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## Sexting and Mental Health: A School-based Longitudinal Study Among Youth in Texas

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# Sexting and Mental Health: A School-based Longitudinal Study Among Youth in Texas

## **Authors**

Pooja Chaudhary, Melissa Peskin, Jeff R. Temple, Robert C. Addy, Elizabeth Baumler, and Ross Shegog

## INTRODUCTION

“Sexting” is relatively a common occurrence, in part, due to increased accessibility and use of smart phones among U.S. youth. National news events suggest that sexting could have significant emotional consequences leading to anxiety, depression and even suicide.<sup>1-4</sup> For example, 13-year old Hope Witsell, sexted her topless picture to a boy that she liked and after the image was circulated to other students, she was bullied at school, and subsequently committed suicide.<sup>1</sup> This anecdote (and others), however, are not adequate to infer the impact of sexting on youth and society. School administrators, parents, and policy makers often face unique challenges in their attempts to design targeted interventions in the absence of proper recognition of these issues.<sup>3</sup> The current study, therefore, attempts to examine the empirical relationship between sexting and the mental health of youth, and to propose recommendations for interventions.

### ***Sexting Defined***

“Sexting” may not be the exact or preferred term used by youth,<sup>5,6</sup> but this term has been used and widely accepted by mass media, legislators and researchers.<sup>7</sup> Sexting was first defined publicly in 2005, as a consensual practice of sending nude pictures between mobile phones.<sup>8,9</sup> In 2009, sexting was considered as one of the finalists for “word of the year” for the New Oxford American Dictionary,<sup>9,10</sup> indicating its permanency in day-to-day English linguistic. Increased search engine queries of the term sexting in recent years serves as additional evidence of its popularity.<sup>11</sup>

Because sexting has varied definitions, there are implications for how the problem is viewed by researchers and practitioners. Sexting is an interplay of the words “sex” and “texting”.<sup>12,13</sup> Some studies restrict their definition to text messages *without* images,<sup>14</sup> whereas some focus on self-production of sexual images by youth.<sup>15,16</sup> Further, some researchers employ a more comprehensive definition by including additional electronic transmissions (social media, e.g. snapchat) of both sexually explicit pictures, and/or messages from one person to another.<sup>17</sup> Although there is not an established legal definition of sexting, some legal authors define it as “the self-production and distribution by cell phone of sexually explicit images in the course of consensual, voluntary activity.”<sup>18</sup>

### ***Youth and Cell phones***

The cell phone is a widespread communication tool among modern-day youth. Youth recognize cell phones as facilitators of their social relationships and feel disconnected from their social lives without their cell phones.<sup>6</sup> For example, in a 2013 Pew Research Center study, 78% of

nationally representative youth (12-17 years) reported owning a cell-phone, and almost half (48%) reported owning a smart-phone.<sup>19</sup> However, this data may be outdated, and these numbers have undoubtedly increased in recent years. In that same study, about three in four youth reported accessing the Internet on cell phones and other mobile devices. Out of those youth, one in four accessed the Internet mostly on their cell-phones.<sup>19</sup> Inclusion of a camera and Internet connectivity to cell phones further adds to this wider unsupervised digital space.<sup>20</sup> Cell phones are therefore becoming an easier, more comfortable and effective method of social communication compared to conventional forms of interpersonal communication (e.g. face-to-face, voice call).<sup>21</sup> Unfortunately, more youth have started using cell phones for risky sexual exploration and interaction.<sup>22</sup>

### ***Youth and Internet use***

The vast majority of U.S. youth (13-17 years) also report daily Internet use. Twenty four percent report using the Internet almost constantly, and 56% report going online several times a day.<sup>23,24</sup> Increased Internet use is linked to the ubiquity of smart phones, and the Internet has provided an online space where U.S. youth engage with social media and social networking sites. In fact, 73% of U.S. youth between the ages of 12-17 years report having a social media profile<sup>24-27</sup> and 22% log on to a social media site more than 10 times a day.<sup>26</sup> This engagement with social media has become an important medium of self-expression among youth and, with the advent of smartphones, has dramatically increased in the last five years.<sup>27</sup> Social media and social networking sites also enable youth to create public or semi-public profiles to share information and interests. With these profiles, they can post messages, images, and videos and interact with a wide range of people in real-time.<sup>28</sup> Much of this activity might be unmonitored and unrestricted, as nearly 33% of U.S. youth (8-18 years) have Internet access in personal and private locations such as bedrooms.<sup>29</sup> Sexting, therefore, is a likely byproduct of this increased Internet use and online interactions in a greater variety of locations.<sup>23,20</sup>

### ***Prevalence of Sexting***

The prevalence of sexting among youth increases with age and ranges from about 15% to 57% (see footnote in Table 1). More specifically, estimates of sexting range from 13% to 48% among receivers, and 5% to 38% among senders. According to the National Sex and Tech (2008) survey among youth (13-19 years) who were involved in sexting, 71% of girls and 67% of boys reported sending sexually suggestive messages and images to their boyfriend/girlfriend.<sup>30</sup> However, fewer youth reported doing these activities

to someone they just know online (15%) or someone they just met (7%).<sup>33</sup> In another study conducted among Texas high school students, Temple et al. reported that 68% of girls and 42% of boys reported being asked for sexual images of themselves.<sup>20</sup> In that same study, 27% of girls and 3% of boys reported being bothered by this request. The wide range of prevalence estimates for sexting may be explained by the differences in the age groups studied, different sampling strategies, different data collection methods, and different operational definitions of sexting. Further, it should be noted that few of these studies specifically focus on middle school youth and the prevalence of sexting among early adolescents (ages 10-14) is not yet known.<sup>31</sup>

