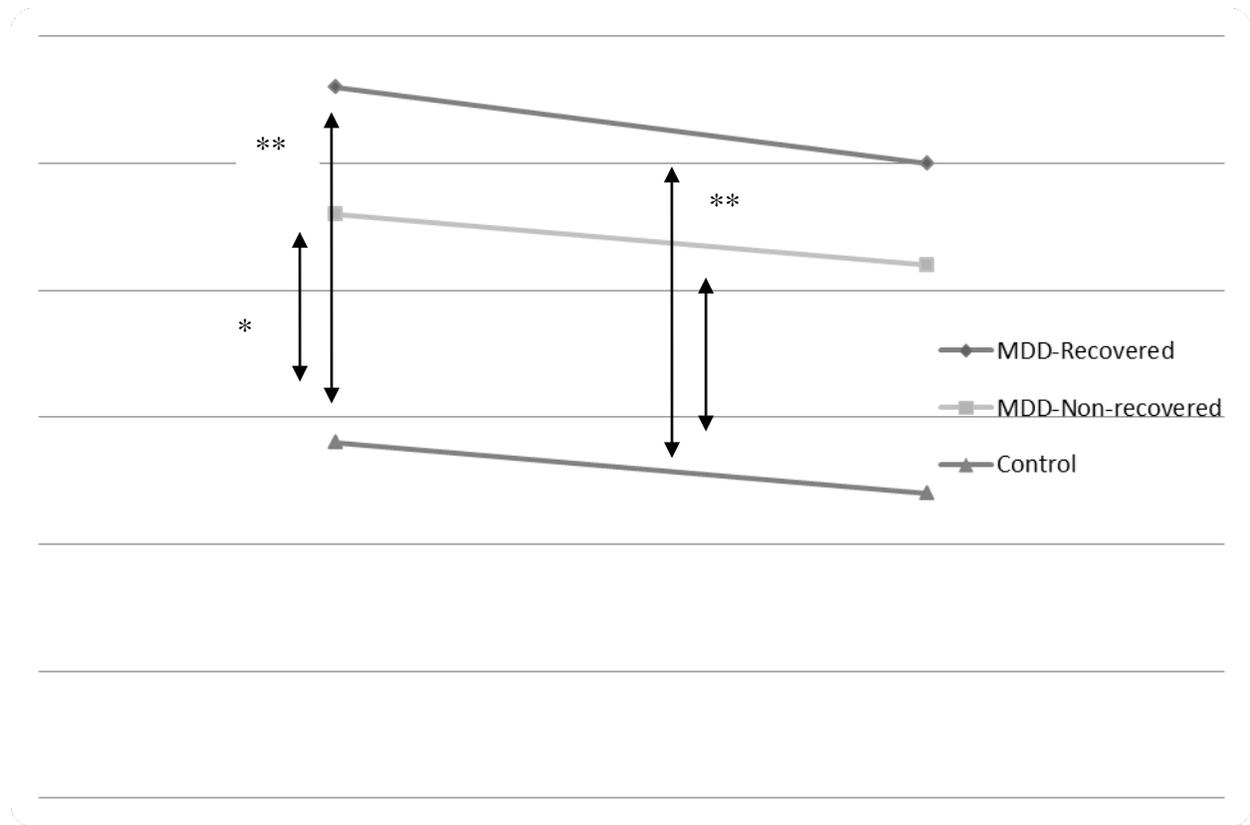
Looking more closely at the differences among the three groups during the final week of the study, it can be seen that the results contradicted hypothesis 4. See Table 9.

Post hoc analysis of these differences using the Bonferroni procedure showed that the

Control group reported significantly less EM use in social isolation than did the MDD-Recovered group. The Control group and the MDD-Non-recovered group reported similar amounts of time with EM in an asocial context. In addition, the MDD-Non-recovered group and the MDD-Recovered group were similar in their use of EM alone.

EM and NEM use in all other social contexts was not significant across groups.

