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Impact of Sexual Education on Comprehension and Experience Among Individuals with Down Syndrome

THESIS

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MASTER OF SCIENCE

in Genetic Counseling

by

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DEDICATION

To

my beloved companion, Brian

I will forever treasure our six years together. You may have entered my life as a stray, but you will never stray from my heart.

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ABSTRACT OF THE THESIS

Impact of Sexual Education on Comprehension and Experience Among Individuals with Down Syndrome

by

Meghan Therese Blunt

Master of Science in Genetic Counseling

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Professor John Jay Gargus, MD, PhD, Chair

Comprehensive sexual education, at a level appropriate for the individual's developmental ability, is recommended for all persons with Down syndrome. Although resources exist for parents and healthcare providers to facilitate sexual education for individuals with Down syndrome, many are hesitant to provide sexual health information to this population. Furthermore, the most effective approach to educating this population about sexual health is not well established. Previous research suggests that typically developing adolescents rely on multiple sources of sexual education. However, the effect of multiple sources of sexual education on comprehension within the Down syndrome population has not been evaluated by any currently published research. Using data from an anonymous online survey of 94 mothers of individuals with Down syndrome, this study investigated the impact of multiple sources of sexual education, versus zero or one, on reported comprehension of five measures of sexual education comprehension. The measures selected for this study were mother's report that her son or daughter with Down syndrome understands consent, knows about sexual intercourse, understands that

intercourse can lead to a pregnancy and baby, knows how to decline sexual advances, and understands what is appropriate behavior toward romantic interests. In the univariate analysis, individuals who received sexual education from multiple sources were 3.2 to 9.3 times more likely to understand, depending on the specific measure of comprehension. Additional variables related to demographics, the individual's experience with sexuality and romance, and parental concern related to these topics were compared with sexual education comprehension. Age, gender, reading level, social media use, and dating history of the individual with Down syndrome were consistently significantly associated with the outcomes. After accounting for differences in age, gender, and reading level, receiving multiple sources of sexual education remained a significant predictor of reported understanding for four out of five measures of sexual education comprehension, with odds ratios ranging from 3.0 to 9.0. The results suggest that receiving sexual education from multiple sources may improve learning outcomes within the Down syndrome community. Should the finding be replicated in future studies, this knowledge can be implemented into future programs designed for individuals with Down syndrome and potentially others with intellectual disability.

I. INTRODUCTION

1.1 History of Down syndrome

Accounting for approximately 1 in 700 births in the United States (CDC, 2020), Down syndrome is one of the most common forms of intellectual disability. The chromosomal disorder, which is characterized by mild-to-moderate intellectual disability, developmental delays, typical dysmorphic features, and various birth defects, occurs in all ethnic and socioeconomic groups. Analysis of historical literature and art suggests that Down syndrome has existed for centuries. However, our medical understanding of the condition and its underlying genetic cause has only been elucidated within the last 200 years. Named after the British physician John Langdon Down, who was the first to publish an accurate depiction of the condition, Down syndrome was initially described in 1866. In his work "Mental Affections of Childhood and Youth" (Down, 1887), he categorized individuals with intellectual disability into groups based on their physical features. Approximately 10% of his patients had flat, broad faces, narrow palpebral fissures and slanted eyes, an enlarged tongue, and sparse hair, features now known to be associated with Down syndrome. The underlying mechanism for these features was not hypothesized until the 1930s, when Petrus J. Waardenburg (1932), Adrien Bleyer (1934), and G. Fanconi (1938) independently hypothesized that Down syndrome might be caused by nondisjunction (Carter, 2002). This hypothesis was confirmed by Lejeune et al. in 1959, when it was observed that individuals with Down syndrome had an extra chromosome present within their cells. Since that discovery, our knowledge of Down syndrome and approach to medical management has rapidly evolved. With improved medical treatments and supportive therapies, the average life expectancy for individuals with Down syndrome

has increased from 12 years in 1949 to approximately 60 years today (Ebensen, 2010). Increasing public awareness and acceptance of individuals with disabilities, as well as legislation such as the Americans with Disabilities Act of 1990, has enabled individuals with Down syndrome to contribute to their communities and lead enriching lives. Despite improvements to quality of life, there are still gains to be made with regard to social independence.

1.2 Genetics of Down syndrome

Typically, humans have 23 pairs of chromosomes; one set is inherited from each parent through either the egg or sperm, for a total of 46. Chromosomes 1 through 22 are autosomes, which are generally present in two copies regardless of the individual's sex. The specific pairing of sex chromosomes, referred to as X and Y, varies depending on an individual's sex. Females typically have two X chromosomes, while males have one X and one Y. Down syndrome occurs when an individual inherits three copies, either partially or completely, of chromosome 21. In approximately 95% of cases, Down syndrome is caused by meiotic nondisjunction, wherein the precursor to an egg or sperm cell fails to divide correctly, resulting in an extra copy of chromosome 21 in the egg or sperm (CDC, 2020). When this egg or sperm cell joins with its counterpart during fertilization, the resulting zygote has three independent copies of chromosome 21. There is an association between advancing maternal age and meiotic nondisjunction in egg cells. A woman's risk during the second trimester to have a pregnancy with Down syndrome is approximately 1 in 700 at age 30, 1 in 196 at age 35, and 1 in 86 at age 40 (Hook et al., 1981). Approximately 3% of cases of Down syndrome are caused by unbalanced translocations, which occur when all or