Demographic factors such as race/ethnicity, age, and gender may impact estimates of youth sexting. For example, among Los Angeles middle school youth, African Americans were more likely (OR=1.8; 95%CI [1.1-2.9]) to report receipt of sexting in the form of texts and/or images, as compared to Whites and Hispanics<sup>32</sup>. With respect to age, a recent systematic review suggested that age was positively correlated with receiving sexting. With respect to gender, evidence is equivocal with some studies showing no differences, and others reported boys were more likely to be senders of sexual images than girls.<sup>33</sup>

**Table 1: Comparison of Sexting Prevalence across Studies**

Study	Definition of Sexting	Study design	Study Population	Key Findings
Sex and Tech Results from a Survey of Teens and Young Adults: The National Campaign to Prevent Teen and Unplanned Pregnancy. Cosmogirl.com, (2008). <sup>30</sup>	Ever sending or posting online, nude semi-nude images/videos or sexually suggestive messages electronically	National Cross-sectional Online Survey	653,13-19 year olds	48% youth had received sexually suggestive messages 31% youth had received a nude semi-nude picture/video 38% youth had sent/posted sexually

				suggestive messages 20% youth had sent/posted a nude semi-nude picture/video
Lenhart, (2009) Pew Internet and American Life Project. <sup>34</sup>	Ever sent/received sexually suggestive nude or nearly-nude photos/videos of themselves or of someone known on cell phones	National Cross-sectional telephone survey, Focus groups, Paper survey	800, 12-17 year olds	15% received sexting. 4% sent sexting. (see footnote)
Thomas, (2009) Cox Communications. <sup>14</sup>	Ever sent sexually suggestive texts or emails with nude or nearly nude photos.	National Online Cross-sectional Survey	655, 13-18 year olds	19% sent sexting 3% forwarded sexting 17% received sexting
Hinduja & Patchin, (2010). <sup>35</sup>	Sent or received sexually explicit or sexually-suggestive images or video via a cell phone from someone in last 30 days	Local Cross-sectional Survey	4,400, 11-18 year olds.	13% of youth had received sext. 8% of youth had sent sext.

Associated Press and MTV(AP-MTV) digital abuse study (2011). <sup>36</sup>	Ever sent or forwarded nude photos and sexually charged messages on cell phone or online.	National Online Cross-sectional survey	1355, 14-24 year olds	15% senders; 21-33% receivers
Mitchell, Finkelhor, Jones, & Wolak, (2012). <sup>37</sup>	Ever sent/received via cell phone, the Internet & other electronic media of nude or nearly nude, or sexually explicit images.	National Cross-sectional Telephone survey	1560, 10-17 year olds	2.5% of youth received/sent nude or nearly nude images [see footnote; 1% of youth received/sent sexually explicit (i.e. showing naked breasts, genitals or bottoms) images]
Temple et al., (2012). <sup>39</sup>	Ever sent/received a naked picture through text or e-mail	Local Cross-sectional Survey	948, 14-19 year olds	28% had sent sext. 31% asked someone for sext. 57% had been asked to send sext.
Peskin et al., (2013). <sup>40</sup>	“Using technology to ever create, send, and receive sexually explicit photos, videos, and/or text-only	Local Cross-sectional survey	1034, tenth grade ethnic minority students, mean age=16 years	20% sent a sext 30% received a sext.

	messages”			
Strassberg, Mckinnon, Sustaíta, & Rullo, (2013). <sup>41</sup>	Ever transfer of sexually explicit photos via cell-phone.	Local Cross-sectional Survey	606, 13-18 year olds	20% sent sexually explicit photos of themselves 25% forwarded such a picture 40% received a sexually explicit image
Ybarra & Mitchell, (2013). <sup>42</sup>	Sharing with someone sexual (nude or nearly nude) pictures of oneself using text messaging, and in person within last one year	National Cross-sectional Online Survey	3,715, 13-18 year olds	7% of youth reported sexting in past year. (5% by texts; 2% online; 1% in-person; and .2% in some other way)
Houck et al., (2014). <sup>43</sup>	Sending sexual picture of themselves or sexual message on text, email or social media sites like Facebook in last six months	Local Cross-sectional Survey (Rhode Island)	418, 12-14 year olds	17 % had sent a sexually explicit text message in the past six months. 5 % reported sending both sexually explicit text messages and nude or seminude photos
Dick et al., (2014). <sup>44</sup>	Whether a respondent’s	Local Cross-sectional Survey	1008, 14-19 year olds	29% were engaged in sexting

partner had asked them to send nude or seminude photos of themselves in the past 3 months.