Figure 1: Change in Electronic Use Alone from Week B to Week 7



Note:

* $p \leq .05$

** $p \leq .01$

Control n=6

MDD-Non-recovered n = 26

MDD-Recovered n=13

This finding raises further questions about the function of solitary media use by depressed youth. Do these solitary media experiences help or hinder eventual recovery? Perhaps asocial media use buffers the world for recovering depressed youth thereby providing the opportunity to process the day's social activities in order to reduce depressive symptoms as suggested by the *Social Risk Hypothesis*. This contention is supported by normative experience sampling data with 8th and 10th graders showing that hanging out/media use was associated with an improvement in negative mood despite social context (Weinstein & Mermelstein, 2007). Although high negative mood is not the key characteristic of a depressed person (Forbes & Dahl, 2005), there is a tendency for depressed people to experience and report high negative mood (American Psychiatric Association, 1994; Daniela Q. C. M Barge-Schaapveld, Nicolson, Berkhof, & deVries, 1999). Perhaps the MDD-Recovered participants continue to use EM in an asocial context as an opportunity to combat the symptomatic tendency toward high negative mood.

Another possibility is that asocial EM use is a trait for some depressed people. This data suggests that during the depressive episode the sufferers tend to avoid social interaction and activities and often pass the time with EM use. It is not clear however if this behavior is due to the state of being depressed or if it is a continuing trait of some people. In addition, humans are by nature habitual (Aarts, Verplanken, & van Knippenberg, 1998). Asocial EM use may be unrelated to relapse or recovery from depression, but instead merely be a pattern of behavior that developed through the depressive episode. In fact, experience sampling data show that, although time spent with passive leisure and social interactions does not increase for recovering depressed adults, improvement in negative affect during these activities is reported (Daniela Q. C. M.

Barge-Schaapveld, Nicolson, van der Hoop, & DeVries, 1995). Perhaps depressed people who are recovering are merely enjoying their habitual behaviors. Alternatively, the possibility that asocial media use has a more definitive relationship with relapse will be explored in the following section.

Data on participant improvement or relapse and continued experience sampling after the 7th week of the study is not available from this dataset. Therefore, continuing to follow MDD-Recovered individuals through their daily behaviors and social context will add to our understanding of the function of asocial behaviors in depressed youth. Barge-Schaapveld et al. (1995) report no change in active leisure or social interaction during recovery for adults but there was a decrease in passive leisure activities. This is consistent with the current findings with youth. However the specifics of media use and social isolation has not been examined in the literature and additional questions are resulting. It would be interesting to continue to follow the MDD-Recovered participants through recovery to explore if, how, and when the self-isolative behaviors recede. In addition, an understanding of which other behaviors are being forfeited to gain the increased social interaction seen by clinicians in the MDD-Recovered participants since it appears that they continue their socially isolative behaviors where EM use is concerned.

Perhaps asocial EM use is, as suggested by the *social risk hypothesis*, a valuable coping mechanism for depressed individuals and aids in eventual recovery. Perhaps the tendency to use EM in social isolation does not change during full remission from an episode for people who suffer from depression merely due to the habitual nature of human behavior (Aarts, et al., 1998). Alternatively, perhaps this habit is an important component of relapse and the patterns of use are different for recurrent versus single episode depression sufferers. In addition, perhaps solitary

media use is predictive of a person who may develop or have recurrent depression. The following section explores these more causal mechanisms associated with EM use.

4.2.2 Electronic Communication Media

Additional secondary analyses were done to consider the ways children and adolescents with and without depression used electronic communication such as text messaging, email, and IM in their everyday lives. Since communication is by nature a social activity and since these forms of communication are generally considered to be media use an analyses of the use of electronic communication under the same social conditions as the EM and NEM use (any, alone, and with peer) was performed.