part of chromosome 21 is attached to another chromosome, resulting in extra chromosome 21 material (CDC, 2020). These translocations may be *de novo*, meaning they occurred sporadically in the individual with Down syndrome, or inherited from a parent. In the latter scenario, one parent is a balanced translocation carrier, meaning they have the typical amount of genetic material but part or all of chromosome 21 has translocated to a different chromosome. This increases the chance that their offspring will inherit an unbalanced translocation, resulting in extra chromosome 21 genetic material. The remaining 2% of Down syndrome cases are the result of mitotic nondisjunction. In these individuals, a cell division error occurred after the formation of the zygote, resulting in a cell line with an extra copy of chromosome 21. Individuals with this form of Down syndrome are often referred to as mosaic, meaning some of their cells have the typical 46 chromosomes and others have 47 chromosomes, including three copies of chromosome 21. Despite the varying genetic mechanisms, there is minimal genotype-phenotype correlation.

1.3 Clinical features of Down syndrome

In his assessment of patients with Down syndrome, John Langdon Down commented that, due to their shared physical features, "it is difficult to believe they are not brothers and sisters" (Down, 1887). Although they often share a similar set of features, no two persons with Down syndrome have the exact same clinical phenotype. Typical features include a flat, broad face, especially a depressed nasal bridge; upward slanting palpebral fissures, or eye lids; Brushfield spots, or white spots on the iris; small ears; short neck; protruding tongue; wide, short hands with short fingers; single palmar crease; clinodactyly, or abnormally curved fifth digits; widened space between the first and second toes;

hypotonia; and short stature (CDC, 2020). Individually, these features are found in the general population; together, they comprise the characteristic appearance of Down syndrome.

In addition to the characteristic physical features, individuals with Down syndrome are at an increased risk for organ malformation and related complications. Approximately 50% of individuals with Down syndrome have a congenital heart defect (CHD), the most common of which is an atrioventricular septal defect (AVSD), which involves holes between the chambers of the left and right sides of the heart. AVSDs account for 40% of CHDs in this population (Asim et al., 2015). Ventricular septal defects (VSDs), involving an abnormal opening between the lower chambers of the heart (ventricles), are seen in approximately 32% of patients; other cardiac defects have been reported but at much lower frequencies (Asim et al., 2015). An array of gastrointestinal disorders occurs more frequently in individuals with Down syndrome, as compared to the general population. These include Hirschsprung disease, a congenital disorder in which missing nerve cells in the colon prevent bowel movements; duodenal and small bowel stenosis (narrowing) or atresia (complete obstruction); imperforate anus, wherein the opening to the anus is missing or blocked; and annular pancreas, which occurs when a ring of pancreatic tissue encircles part of the duodenum (Holmes, 2014). Persons with Down syndrome are also more prone to gastroesophageal reflux, celiac disease, chronic constipation, and intermittent diarrhea. Due to malformation of the ear canal, chronic ear infections and hearing loss have been reported (Strome, 1981). Thyroid gland dysfunction often leads to hypothyroidism in these individuals (Amr, 2018). Additionally, children with Down syndrome have a greater risk to develop leukemia, as compared to typical children (Murphy et al., 2019).

One of the defining features of Down syndrome is intellectual disability. Cognitive impairment usually ranges from mild to moderate, but severe cases have been reported (Lott and Dierssen, 2010). The Intelligence Quotient (IQ) for this population generally ranges from 30 to 70, with an average score of 50 (Vicari, 2004). Compared to the general population, with an average score of 100 and typical range of 85 to 115, this is significantly decreased. Cognitive functioning tends to decline with age, as compared to age-matched controls. Behavioral deficits often include short attention span, impulsive behavior, and poor judgement. Most individuals with Down syndrome require assistance and do not live independently. The majority reside with their families throughout their lives, but some live as adults in group homes with supportive services available.

The developmental trajectory of children with Down syndrome differs from that of typical children, and not all cognitive domains are impacted equally. Early motor skills, such as rolling over, standing, and walking, and social development milestones, such as recognition of parents and self-feeding, are typically delayed by several months. Severe language deficits, including articulation and expressive syntax, are noted, with greater delays observed with expressive language than receptive language (Contestabile, 2010). Both short-term and long-term memory, as well as attention span, are negatively impacted, contributing to a decrease in learning rate as compared to typically developing children (Lott and Dierssen, 2010). Early intervention programs have been implemented in many states to reduce the achievement gap between typically developing children and children with Down syndrome and improve long-term outcomes for children with disabilities.