Rice et al., (2014). <sup>32</sup>	Ever sent/received sexually explicit text or picture message on cell phone	Local Cross-sectional survey	1285, 10-15 year olds	20% students reported receiving a sexting message 5% reported sending a sexting message
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**Footnote:**

Mitchell et al (2012) is a younger sample and used landlines based data collection methods. The study represented a small section of the population and also had low response rates.

Lenhart et al (2009) is an older study when fewer middle school youth used smartphones.

***Why Do Youth Engage in Sexting?***

Youth often highlight several reasons for sexting, including for fun, to get out of boredom, to get a boy/girl's attention; as a joke; to get positive feedback; sexual experimentation or to initiate sexual activity, to flirt, to feel sexy, as a form of self-representation, to fit in, in response to someone's post; or accidentally or unintentionally.<sup>33</sup> Some experts have reported that personality factors such as higher sensation seeking, lower sense of coherence (person's ability to handle stressful life situations), and impulsivity are significant correlates of youth sexting.<sup>45-47</sup> A recent study was conducted with secondary school students in Belgium used Social Learning Theory as a framework to understand this behavior.<sup>48</sup> Authors reported that youth who justify sexting; hold positive attitudes towards sexting; perceive peer approval of sexting; and perceive positive emotional consequences of sexting such as thrill and excitement, were more likely to engage in sexting. However, in that same study, youth were neither influenced by observing celebrities posting sexy pictures of themselves nor affected by perceived parental attitude toward sexting.

Sexting practices may also be a normative relationship practice in the current social, sexual and technological environment.<sup>22</sup> For example, some youth prefer safe, non-casual or short-term virtual involvements compared to actual physical or emotional relationships.<sup>49</sup> Gender also influences understanding of and practices related to sexting. For boys, sexting may be viewed as a means to status or masculinity.<sup>5</sup> On the other hand, for girls, it may be viewed as damaging to one's sexual reputation.<sup>50,51</sup> According to the National Campaign to Prevent Teen and Unplanned Pregnancy, 23% of young girls reported being pressured to send sexually suggestive content.<sup>30</sup>

### ***Legal and Mental Health Consequences of Sexting***

Researchers and the general public often show significant apprehension about the potential legal consequences of sexting. Further, youth may be unaware of the consequences and the permanency of their digital footprints, or may be indifferent to them.<sup>52</sup> While rare, some youth who engaged in sexting have been indicted for creation, possession or distribution of child pornography,<sup>12,15,52</sup> juvenile law misdemeanors,<sup>23</sup> and disorderly conduct and felony.<sup>34</sup> Quayle & Newman reported that even minors, who possessed self-produced sexual images, were considered as proprietors of child pornography.<sup>15</sup> The majority of these legal sufferers of child pornography production and possession were youth.<sup>15</sup> Fortunately, many states and jurisdictions have softened penalties for sexting. Suspension and expulsion are also potential consequences for youth involved in sexting.<sup>12</sup> Although this has only happened in a few cases, youth convicted of sexting offenses may also be registered as sex offenders which might lead to long-term implications such as school drop-out, lack of employment, and a permanent criminal record.<sup>53</sup> Currently, various states are grappling with sexting, how it is defined, and whether it should be considered as a crime irrespective of the age of the victim.<sup>54,55</sup>

Although there are several anecdotal incidents, the scientific literature describing the association between sexting and mental health outcomes such as depression is mixed, with many studies suggesting a positive association, but other studies suggesting no association or a protective effect. With respect to positive findings, Ouytsel et al., (2014) reported an association between sexting and depression symptoms in a retrospective study conducted with 15 to 18 year old Belgian youth.<sup>16</sup> In that study, sexting was assessed with a single question as to whether the youth sent a naked or half naked picture of themselves using cell phones or Internet in the months prior to the study. Similarly, Dake et al., (2012) reported an association between sexting and depression symptomatology

(OR=1.87; 95%CI [1.24-2.82] among a cross-sectional sample of 12 to 18 year old U.S. youth.<sup>56</sup> In that study, however, study authors did not disclose the specific sexting measure. Additionally, Ybarra & Mitchell, (2013), reported a positive association between sexting (defined as: sharing sexual photos online, in-person or via texts) and depression symptoms among a national sample of 13 to 18 year old females.<sup>42</sup> Similarly, Mitchell et al., (2012) reported that 21% of respondents (10 to 17 years) appearing in, creating or receiving sexting images in their national survey felt extremely upset, embarrassed, or afraid.<sup>37</sup> Further, in another retrospective study of Southeast Texas high school students, Temple et al. reported no association between sexting (defined as whether they ever sent naked pictures of themselves through text/email) and depression symptoms after adjusting for sexual behavior, age, gender, race/ethnicity or parent education<sup>46</sup>. With respect to other null findings, sexting was not found to be associated with depression symptoms among 18 to 24 years old in a US sample.<sup>57</sup> On the other hand, in a cross-sectional survey, it was reported that youth (18 year olds), who were engaged in sexting (either pressured to do so or not), were less likely to suffer from symptoms of depression during high school.<sup>58</sup>

In contrast to the research with depressive symptoms, the association between sexting and anxiety symptoms has received limited attention in the literature. Among adults, for example, attachment anxiety was positively associated with the need for sexting or sexting behavior.<sup>33</sup> However, among a study of U.S. young adults (18 to 24 year olds) by Gordon-Messer et al., (2013), sexting was not associated with anxiety.<sup>57</sup> In another cross-sectional study of high school youth, the association between these variables was also not significant.<sup>59</sup>

While important, these study findings related to the association between sexting, depression, and anxiety symptoms, should be viewed in the context of two limitations. First, all studies were conducted with older age youth and might not be relevant for younger youth. Additionally, all studies were cross-sectional and thus cannot establish causality.