During baseline week of the study no participants reported the use of electronic communication during the sampled time points. Week 7 data showed no significant difference among the groups (Control, MDD-Recovered, MDD-Non-recovered) in their use of electronic communication under any of the three conditions (any, alone, with peer). All $F_s \leq 0.76$, and all $p_s > .38$.

Table 10: Means and SD of Media Use for Three Groups: Week 7

	MDD - Recovered (n=13)	MDD-Non- recovered (n=26)	Control group (n=60)	Statistic	p
EM use overall	0.47 (0.26)	0.42 (0.22)	0.40 (0.20)	$F_{(2,95)} = 1.06$	.352
EM use alone	0.25 (0.20)	0.21 (0.22)	0.12 (0.15)	$F_{(2,95)} = 2.86$	.062
EM use with peer	0.13 (0.12)	0.09 (0.13)	0.15 (0.15)	$F_{(2,95)} = 1.95$	.147
NEM use overall	0.00 (0.00)	0.01 (0.02)	0.04 (0.07)	$F_{(2,95)} = 2.18$	.119
NEM use alone	0.00 (0.00)	0.01 (0.02)	0.02 (0.06)	$F_{(2,95)} = 0.85$	.432
NEM use with peer	0.00 (0.00)	0.00 (0.00)	0.01 (0.02)	$F_{(2,95)} = 0.71$	.493

Note:

Untransformed mean and SDs reported.

Statistic computed using transformed data

Reported in proportion of 12 calls completed over the course of baseline weekend

Covariate: SES

5.0 DISCUSSION

5.1 MEDIA SOCIAL ISOLATION AND DEPRESSION

This thesis fills a gap in the literature by looking at how depression is related to common behaviors of children and adolescents. Specifically examined is the use of electronic media (EM) and non-electronic media (NEM) in the everyday lives of youth and how these media uses are connected to social interaction. Recent reports indicate that youth use EM to cope with or control emotions such as boredom, anger and loneliness, to have fun and to a lesser degree to make friends (Olson, 2010). How normal development findings relate to youth with psychopathology is also a question that is partially addressed in this paper.

Clinical evaluations of children and adolescents suffering from depression often report behaviors that appear to limit the social interactions of the sufferers. In addition, research shows that depressed youth spend significantly less time with friends than do non-depressed youth (R. W. Larson, et al., 1990). Time is finite and if one chooses an activity, another activity must be forfeited (Robinson & Martin, 2010). If a person is choosing to spend time alone with media then he/she does not have that time for other activities, including social interaction. While these social limiting behaviors are not symptomatic of depression they are often noted by clinicians. A symptomatic relative of this behavior might be the withdrawal from involvement in activities that used to be enjoyed by the child or adolescent (American Psychiatric Association, 1994; Kaufman, et al., 1997).

When a person is depressed he/she often stops participating in sports, academics, and

creative clubs and the rejection of involvement in these activities serves to limit social interaction. Social interaction for depressed youth is limited by the noticeable symptomatic withdrawal from activities, like quitting the soccer team or chorus. In addition, social interaction may be surreptitiously limited through other common, everyday behaviors. This analysis looks at two broad categories of media use (electronic and non-electronic) and addresses the use of these media in terms of overall time spent, social context, and asocial context.

Why look at media use? The wide adoption of media, especially EM, by the popular culture as common and acceptable past-times, entertainment, and communication devices, as well as the nature of media as both a social tool and a socially isolating tool, makes it a good microcosm of the behaviors and social environments of children and adolescents. In addition, it has been shown that depressed participants use media more than non-depressed youth do (Carpentier, et al., 2008). However, neither the social circumstance in which youth with and without depression use media, nor the differences between EM and NEM use, has been examined. An inspection of these differences may help to illustrate mental health. In addition, examining the social context in which common behaviors such as media are used by children and adolescents, with and without major depression, in their regular home and social environments, is called for in order to better understand the course, development and recovery of depression in this early onset group.