With regard to sexual development, adolescents with Down syndrome typically experience the physical changes associated with puberty, such as development of pubic

hair and menstruation for girls, at the same time as their age-matched peers (Roizen, 2010; Pueschel et al., 1985). However, the emotional and intellectual development that occurs during this period, including social maturity and communication, self-control, and abstract thinking, is delayed as compared to typically developing children. Teenagers and young adults with Down syndrome, like many their age, begin to develop feelings of sexual attraction and express interest in dating, marriage, and parenthood (NDSS, 2020). Individuals with Down syndrome may become sexually active, and although uncommon, both males and females with Down syndrome have been reported to have biological children.

1.4 Sexuality and sexual health education

The Sexuality Information and Education Council of the United States (SIECUS) defines sexuality education as "a lifelong process of acquiring information and forming attitudes, beliefs, and values about important topics as identity, relationships, and intimacy" (SIECUS, 2004). Traditionally, parents have been the primary educators for sexuality-related topics, but SIECUS suggests that more formal education in school and other community groups and organizations may provide additional benefit. SIECUS guidelines recommend that comprehensive sexuality education be taught at multiple stages of development to maximize retention and implementation of safe sex practices. Comprehensive sexual education incorporates lessons about human development; relationships; personal skills, such as communication and decision-making; sexual behavior, including abstinence and sexuality, and sexual health, including sexually transmitted diseases, pregnancy, and contraceptives. Information about societal aspects of

sexuality, including gender roles, effects of media on perception of sexuality, and diversity, is also provided in comprehensive sexual education programs.

Literature suggests that different sources of sexual education can have varying effects on learning outcomes. Receiving sexual education from parents, grandparents, and religious leaders is associated with beliefs that delay sexual intercourse, while information about sex from friends, cousins, and media is associated with beliefs encouraging earlier participation in sexual behavior (Bleakley et al., 2009). Bleakley et al. (2009) assert that "adolescents rely on multiple sources of information about sex" and suggest it is equally important that parents, authoritative community members, and schools provide sexual education to this group. Furthermore, SIECUS recommends that sexual health information be provided by multiple sources, including parents, schools, community health programs, and other organizations. Currently available literature suggests that multiple sources of sexual education is associated with improved learning outcomes in the general population, but this has yet to be evaluated in individuals with intellectual disability.

1.5 Sexuality and sexual health education for individuals with intellectual disability

Historically, individuals with intellectual and developmental disabilities were discriminated against with regard to expressions of sexuality and access to education. When the first medical diagnosis of "mental retardation" was given in 1614, the cause was determined to be "overindulgence in sexual pleasure" (Wade, 2002). This viewpoint and negative perceptions of individuals with intellectual disability persisted for several hundred years. With the Eugenics Movement of the late 19th and early 20th centuries, many U.S. states passed sterilization laws to limit the reproduction of individuals with disabilities

(Wade, 2002). Although public acceptance of eugenics waned following the aftermath of World War II, these laws remained in effect in many U.S. states until the 1970s. The President's Committee on Mental Retardation, established by President Lyndon B. Johnson in 1966, promoted the creation of services to assist individuals with cognitive disabilities (Krause, 1986). In the 1960s, movements to promote sexual freedom and deinstitutionalization of individuals with disabilities prompted society to begin considering the sexuality rights of this population. The Education for All Handicapped Children Act of 1975 and Individuals with Disabilities Education Act of 1990 required schools to provide "a free and appropriate education" for all children, regardless of ability. However, these pieces of legislation did not require that sexual education be provided to these individuals.

In their 2004 guidelines, SIECUS states that all children, regardless of gender, ethnicity, sexual orientation, socioeconomic status, or disability, benefit from comprehensive sexuality education. Additionally, in their 2001 position statement "Sexuality of Persons with Disabilities," SIECUS maintains that individuals with intellectual disabilities "have a right to sexuality education, sexual health care, and opportunities for socializing and for sexual expression." Their report recommends that families and health care providers of individuals with intellectual disability receive training to learn how to more effectively communicate sexual health information to this population. Despite these recommendations, individuals with intellectual disability are still often denied access to comprehensive sexual education. As compared to 96% of typically developing teenagers, only 53-56% of adults with intellectual disabilities receive formal sexual education (Martinez et al., 2010). When this population does receive sexual education, it is rarely comprehensive, typically covering only the basics of anatomy. Without proper education

about sexuality, individuals with intellectual disability are at a higher risk for sexually transmitted diseases and unintended pregnancies (Medina-Rico et al., 2017). Additionally, they are more likely to display inappropriate sexual behaviors. Expanding access to sexual education can have a lasting impact on the health and wellbeing of individuals with intellectual disabilities, as well as their families and caregivers.

1.6 Sexual health education for individuals with Down syndrome

Although many people assume that individuals with Down syndrome do not experience sexual attraction and desire intimacy, and therefore do not require sexual education, we now know this to be a false assumption. The National Down Syndrome Society (NDSS) claims that sexual education, at a level appropriate for the developmental and cognitive abilities of the individual with Down syndrome, encourages healthy sexuality, reduces the risk of sexual abuse and disease transmission, avoids sexual misunderstandings, and prevents unintended pregnancy (NDSS, 2020). For these reasons and others, sexual health education is a critical part of development and should be provided to all individuals with Down syndrome. Terri Couwenhoven, MS, CSE, a sexuality educator specializing in education of individuals with cognitive disabilities, developed a program for parents of individuals with Down syndrome to help them learn how to teach their child about sexuality and romance. Despite this resource and others available for parents of individuals with intellectual disability, current literature suggests parents of individuals with Down syndrome are hesitant to provide their sons and daughters with sexual education (Frank, 2016). Additionally, they may be less inclined to seek out

alternative sources of sexual education for their children, potentially limiting their child's understanding of sexuality and appropriate expression of their feelings.