### **Objectives of Current Study**

Nationally, estimates for sexting vary greatly among youth ages 10 to 19 years and depend on several factors. Thus, more studies are needed to estimate the prevalence of this behavior among early adolescents,<sup>31</sup> in particular, given their high Internet and cell phone use. Furthermore, although many have expressed concerns about sexting's potential impact on mental health problems like depression and anxiety, more longitudinal

research is needed among early adolescents, given their high rate of mental health problems like depression<sup>60</sup> and anxiety.<sup>61</sup> Thus, the objectives of this study are to 1) provide an overview of sexting research, 2) estimate the prevalence of sexting and 3) examine its longitudinal association with anxiety and depression symptoms, among early adolescents. Study findings could inform future interventions to prevent sexting and mental health among this target population.

## **METHODS**

### ***Study Design***

This is a retrospective analysis using data collected in a CDC-funded three-year, randomized, two-arm, nested, evaluation study. The study was approved by the Institutional Review Board at the University of Texas School of Public Health (UTSPH) (HSC-SPH-12-0593).

### ***Participants***

We recruited 10 middle schools in a large urban school district in Southeast Texas between November 2013 and May 2015.<sup>62</sup> Five schools were randomly assigned to intervention, and five to comparison groups. We enrolled 1760 sixth grade students from the 10 participating middle schools. Trained research staff visited schools to describe the purpose, general design, and enrollment criteria to students during classroom time. Information (in Spanish and English) about the study was sent home with students and signed parental consent forms were obtained. Parents were informed of the confidential nature of the assessment in the parental consent form. Research staff actively followed-up with parents who did not respond or did not return the parental consent forms. To maximize enrollment, teachers received a monetary incentive (\$20) if the class reached 90% return rates on the parent consent form (irrespective of parents agreeing to participate). Overall, the rate of total consent forms returned (yes or no) was 70.2% (1235/ 1760), and the proportion of parents who replied positively to the consent was 52.3% (921/1760). Students received a small monetary incentive for returning the parental consent form.

### ***Data Collection***

We collected data using a web-based computer-assisted self-Interview (CASI) survey (e.g. Qualtrics), hosted on secured servers. Before collecting data, students were informed about the purpose of the study, procedure, enrollment requirements, what they would be asked during the study, and how their confidentiality would be protected. We also told students that their

participation was voluntary and that they could withdraw at any point during the study. If they agreed to participate in the study, youth assent was obtained from them. Each eligible student completed, at school during regular class time, a 45 minute to one-hour student questionnaire using school computers equipped with headphones. Baseline data were collected from 6<sup>th</sup> grade participants during November 2013-April 2014, and the 12-month follow-up data was collected during November 2014-May 2015 when the participants were in the 7<sup>th</sup> grade.

### **Measures**

All measures were self-reported. Demographic variables included information on: (1) age of the student at baseline (in years and analyzed as continuous variable); (2) sex (male, female); (3) country of origin (United States, other); (4) race/ethnicity (African American, Hispanic, other); (5) household composition (living with both biological parents, one biological parent, others); (6) parent /guardian highest education level (less than high school, high school, and above); (7) academic grades (mostly A's & B's, other; and (8) ever had boyfriend/girlfriend ("someone that you have dated, gone out with, or gone steady with?") (yes, no).

Sexting behavior was the independent variable. and was defined in the survey as "the practice of sending or posting sexually suggestive text messages, videos and images, including nude or semi-nude photographs or videos, via cellular telephones or over the Internet (such as email or social networking site like Facebook)" <sup>40,63</sup>. It was assessed with the following yes/no questions: (1) "Have you ever sent naked/nude picture or video (of yourself) to someone through email, text message, or a social networking site like Facebook? "; (2) "Have you ever forwarded a nude picture or video to someone other than the one(s) it was originally meant for?"; (3) "Have you ever received a nude picture or video from someone (of himself/herself) through email, text message, or a social networking site like Facebook?"; (4) "Have you ever sent a sexually suggestive message to someone through email, text message, or a social networking site like Facebook?"; (5) "Have you ever received a sexually suggestive message from someone through email, text message, or a social networking site like Facebook?". Students were classified into two categories of sexting: 'involved in sexting' [if the response to any of the questions a yes; and 'not involved in sexting, if the response to all of the questions is a no].