Depressed people are often socially isolative; however, the mechanisms by which depression and social isolation are related remains unclear. Do depressed people avoid social interaction and seek out asocial activities, do people lack social interaction and become depressed, or is there some other relationship between them? While a definitive causal answer to

these questions is beyond the scope of this dissertation, the potential for these relationships and how data from this study support the relational assumptions is explored here.

5.2 DEPRESSION AS A CATALYST FOR SOCIAL ISOLATION

Data from this analysis provide some support for the *social risk hypothesis* of depression by demonstrating the tendency for currently depressed children and adolescents to use EM more frequently in socially isolating ways than non-depressed participants. The *social risk hypothesis* of depression suggests that people suffering from depression have cognitive difficulty in making socially acceptable responses to social cues and are therefore at high risk for social rejection (Allen & Badcock, 2003). Consequently, children and adolescents who are depressed may tend to avoid social situations that have potential to incur social rejection and are drawn to activities that do not require socially acceptable responses. The cognitive difficulty in responding to social cues is thought to be a catalyst for the socially isolative behaviors that function as self-preservation from social rejection for the depressed person (Allen & Badcock, 2003). Neuroimaging studies that show differential responses to reward in depressed and non-depressed groups support the contention of cognitive difficulty presented in the *social risk hypothesis* (Forbes, et al., 2009; Siegle, et al., 2007). Therefore, when alone with media the depressed person can be deficient in socially acceptable responses without actual social consequence. The television does not care if one laughs at the joke or smiles at seeing the attractive character. The computer does not stop playing with you if you do not feel excited after winning or disappointed after losing a game. The book does not think you are odd if you weep inexplicably. Perhaps solitary media use is a safe haven from social rejection for the depressed person. The dataset

examined in this thesis does not allow an examination of the temporal ordering of the depressive episode and the socially isolative behavior prior to the depressive episode due to the start of the study in episode. Therefore, in order to gain some insight into the mechanisms of social isolation a subgroup of the MDD participants who reached recovery status (MDD-Recovered) is examined.

The MDD-Recovered subgroup of depressed participants continue to report a similar amount of time using EM as did the Control group but despite recovery the MDD-Recovered continue to use EM in social isolation significantly more so than the Control group. In fact, post hoc analysis comparing the Control group with MDD-Recovered and MDD-Non-recovered, reveals that the tendency for depressed participants to use EM in social isolation did not change after recovery from depression. This finding is in agreement with the Barge-Schaapveld (1995) data which shows that reports of social interactions did not change with recovery from depression for adult participants. Indeed the MDD-Recovered subgroup in our sample used EM in social isolation to a similar degree as MDD-Non-recovered group. See Figure 1. This finding presents the question of the relationship between the continued use of EM in an asocial context during recovery from depression as either an aid or hindrance to recovery or as a trait behavior of youth.

5.3 ASOCIAL BEHAVIOR AS AN AID TO RECOVERY

The continued use of EM in an asocial context seen in the MDD-Recovered group may indicate a positive correlation between asocial behavior and recovery, supporting the *social risk hypothesis* of depression. Research shows in normative samples of children and adolescents improvement

in negative mood with relaxing (Larson & Richards, 1994; Weinstein & Mermelstein, 2007). In addition mood management data suggests that EM is used to maintain current positive mood and increase negative mood in both adult (Zillmann, 1988a, 1988b) and youth samples (Carpentier, et al., 2008). The continued use of EM in an asocial context may be relaxing for the recovered depressed youth providing him/her with time to recover from the social demands of the week.