1.7 Previous study on sexuality and romance in individuals with Down syndrome

As part of her thesis research in 2019, Jessica Greenwood investigated the factors associated with sexuality in children with Down syndrome, particularly variables influencing mothers' willingness to allow their son or daughter to be alone with a partner (Greenwood, 2019). The results of her study demonstrated that age, developmental level, understanding of consent, and knowledge about sexuality are significantly associated with parental permissiveness. These findings prompted additional questions about sexual education within the Down syndrome community and inspired this study.

1.8 Aims of this study

The impact of multiple sources of sexual education on comprehension of key learning outcomes in individuals with intellectual disability has not been investigated in any currently published studies. This study explores factors associated with comprehension of sexual education learning outcomes among individuals with Down syndrome. The first aim of this project is to identify factors that predict effectiveness of sexual education within the Down syndrome population. As the data analyzed in this study were collected from a survey of parents of individuals with Down syndrome, effectiveness of sexual education for the individuals with Down syndrome was not measured directly. Rather, parents' perception of their son's or daughter's knowledge was utilized as a proxy. The measures used in this survey were parents' responses to the following questions:

- Do you believe your child has the ability to understand consent?
- Does your child know about sexual intercourse?
- Does your child understand that intercourse can lead to pregnancy/baby?
- Does your child know how to decline sexual advances by someone who is interested in them?
- Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?

The secondary aim is to determine whether receiving sexual education from multiple sources, versus a single or no source, is associated with increased sexual education comprehension within the Down syndrome community. The goal is to understand what barriers exist in educating individuals with Down syndrome about sexual health so that healthcare providers may better assist these individuals. The hypothesis tested is that independent of confounding factors, such as age, gender, and developmental level, individuals with Down syndrome who have received sexual education from multiple sources, versus zero or one, will exhibit a higher level of understanding of the five measures of sexual education comprehension.

II. METHODS

2.1 IRB protocol

Utilizing the Exempt Self-Determination Tool provided by the Institutional Review Board of the University of California, Irvine, this research study was reviewed and determined to fall under the category of "self-determined exempt human subjects research."

2.2 Survey and data collection

The data analyzed in this project were collected through a prior research project completed by Jessica Greenwood as part of her master's degree in genetic counseling. Her survey consisted of 88 questions related to parent and child demographics, experiences with romance and sexuality of the individual with Down syndrome, and parental concerns related to sexuality and romance in their children. The questions were modeled after the Sexual Behavior Scale created by Stokes and Kaur (2005). Due to branching logic and participants' ability to skip questions, the number of questions answered by each respondent varied. To aid with distribution to eligible individuals, she contacted 125 Down syndrome organizations and associations, such as the Down Syndrome Association of Orange County, and support groups for parents of children with Down syndrome. Additionally, the survey was shared with the National Society of Genetic Counselors' listserv to enable genetic counselors to provide the link to eligible families. The first page of the survey included an information sheet with the study's IRB approval from the University of California, Irvine. Proceeding to the next page indicated that the respondent provided his or her consent to participate in the study.

2.3 Participants

To be included in the study, survey respondents were required to be at least 18 years of age and the parent of a child with Down syndrome aged 12 or older. The survey was distributed online through REDCap, therefore requiring the internet access to participate, and available exclusively in English. Individuals who completed the survey were not asked to provide their contact information, allowing for anonymity of the subjects.

In total, 161 individuals opened the survey link. 12 did not proceed to the start of the survey, and 42 did not complete the required identification information for their son or daughter with Down syndrome: first initial, last initial, and date of birth. There were 107 participants who completed the survey. 12 respondents were male, and 95 respondents were female. Due to small sample size, resulting in insufficient power to support a gender difference between respondents, the males were removed from the sample. Additionally, two of the female respondents were mothers of the same individual with Down syndrome. Given that their responses would likely be similar and could potentially confound analysis, one was selected to be removed at random.

2.4 Statistical analysis

IBM SPSS software version 26 (IBM 2019) was utilized to calculate descriptive, univariate, and multivariate analyses. Responses to the five measures of sexual education comprehension listed below were compared by demographic factors of the individual with Down syndrome, such as age, gender, reading level, and number of sources of sexual education received, and parental factors, such as concerns about their child with respect

abuse and pregnancy. Statistical analyses included Pearson's chi-squared test and Fisher's exact test.

- Do you believe your child understands consent?
- Does your child know about sexual intercourse?
- Does your child understand that intercourse can lead to pregnancy/baby?
- Does your child know how to decline sexual advances by someone who is interested in them?
- Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?