Anxiety and depression were the dependent variables. Anxiety symptoms were measured by the Generalized Anxiety Disorder-7 (GAD-7) scale, a well-validated screening tool for detecting GAD among youth <sup>64-66</sup>. We asked students the following seven questions: "Over the last two weeks,

how often have you been bothered by the following problems?"..... (1) "feeling nervous, anxious or on edge"; (2) "not being able to stop or control worrying"; (3) "worrying too much about different things"; (4) "trouble relaxing"; (5) "being so restless that it is hard to sit still"; (6) "becoming easily annoyed or irritable"; and (7) "feeling as if something awful might happen". Items were analyzed using a four-point response scale [(0) not at all, (1) several days, (2) more than half the days, and (3) nearly every day)]. Anxiety symptoms were further characterized as mild, moderate, and severe anxiety symptoms based on the scores  $\geq 5$ ,  $\geq 10$ , and  $\geq 15$  respectively<sup>64,65</sup>. We then created a dichotomous variable for anxiety, where we classified any youth with mild, moderate or severe anxiety as having anxiety symptoms. For symptoms of depression, we used the Modified Depression Scale (MDS),<sup>67</sup> a six-item self-report scale designed to assess the frequency of depressive symptoms. We asked students the following six questions: "In the past 30 days, how often..." (1) "were you very sad?"; (2) "were you grouchy or irritable, or in a bad mood?"; (3) "did you feel hopeless about the future?"; (4) "did you feel like not eating or eating more than usual"; (5) "did you sleep a lot more or less than usual?"; and (6) "did you have difficulty concentrating on your school work?". Items were analyzed using a five-point response scale [(1) never, (2) seldom, (3) sometimes, (4) often, and (5) always)]. Total scores were derived by summing individual items among youth who answered all the five questions (range: 6–30). Since higher scores indicated more severe symptoms, we categorized depression variable into two categories "depressed" (by including youth who responded "often" or "always" to each survey item) and "not-depressed"<sup>67</sup>.

### ***Analysis Plan***

First, we computed descriptive statistics to characterize the socio-demographic characteristics of the sample. We also computed the prevalence of sexting, self-reported symptoms of depression, and anxiety. Next, sample characteristics were compared based on sexting and non-sexting status. Next, we conducted univariate logistic regression analyses to estimate the unadjusted odds ratios for the relationship between sexting and anxiety symptoms. Next, we conducted multivariate logistic regression analyses to examine the relationship between sexting and anxiety symptoms controlling for potential confounders (age, sex, country of origin, race/ethnicity, household composition, parent/guardian highest education level, and academic grades; ever had boyfriend/girlfriend; anxiety symptoms at baseline; and intervention status). We assessed the fit and assumptions of the model using goodness-of-fit tests and regression

diagnostics. To examine the relationship between sexting and depression symptoms, we followed a similar analytic approach. We dropped the missing values from the final regression models. We used multi-level modeling for analysis to adjust for any intraclass correlation (ICC) among students within the same school. All data were analyzed using Stata 14 © Copyright 1996–2015 StataCorp LP.

At baseline (6<sup>th</sup> grade), 826 youth participated in the study. Of these youth, 709 completed the follow-up survey (7<sup>th</sup> grade) and were eligible for inclusion in analyses. However, of the 709 participants, we also excluded participants who were missing survey values for any analyzed variables (n=209), resulting in a final analytic sample of 500. Anxiety, depression and sexting (at follow-up) contributed most of the missing data. We found no significant differences between the final analytic sample (n=500) and the overall sample (n=826) at baseline and follow-up, with respect to all studied variables (socio-demographics, ever had boyfriend/girlfriend, sexting, anxiety and depression). Further, with the exception of age, there were no significant differences on any analyzed variables between the intervention and comparison group in this study sample.

## RESULTS

### *Sample Characteristics*

**Table 2** describes the sample characteristics at baseline. The mean age was 12.2 (SD=0.57) years. The prevalence of sexting in 6<sup>th</sup> and 7<sup>th</sup> grade, respectively was 11.8% and 12.0%. Approximately, 11.2% and 12.0% of youth were symptomatic for symptoms of depression at 6<sup>th</sup> and 7<sup>th</sup> grade, respectively. Almost 40% of 6<sup>th</sup> graders and 7<sup>th</sup> graders, each, reported anxiety symptoms.

**Table 2: Sample Characteristics**

<b>Variables</b>	<b>Total N=500</b>
<b>Age (years)</b>	
Mean, (SD)	12.22, (0.57)
<b>Sex</b>	
Male	238 (47.60%)
Female	262 (52.40%)
<b>Country of origin</b>	
United States	425 (85.00%)
Other	75 (15.00%)
<b>Race/Ethnicity</b>	

African-American	96 (19.20%)
Hispanic	365 (73.00%)
Other <sup>a</sup>	39 (7.80%)
<b>Household composition</b>	
Living with one biological parent	178 (35.60%)
Living with both biological parents	276 (55.20%)
Living with others <sup>b</sup>	46 (9.20%)
<b>Parental/Guardian education</b>	
High School and above	329 (65.80%)
Less than High School	171 (34.20%)
<b>Grades in school</b>	
Mostly A's and B's	260 (52.00%)
Other <sup>c</sup>	240 (48.00%)
<b>Ever had boyfriend/girlfriend</b>	228 (45.60%)
<b>Sexting-6<sup>th</sup> grade</b>	59 (11.80%)
<b>Sexting-7<sup>th</sup> grade</b>	60 (12.00%)
<b>Depression-6<sup>th</sup> grade</b>	56 (11.20%)
<b>Depression-7<sup>th</sup> grade</b>	60 (12.00%)
<b>Anxiety-6<sup>th</sup> grade</b>	194 (38.80%)
<b>Anxiety-7<sup>th</sup> grade</b>	190 (38.00%)