5.4 ASOCIAL BEHAVIOR AS A HINDERANCE TO RECOVERY

An alternative explanation to the *social risk hypothesis* of depression is a more causal mechanism of social isolation. Both shyness and loneliness have been shown to have a positive relationship with depression (Gotlib & Hammen, 2002). In addition Joiner suggests that the core to loneliness is a lack of pleasurable engagement (Joiner, et al., 2002). Social isolation, the antithesis of pleasurable engagement, may serve to exacerbate and prolong feelings of loneliness that may lead to an episode of depression. Perhaps media use provides an opportunity for the person at risk for depression to appear to be active and involved, while actually being sedentary and socially isolative. While spending some time alone during adolescence is healthy and may contribute to identity development (Larson, 1990), additional evidence by Larson shows that spending large amounts of one's time alone is correlated with maladjustment. This opportunity provided by media may serve to mask socially isolative behaviors and feelings of sadness and rejection, thereby setting the stage for an episode of depression to develop and worsen through self-isolation and feelings of loneliness.

What does this possibility of a causal mechanism of social isolative behavior mean in

terms of recovery from depression? Since low positive affect is characteristic of depression (Forbes & Dahl, 2005) and an improvement in positive mood is seen when participating in numerous activities (Weinstein & Mermelstein, 2007), it may be important to offer and encourage participation in social activities for youth in recovery.

5.5 TRAIT BEHAVIOR OF ASOCIAL MEDIA USE

Despite the decrease in overall use of EM by the MDD-Recovered group, they continue to use EM in social isolation at a significantly higher level than the control group. See Figure 1. It is possible that asocial EM use has no causal or resulting relationship with depression but is instead a trait behavior of some individuals. Trait behaviors are those behaviors that continue despite changes in affective states. Barge-Schaapveld and colleagues presented data that pointed to people with history of depression being prone to asocial behavior (Daniela Q. C. M. Barge-Schaapveld, et al., 1995). Data from Barge-Schaapveld and colleagues also showed that adults recovering from depression reported no increase in social interaction or active leisure and a decrease in passive leisure. This is consistent with the findings from this analysis where depressed youth continue to use EM in an asocial context after recovery. In addition, recovering depressed adults reported increased enjoyment of passive leisure and asocial activities with recovery (Daniela Q. C. M. Barge-Schaapveld, et al., 1995). So, although the depressed adult participants continue their asocial behaviors their enjoyment of these behaviors increases. Perhaps this is true of youth recovering from depression as well. Perhaps youth prone to depression enjoy asocial behaviors and EM use is a convenient asocial activity. These findings present support for the *uses and gratifications theory* of media use. This theory proposes that

people choose and use media for reasons of their own. These data support the contention that currently depressed youth and in recovery from depression choose to use EM to fulfill their needs to be alone.

5.6 PROTECTIVE COMPONENT OF NEM USE?

According to our sample, regardless of mental health status, NEM is a less common choice among children and adolescents than EM. This is in line with the literature on reading that suggests that school aged children spend 10 minutes per day with written material (R. C. Anderson, et al., 1988; Hofferth & Sandberg, 2001). It is probably not surprising that children and adolescents choose to spend more time with EM than with NEM. However, the implications of these choices may be important. It is also important to recognize that the participants in this study reported very few uses of NEM relative to EM. Perhaps a larger sample or an increase in contact times each day would enable us to more clearly see potential relationships.

Chi square analysis showed the Control group reporting significantly more NEM use overall than both the MDD and the MDD-Recovered groups. This finding is consistent with contentions from Bertocci et al. (2008) reporting significantly more magazine use by non-depressed youth than by youth with MDD. This finding provides some support for the possibility that NEM such as books, magazines, and newspapers provide a protective relationship from depression. While the evidence does suggest an inverse relationship between NEM and depression, with less use of NEM by adolescents with depression, a causal attribution is premature.

It is interesting to note that the absolute counts of NEM use remained fairly constant for

the Control group over the course of the study. For the depressed group however there was a decrease from week B to week 7, although not significant, for all categories of NEM (i.e. overall use, alone and with peers). Again, these findings suggest a negative association between NEM use and depression that may become evident with a larger sample of participants or an increase in time points. What are the potential mechanisms for the differential seen in NEM use? Perhaps depressed youth do not use NEM to the extent that Controls do because the cognitive demands of reading are too challenging for the depressed youth. Watching television or listening to music requires less attention and concentration than does reading. Perhaps the differential seen in NEM use is a function of the depressed participants cognitive deficits and lack of concentration.