Statistical significance is reported for each analysis as a nominal p-value. A significance level of p-value less than 0.05 was selected. No corrections were made for multiple comparisons.

Logistic regression was utilized to investigate the associations between the independent variable number of sexual education sources and the five dependent variables of interest measuring sexual education comprehension after adjusting for the age, gender, and reading level, used as a proxy for developmental level of the individual with Down syndrome. Additional variables with significant p-values, identified in univariate analyses, were individually added as covariates to the logistic regression model to determine whether any would impact understanding of the measures of sexual education comprehension.

III. RESULTS

3.1 Demographics of Participants

The demographics of the study population, consisting of 94 mothers, are summarized in Table 1. The respondents' ages range from 28 to 71, with a mean age of 53.3 and a standard deviation of 8.80. With regard to race and ethnicity, 79 (84.9%) respondents self-identified as non-Hispanic white, 11 (11.8%) were reportedly Hispanic, and 3 (3.2%) were of Asian ancestry. Twenty-eight (30.8%) participants reported that their highest level of education was a graduate degree, 30 (33.0%) had a bachelor's degree, and 33 (36.3%) reported having less than a 4-year degree. Thirty-seven (39.4%) of the respondents reported receiving specialized training for educating their child about sexual behavior and romance. Mothers expressed concern for their son or daughter with Down syndrome with respect to the following subjects: child abuse (78.7%), pregnancy/impregnating others (45.7%), STDs (53.2%), child being in a romantic relationship (66.0%), others misinterpreting child's behavior as sexual (62.8%), and child having misconceptions about sex (62.8%). Ninety-two (97.9%) parents reported they allow or would allow their child to date, and 71 (75.5%) allow or would allow their child to be sexually active.

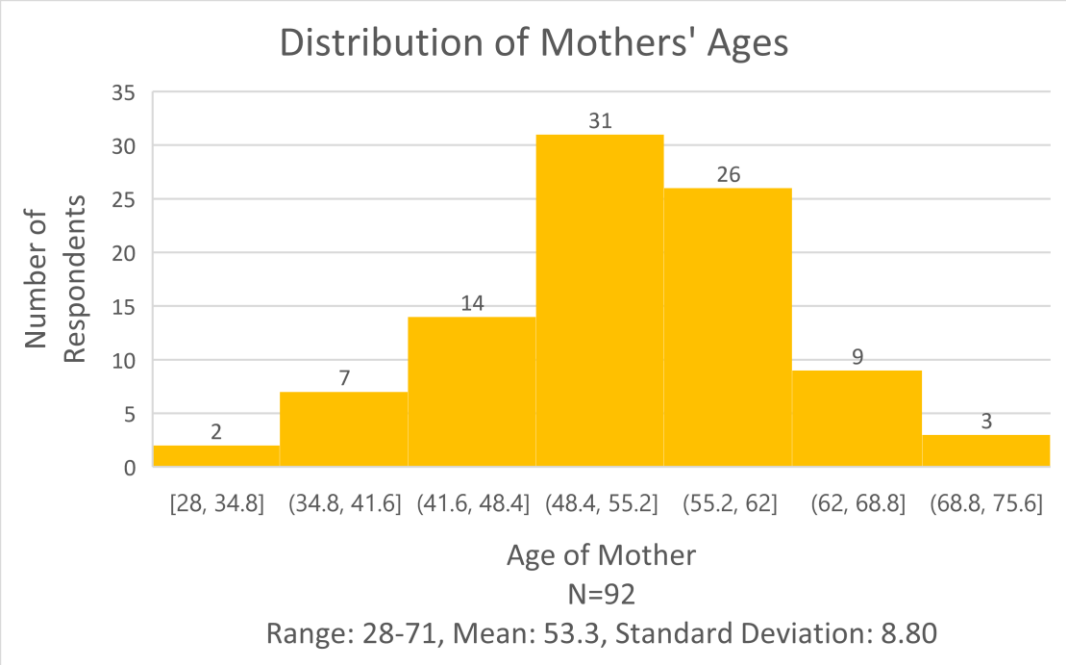
Table 1: Demographics of Respondents (Mothers of Individuals with Down Syndrome)

Parent Characteristic	N	(%)
Education	91	100.0
Less than 4-year degree	33	36.3
4-year degree	30	33.0
Graduate degree	28	30.8
Race/Ethnicity	93	100.0
Caucasian	79	84.9
Hispanic	11	11.8
Asian	3	3.2
Received specialized training for educating child about sexual behavior and romance	94	100.0
Yes	37	39.4
No	57	60.6

Table 1 (Continued): Demographics of Respondents (Mothers of Individuals with Down Syndrome)

Parent Characteristic	N	Yes (#)	Yes (%)
Expressed concern for child abuse	93	74	78.7
Expressed concern for child becoming pregnancy/impregnating others	93	43	45.7
Expressed concern for child having/getting an STD	92	50	53.2
Expressed concern for child being in a romantic relationship	94	62	66.0
Expressed concern for others to misinterpret child's behavior as sexual	92	54	57.4
Expressed concern that child may have misconceptions about sex	93	59	62.8
Allows or would allow child to date	94	92	97.9
Allows or would allow child to be sexually active	87	71	75.5