SD=Standard Deviation

a= includes Whites; Asian or Pacific Islanders; American Indians or Native Americans; and others

b=includes Stepmother; Stepfather; Foster mother; Foster father; Adoptive mother; Adoptive father; Parent's partner, boyfriend, or girlfriend; Brother or sister; Grandparent; Aunt or uncle; Other relative and others

c= includes Mostly B's and C's; Mostly C's and D's; and Mostly D's and F's

Note: 6<sup>th</sup> grade is baseline; 7<sup>th</sup> grade is follow-up.

### ***Descriptive Statistics by Sexting Status***

**Table 3** describes that youth who reported sexting were significantly more likely to being older; living with one of their biological parents or another relative; receiving grades other than mostly A's and B's; ever having boyfriend/girlfriend; and symptomatology for depression and anxiety (at 6<sup>th</sup> and 7<sup>th</sup> grade, each) as compared to youth who did not report sexting ( $p < 0.05$ ).

**Table 3: Sample Characteristics, by Sexting Status**

<b>Variables</b>	<b>Sexting N=59</b>	<b>Non-Sexting N=441</b>
<b>Age (years)**</b>		
Mean, (SD)	12.45, (0.76)	12.18, (0.54)
<b>Sex</b>		
Male	24 (40.68%)	214 (48.53%)
Female	35 (59.32%)	227 (51.47%)
<b>Country of origin</b>		
United States	47 (79.66%)	378 (85.71%)
Other	12(20.34%)	63 (14.29%)
<b>Race/Ethnicity</b>		
African-American	15 (25.42%)	81 (18.37%)
Hispanic	39 (66.10%)	326 (73.92%)
Other <sup>a</sup>	5 (8.47%)	34 (7.71%)
<b>Household composition*</b>		
Living with one biological parent	27 (45.76%)	151 (34.24%)
Living with both biological parents	23 (38.98%)	253 (57.37%)
Living with others <sup>b</sup>	9 (15.25%)	37 (8.39%)
<b>Parental/Guardian education</b>		
High School and above	43 (72.88%)	286 (64.85%)
Less than High School	16 (27.12%)	155 (35.15%)
<b>Grades in school*</b>		
Mostly A's and B's	21 (35.59%)	239(54.20%)
Other <sup>c</sup>	38 (64.41%)	202 (45.80%)
<b>Ever had boyfriend/girlfriend**</b>	39(66.10%)	189 (42.86%)
<b>Depression-6<sup>th</sup> grade*</b>	12 (20.34%)	44 (9.98%)
<b>Depression-7<sup>th</sup> grade*</b>	14 (27.73%)	46 (10.43%)
<b>Anxiety-6<sup>th</sup> grade**</b>	36 (61.02%)	158 (35.83%)
<b>Anxiety-7<sup>th</sup> grade**</b>	34 (57.63%)	156 (35.37%)

SD=Standard Deviation

\*p&lt;0.05, \*\*p&lt;0.001

a= includes Whites; Asian or Pacific Islanders; American Indians or Native Americans; and others

b=includes Stepmother; Stepfather; Foster mother; Foster father; Adoptive mother; Adoptive father; Parent's partner, boyfriend, or girlfriend; Brother or sister; Grandparent; Aunt or uncle; Other relative and others

c= includes Mostly B's and C's; Mostly C's and D's; and Mostly D's and F's

**Univariate and Multivariate Analyses for Sexting and Anxiety**

In the univariate analyses, youth who reported sexting had significantly greater odds of anxiety symptoms than those who did not report sexting (OR=2.48; 95% CI=1.43-4.32) (**Table 4**). Additionally, the odds of having anxiety symptoms among females were greater (OR=1.89; 95% CI=1.31-2.73) than males. Symptoms for anxiety at 7<sup>th</sup> grade were also significantly (OR=3.84; 95% CI=2.62-5.63) associated with anxiety symptoms at 6<sup>th</sup> grade. No other variables were significantly associated with anxiety symptoms in the univariate analyses.

**Table 4: Univariate and Multivariate Logistics Analysis of Variables for Anxiety at 7<sup>th</sup> grade (N=500)**

Variables	Univariate		Multivariate	
	OR	95% Confidence Interval	OR	95% Confidence Interval
<b>Sexting</b>	2.48*	1.43-4.32	1.95*	1.05-3.61
<b>Age (years)#</b>	1.10	0.80-1.50	1.09	0.76-1.56
<b>Sex</b>				
Female	1.89*	1.31-2.73	1.87*	1.25-2.82
Male	Ref	Ref	Ref	Ref
<b>Country of origin</b>				
United States	1.36	0.81-2.30	1.32	0.74-2.33
Other	Ref	Ref	Ref	Ref
<b>Race/Ethnicity</b>				
African-American	1.00	0.63-1.59	0.86	0.50-1.47
Other <sup>a</sup>	1.29	0.66-2.51	1.26	0.60-2.67
Hispanic	Ref	Ref	Ref	Ref
<b>Household composition</b>				
Living with one biological parent	1.18	0.80-1.73	1.08	0.70-1.65
Living with others <sup>b</sup>	1.02	0.53-1.94	0.82	0.40-1.69
Living with both biological parents	Ref	Ref	Ref	Ref
<b>Parental/Guardian education</b>				
High School and above	1.00	0.68-1.46	1.01	0.65-1.56