Another possibility is that the protective factor associated with NEM use is not found in its use alone, but rather in its use within a peer social context. The descriptive counts of NEM use with a peer, while not statistically significant, might provide preliminary evidence of this. Not a single depressed participant reports using NEM with a peer during any of the analyzed weeks of the study. See Table 4. This is in comparison to the stable reporting of NEM use by the Control group.

This differential in social context is interesting and perhaps is a function of the nature of choice of NEM and commitment to NEM. NEM, unlike EM, is a personal experience, and one's choice to read a book, magazine, or newspaper indicates a great deal about that person (i.e. his/her interests, affiliations, and wishes). Reading is often a commitment to the publication (one buys a book or makes a trip to a library; one orders a subscription to a magazine or newspaper). This is in contrast to the relative ease of turning on the television, radio, or computer. If one

reads a book or magazine about horses it is generally because one is interested in horses. Choice of reading material provides insight into a person. Being self-possessed enough to allow others to know one's interests may be too difficult for the depressed youth. Because social experiences and social development are an important part of childhood and adolescence perhaps the depressed youth feels too vulnerable to expose his/her interests, or feels that his/her interests would not be interesting to a peer. "Others will think that I am weird if they know that I have an interest in X. Therefore I cannot share my NEM choices with peers."

Alternatively, perhaps this discrepancy can be explained through symptoms of depression. The symptom of psychomotor agitation may make the experience being still and quiet challenging and perhaps not worth the effort, therefore when interacting with a peer the depressed youth prefers to be active.

While it is likely that NEM use with a peer is not sufficient to stave off depression, perhaps it is a useful component of mental health. Perhaps the use of NEM alone or with a peer demonstrates the ability of the youth to sit still and concentrate and the self-confidence needed to express interests and wishes to others. These are characteristics that are likely lacking in depressed youth. These possible explanations are possible, but further study is required to confirm or deny their merit.

5.7 ELECTRONIC COMMUNICATION

The lack of use of electronic communications such as email, texting, and IMing in this sample was likely due to the era when the data were collected. Texting had not yet become popular in the mainstream culture during the time these data were collected 2002 to 2008. While IMing and

email were common among adults it appears that the children and adolescents in this sample were not avid users.

5.8 LIMITATIONS

While these data provide a window into the lives of depressed and non-depressed children and adolescents, the outcomes do not point to any definitive causal mechanisms for the use of media by these youth. Whether children and adolescents with and without pathology use these media as coping mechanisms, entertainment, symptom enhancers, as habit, or for some other purpose is unknown. In addition, because the design is correlational, whether asocial EM use somehow contributes to the development or persistence of depression, or if it is a function of the depression is unknown.

Sibling relationships are another limitation of the study, inserting a degree of nesting error into the analysis. It should be noted, however, that previous and comprehensive analysis of this potential problem has been shown to be insignificant to the outcomes (Forbes, 2010).

Another potential limitation is the use of a repeated measures design, which may influence participant responses on subsequent calls, thereby biasing the data. By week seven of the study participants had answered the questions multiple times, perhaps resulting in respondents who were suffering from fatigue and boredom.

In addition, some MDD participants had comorbid anxiety disorders, but the sample was not large enough to separately compare those with and without anxiety disorders on media use. Future studies should have MDD and anxiety groups without comorbidity and/or deliberately

have a comorbid MDD/anxiety group.

Lastly, the effects of treatment type could not be compared because there were too few participants in each treatment group, and because the groups were not randomly assigned. Future studies could address this issue by limiting participants to those not receiving pharmacologic treatment.