Figure 1: Age Distribution of Respondents (Mothers of Individuals with Down Syndrome)



3.2 Demographics of participants' children with Down syndrome

The demographics of the individuals with Down syndrome are summarized in Table 2. Information is per their mothers' report. The ages of the individuals with Down syndrome range from 12 to 43, with a mean age of 21.51 and standard deviation of 7.52. 38 (40.4%) were male, with a mean age of 20.25, and 56 (59.6%) were female, with a mean age of 22.30. With regard to reading level, 35 (37.2%) individuals with Down syndrome read at a 2nd grade level or below, 29 (30.9%) read at a 3rd to 4th grade level, and 30 (31.9%) read at a 5th grade level or above. Ten (10.6%) individuals with Down syndrome have no siblings, and 84 (89.4%) were reported to have at least one sibling. Regarding birth order, 25 (26.6%) were the oldest among their siblings, 14 (14.9%) were middle children, and 44 (46.8%) were the youngest member of their family. For sexual education, 27 (29.0%) received sexual education from either a single source or no sources, while 66

(71.0%) received sexual education from two or more sources. Possible sources of sexual education were the mother completing the survey, the other parent, siblings, other family members, teachers, therapists, and peers. Mothers' reports of their son's or daughter's experience with dating varied; 47 (51.1%) had participated in supervised group dates, 14 (14.9%) had been on unsupervised group dates, 42 (45.2%) had participated in supervised one-on-one dates, 15 (16.0%) had been on unsupervised one-on-one dates, and 21 (23.1%) had been in an exclusive romantic relationship. Nine (9.6%) were reported to use some form of contraception, and 4 (4.3%) had been sexually intimate with someone, to their mothers' knowledge. With regard to social media use, 45 (47.9%) were reported to use at least one of the following: Facebook, Twitter, Instagram, and Snapchat. For supportive services, 15 (16.0%) were reported to have utilized Applied Behavior Analysis (ABA) therapy, and 89 (94.7%) had had speech therapy.

Table 2: Demographics of Individuals with Down Syndrome

Child Characteristic	N	(%)
Reading level	94	100.0
2nd grade or below	35	37.2
3rd-4th grade	29	30.9
5th grade or above	30	31.9
Gender	94	100.0
Male	38	40.4
Female	56	59.6
Birth Order	94	100.0
Oldest	25	26.6
Middle	14	14.9
Youngest	44	46.8
Only Child	10	10.6

Table 2 (Continued): Demographics of Individuals with Down Syndrome

Child Characteristic	N	Yes (#)	Yes (%)
Expressed interest in romance	94	56	59.6
Has been sexually intimate with someone	94	4	4.3
Uses birth control	94	9	9.6
Received sexual education from multiple sources	93	66	71.0
Uses social media	91	45	47.9
Has had ABA therapy	91	15	16.0
Has had speech therapy	94	89	94.7
Participated in supervised group dates	92	47	51.1
Participated in unsupervised group dates	94	14	14.9
Participated in supervised one-on-one dates	93	42	45.2
Participated in unsupervised one-on-one dates	94	15	16.0
Has had an exclusive romantic relationship	91	21	23.1