Less than High School	Ref	Ref	Ref	Ref
<b>Grades in school</b>				
Mostly A's and B's	1.19	0.83-1.71	1.28	0.85-1.91
Other <sup>c</sup>	Ref	Ref	Ref	Ref
<b>Ever had boyfriend/girlfriend</b>	1.16	0.81-1.67	1.06	0.70-1.60
<b>Anxiety-6<sup>th</sup> grade</b>	3.84**	2.62-5.63	3.62**	2.44-5.39
<b>Intervention Status</b>	0.80	0.55-1.16	0.82	0.54-1.24

OR=Odds Ratio

\*p<0.05, \*\*p<0.001

# Interpretation – one unit increase in age in years leads to higher odds (1.10 or 1.09 times) of anxiety, but this is not statistically significant.

a= includes Whites; Asian or Pacific Islanders; American Indians or Native Americans; and others

b=includes Stepmother; Stepfather; Foster mother; Foster father; Adoptive mother; Adoptive father; Parent's partner, boyfriend, or girlfriend; Brother or sister; Grandparent; Aunt or uncle; Other relative and others

c= includes Mostly B's and C's; Mostly C's and D's; and Mostly D's and F's

Next, adjusted odds ratios were calculated to examine the association between sexting in 6<sup>th</sup> grade and anxiety symptoms in 7<sup>th</sup> grade after adjusting for covariates (**Table 4**). Sexting remained significantly associated with anxiety symptoms (OR=1.95; 95% CI=1.05-3.61). Similar to the unadjusted analyses, odds of having anxiety symptoms among females were greater (OR=1.87; 95% CI=1.25-2.82) than males in the adjusted analyses and symptoms for anxiety at 7<sup>th</sup> grade were significantly (OR=3.62; 95% CI=2.44-5.39) associated with anxiety symptoms at 6<sup>th</sup> grade.

### ***Univariate and Multivariate Results for Sexting and Depression***

In the univariate analyses, youth who reported sexting had greater odds of depressive symptoms as compared to those who did not report sexting (OR=2.50; 95% CI=1.25-5.02). No other variables were significantly associated with depressive symptoms in the unadjusted model. (**Table 5**)

**Table 5: Univariate and Multivariate Logistics Analysis of Variables for Depression at 7<sup>th</sup> grade (N=500)**

Variables	Univariate		Multivariate <sup>€</sup>	
	OR	95% Confidence Interval	OR	95% Confidence Interval
<b>Sexting</b>	2.50*	1.25-5.02	2.52*	1.12-5.67

<b>Age (years) #</b>	0.68	0.40-1.16	0.55*	0.31-0.96
<b>Sex</b>				
Female	1.78	1.00-3.17	1.11	0.57-2.16
Male	Ref	Ref	Ref	Ref
<b>Country of origin</b>				
United States	1.11	0.50-2.49	0.96	0.41-2.28
Other	Ref	Ref	Ref	Ref
<b>Race/Ethnicity</b>				
African-American	0.47	0.19-1.13	0.57	0.23-1.44
Other <sup>a</sup>	0.68	0.22-2.10	0.65	0.19-2.27
Hispanic	Ref	Ref	Ref	Ref
<b>Household composition</b>				
Living with one biological parent	0.89	0.49-1.63	0.95	0.50-1.82
Living with others <sup>b</sup>	0.93	0.33-2.58	0.74	0.24-2.24
Living with both biological parents	Ref	Ref	Ref	Ref
<b>Parental/Guardian education</b>				
High School and above	0.81	0.46-1.44	0.95	0.50-1.82
Less than High School	Ref	Ref	Ref	Ref
<b>Grades in school</b>				
Mostly A's and B's	0.73	0.42-1.29	0.78	0.43-1.44
Other <sup>c</sup>	Ref	Ref	Ref	Ref
<b>Ever had boyfriend/girlfriend</b>	1.10	0.62-1.93	0.83	0.44-1.57
<b>Depression-6<sup>th</sup> grade</b>	7.61**	3.99-14.51	7.94**	3.88-16.27
<b>Intervention Status</b>	0.54	0.24-1.20	0.45*	0.21-0.96

OR=Odds Ratio

\*p<0.05, \*\*p<0.001

€ICC=0.031

# Interpretation – one unit increase in age in years leads to lower odds (0.71 or 0.55 times) of depression.

a= includes Whites; Asian or Pacific Islanders; American Indians or Native Americans; and others

b=includes Stepmother; Stepfather; Foster mother; Foster father; Adoptive mother; Adoptive father; Parent's partner, boyfriend, or girlfriend; Brother or sister; Grandparent; Aunt or uncle; Other relative and others

c= includes Mostly B's and C's; Mostly C's and D's; and Mostly D's and F's

In the adjusted models, sexting in 6<sup>th</sup> grade was significantly associated with depression symptoms during the 7<sup>th</sup> grade (OR=2.52;

95%CI=1.12-5.67). Additionally, symptoms of depression at follow-up were significantly increased among youth who were younger (OR=0.55; 95%CI=0.31-0.96); and reported depressive symptomatology (OR=7.94; 95%CI=3.88-16.27) in 6<sup>th</sup> grade.