5.9 CONCLUSIONS

The social demands of childhood and adolescence are especially challenging for depressed youth who have a tendency to withdraw from social interaction. Children and adolescents must behave appropriately in school, eat lunch and ride the school bus with classmates, and respond to teachers, parents, and siblings, all of which require a level of social interaction. In addition, childhood and adolescence is a prime time of life for creating and maintaining social ties. How socially isolating behaviors manifest in the daily lives of youth with depression gives us a better understanding of the development and course of depression and perhaps insights into treatment of the disorder.

Results of this thesis show that there is a positive relationship between EM use in an asocial context and depression and that this relationship continues after recovery from depression. In addition, there is a negative relationship between NEM use and depression. The findings from this analysis point to the need for further exploration into the mechanisms of these relationships.

Future research in this area should examine the temporal relationship between social isolation and depression, with attention to the various forms of EM and NEM. In addition a

more timely exploration is needed of the relationships between mental health and electronic communication and networking devices that have gained popularity in the youth culture, such as email, texting, social networking sites, and IMing. These devices are a different form of media from the traditional mass media that is unidirectional and available to virtually everyone. These electronic communication devices are personal and interactive. How these bidirectional types of communication are related to mental health is another interesting opportunity for future study. It is also of concern whether these online communications provide the same level of social support and experience as face-to-face communications do. Work with telephone and email suggests that email communication is insufficient for maintaining a close relationship without also hearing the voice of your friend or loved one (Cummings, Butler, & Kraut, 2002; Cummings, Kraut, & Kiesler, 2001). In addition, increases in Internet use showed decreases in family communication and increases in feelings of depression and anxiety (Kraut et al., 1998). The similarities between email and other forms of online communication such as texting, IMing, and social networking sites suggest a similar result. In addition, it has been found that a host of negative feelings and physiological changes accompany online communication especially when responses are not received immediately (Bayer, 2010; Lin & Peper, 2009). A better understanding of the social contexts of the everyday use of media will aid in our understanding of the cause and course of depression.

APPENDIX A. VARIABLES CREATED FOR DATA ANALYTIC PLAN

Proportion of 12 calls: Range 0-1	Baseline week	electronic	Overall use
			Use alone
			Use with peers
		Non-electronic	Overall use
			Use alone
			Use with peers
	Week 7	Electronic	Overall use
			Use alone
			Use with peers
		Non- electronic	Overall use
			Use alone
			Use with peers
	Residual change score Week 7- Baseline	Electronic	Overall use
			Use alone
			Use with peers
Non-electronic		Overall use	
		Use alone	
		Use with peers	

APPENDIX B. DATA COLLECTION SCHEDULE

	Diagnosis	Baseline week	Week 1		Week 3		Week 5		Week 7	
MDD	KSADS CGI MFQ Tanner staging	EMA Calls	Treatment CGI MFQ	EMA Calls	Treatment CGI MFQ	EMA Calls	Treatment CGI MFQ	EMA Calls	Treatment CGI MFQ	EMA Calls
Non depressed	KSADS CGI MFQ Tanner staging	EMA Calls	EMA Calls		EMA Calls		EMA Calls		EMA Calls	

APPENDIX C. BREAKDOWN OF DATA ANALYTIC PLAN

			Hypothesis	Method
IV	Depression group	Control	1a, 1b, 1c, 2a, 2b, 2c, 3a	ANCOVA
		MDD	1a, 1b, 1c, 2a, 2b, 2c	ANCOVA
			3b	Regression
		MDD-Recovered	3a	ANCOVA
DV	Media Type	Electronic	1a, 1b, 1c	ANCOVA
		Non-electronic	2a, 2b, 2c, 3a	ANCOVA
	Residual Change in Media use	Electronic	3a	ANCOVA
			3b	Regression
		Non-electronic	3a	ANCOVA
			3b	Regression
	Social Context	Alone	1b, 2b, 3a	ANCOVA
			3b	Regression
		Peer	1c, 2c, 3a	ANCOVA
			3b	Regression
		Any	1a, 2a, 3a	ANCOVA

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