## DISCUSSION

In the first longitudinal study of sexting among early adolescents, association, we found that 12% of sixth graders participated in sexting (defined here as: the practice of sending or posting sexually suggestive text messages, videos and images, including nude or semi-nude photographs or videos, via cellular telephones or over the Internet such as email or social networking site like Facebook) Further, we found that sexting was associated with anxiety and depression symptoms, after adjusting for important confounders. These study findings may help inform the development of interventions to reduce sexting and mental health problems among this population.

In our study of early adolescents, the prevalence of sexting was slightly lower than estimates reported in other studies.<sup>38,39,44,63</sup> Furthermore, like previous studies,<sup>58,68</sup> we did not observe significant differences in the prevalence of sexting between males and females. The differences observed in this study could be attributed to several reasons. First, age differences of the study populations could contribute to dissimilarities. For instance, we studied the prevalence of sexting among sixth and seventh graders, but the majority of previous studies examined high-school students and older teenagers. As youth age, increased sexual freedom, a desire for sexual experimentation and greater/increased access to cell phones and internet likely results in a higher prevalence of sexting among these elder youth.<sup>20</sup> Other reasons could include inconsistent definitions of sexting and lack of a valid measure for sexting behavior.<sup>69</sup> More research is thus warranted to explore a common definition and methodology to examine the prevalence of sexting among early adolescent youth.

Our study findings suggest that there is an association between sexting, and symptoms of anxiety and depression. These studies, for depression in particular, support the findings of two studies that reported an association between sexting and mental health outcomes.<sup>45,46</sup> However, our findings are contrary to a prior cross-sectional study of high school students which found no significant association between sexting and these mental health outcomes after controlling for prior sexual behavior.<sup>46</sup> Unfortunately, we did not assess sexual behavior in our study, thus, we were unable to control for this variable in our analysis. However, we used “ever having a

girlfriend or boyfriend” as a proxy variable for prior sexual activity. While not a perfect proxy, it is related to sexual behavior<sup>70</sup> and in some studies, it serves as one of the strongest predictors of sexual activity among adolescents.<sup>70</sup> After adjusting for this proxy variable in our study, sexting and depression (and anxiety) remained significantly associated with each other in the adjusted analyses. Moreover, the existing evidence on the association between youth sexual behavior and mental health problems like depression is unclear. For instance, in one study, no significant association was observed between youth sexual behavior and depression among a school-based nationally representative longitudinal study of 13 to 18 year old youth.<sup>71</sup> On the contrary, sexual behavior was associated with depression symptomatology among a nationally representative probability sample of seventh-grade to twelfth-grade youth.<sup>72</sup> Further research is needed to understand how sexual behavior impacts the association between sexting and mental health outcomes.

Previous studies exploring the association between sexting and mental health outcomes have used an older sample<sup>59</sup>, where sexting is more common and less likely to relate to poor mental health. Our study results suggest that sexting may negatively impact mental health among early adolescents. The less common occurrence of sexting in this early age, may possibly make it more likely to be associated with poorer mental health outcomes. This association however, should not be neglected as previous research suggests that an early onset of anxiety and depressive symptoms can increase the likelihood of more severe mental health issues later in life.<sup>73</sup> Thus, interventions may be needed to address sexting and its possible adverse outcomes in early adolescents.

## **STUDY LIMITATIONS**

The results of our study should be discussed in the context of several limitations. First, the study employed self-report measures for data collection. Although youth were informed about the privacy and confidentiality of the survey, considering the sensitivity of the topic, it is possible that perceived social desirability might have influenced the responses of youth.<sup>74</sup> Second, we used a convenience sample design and included middle school youth from a single urban Southeast Texas school district, thus generalizability may be limited. Third, we did not assess frequency of sexting which might provide a more nuanced understanding of sexting behavior. Fourth, there may be selection bias due to missing data. Fortunately, there were no differences in the characteristics of youth who were excluded from analyses due to missing data on analyzed variables.

Lastly, there may be selection bias because not all participants who were eligible for our study agreed to participate and complete the survey.

## **CONCLUSION**

Despite limitations, our study is among one of the first longitudinal studies to report that sexting is relatively common among early adolescent youth and is associated with poor mental health outcomes. Thus, parents, school personnel, public health practitioners, policy makers, health care providers and youth should address the consequences of sexting in their prevention efforts. For instance, health care professionals should ask their patients about sexting behaviors and consider screening those patients who report sexting for depression and anxiety. Indeed, adolescent-focused health care professionals have expressed a need to better understand their patients' sexual behaviors and any mental health implications.<sup>75</sup> Further, parents should receive more education about the consequences of sexting in relation to adverse mental health outcomes. This area of research is still in its infancy, therefore further validation of these study findings is warranted.

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