Figure 2: Age Distribution of Individuals with Down Syndrome

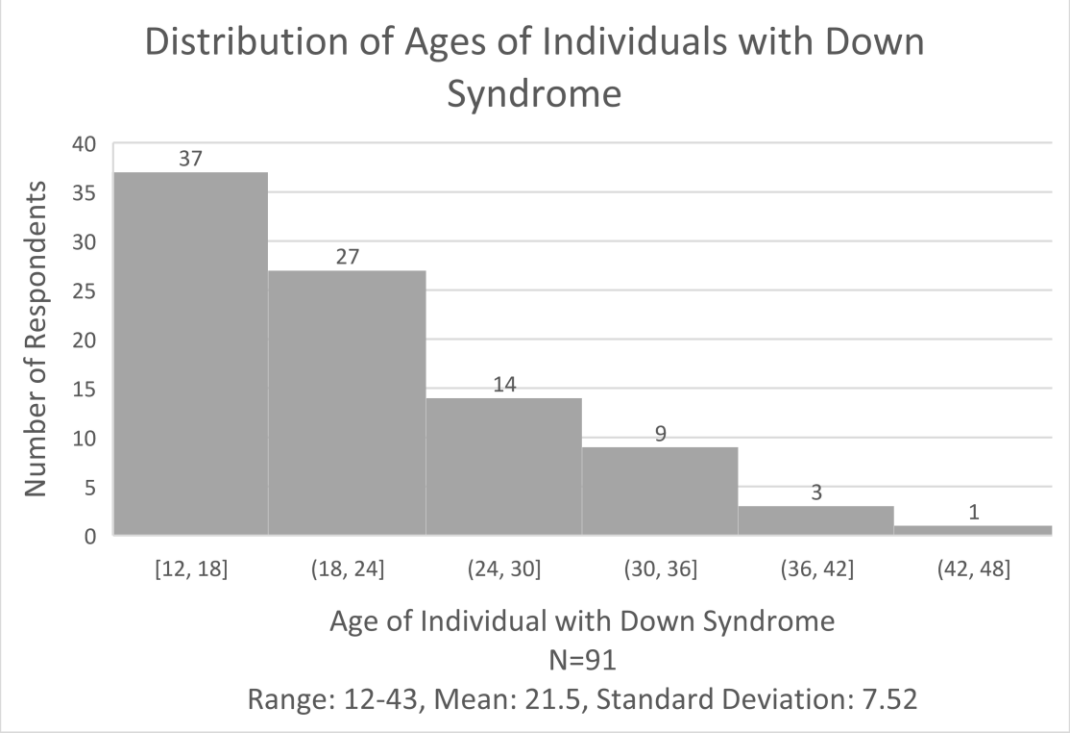


Figure 3: Age Distribution of Males with Down Syndrome

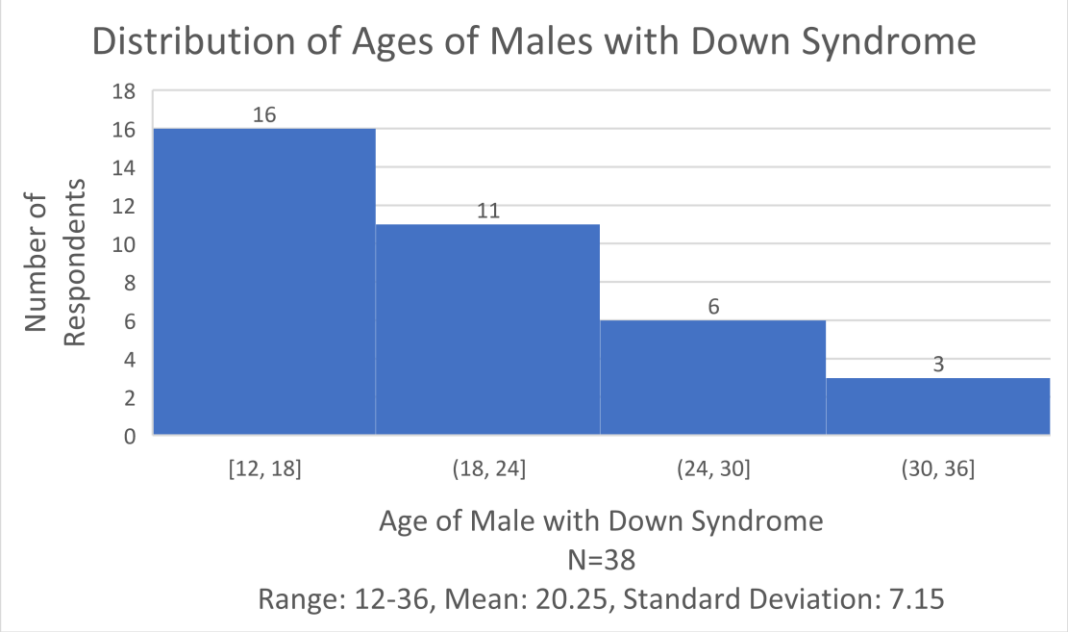


Figure 4: Age Distribution of Females with Down Syndrome

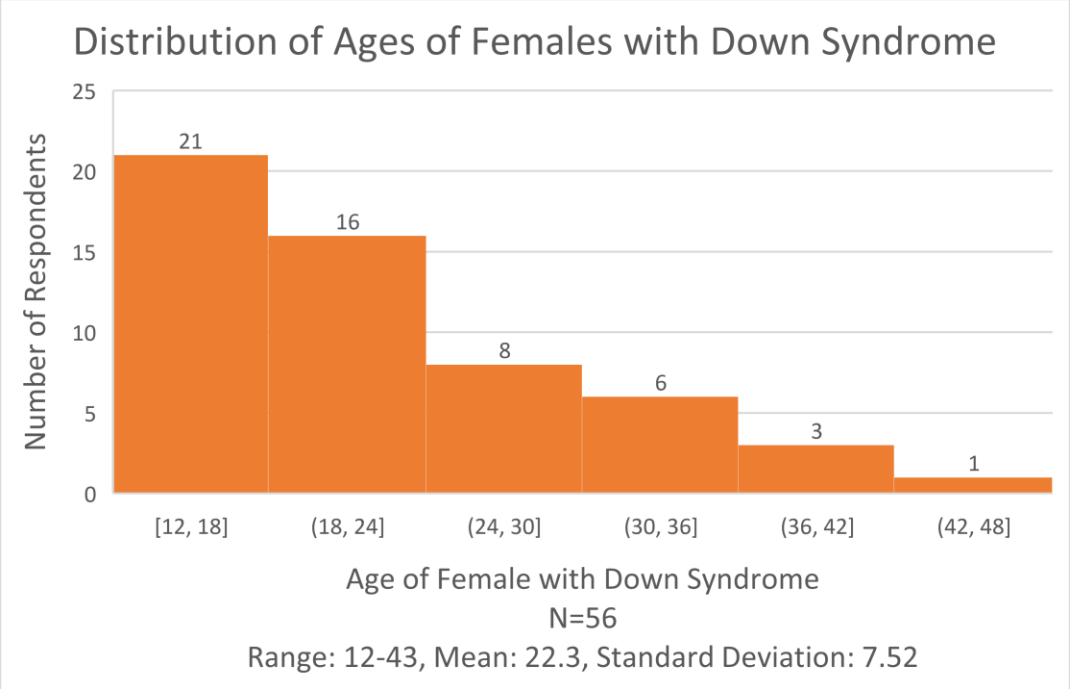
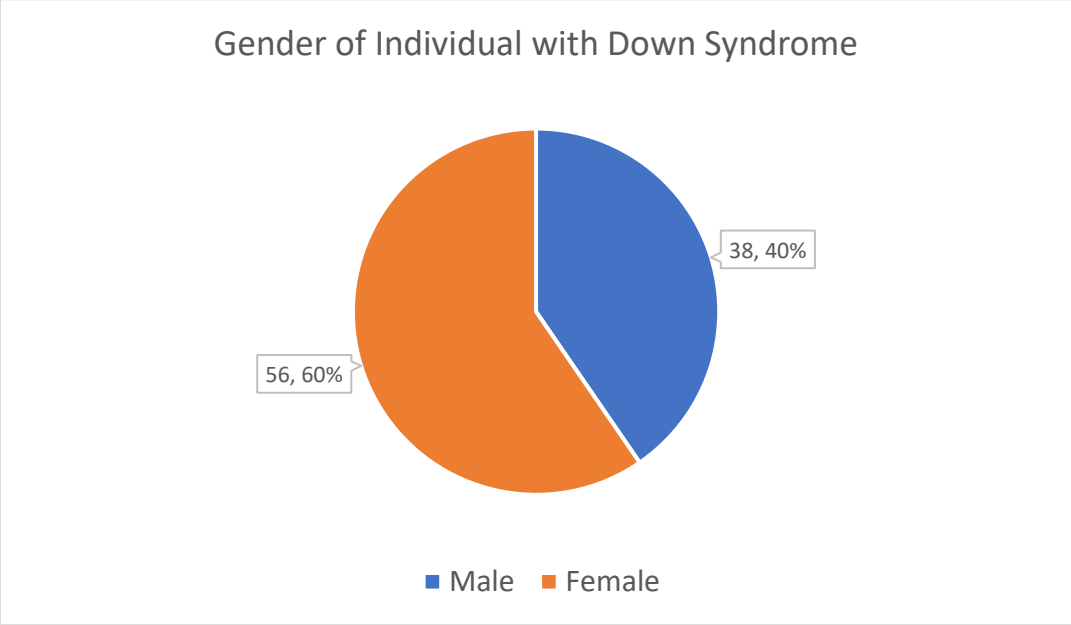


Figure 5: Gender Distribution of Individuals with Down Syndrome



3.3 Measures of sexual education comprehension among individuals with Down syndrome

Mothers' responses to five questions about their son or daughter with Down syndrome were utilized as measures of sexual education comprehension, which are summarized in table 3. Per mothers' report, 42 (46.7%) of the individuals with Down syndrome understand consent, 43 (47.3%) know about sexual intercourse, 40 (44.4%) know that intercourse can lead to a pregnancy and baby, 44 (48.9%) know how to decline sexual advances, and 51 (55.4%) understand what is and what is not acceptable behavior toward romantic interests.

Table 3: Understanding of Five Measures of Sexual Education Comprehension

Question	N	Yes (#)	Yes (%)
Do you believe your child understands consent?	90	42	46.7
Does your child know about sexual intercourse?	91	43	47.3
Does your child understand that intercourse can lead to pregnancy/baby?	90	40	44.4
Does your child know how to decline sexual advances by someone who is interested in them?	90	44	48.9
Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?	92	51	55.4

3.4 Univariate analysis

Individuals with Down syndrome who were reported to understand the five measures of sexual education comprehension and those who were reported to not understand were compared with respect to their demographics, experiences with sexuality and romance, and parental concerns for their children regarding sexuality and romance. The specific subset of variables with statistically significant associations varied depending on the measure of sexual education comprehension. Age of the individual with Down syndrome was sorted into three categories: 12-17 years, 18-25 years, and greater than 25 years. Reading level of the individual with Down syndrome was also divided into three groups: 2nd grade or lower, 3rd to 4th grade, and 5th grade or higher. Parent age was divided by into four groups by quartiles: less than 49 years, 49-53 years, 54-58 years, and greater than 58 years. Due to correlation between parent and child ages, only child's age was utilized in the multivariate analyses.

3.4a Response to question, "Do you believe your child understands consent?"

Individuals with Down syndrome who were reported to understand consent and those who were reported to not understand were compared with respect to demographics,

experiences with sexuality and romance, and parents' concerns regarding these topics. Tables 4.1 and 4.2 detail selected variables pertaining to the individual with Down syndrome and the survey respondent, respectively. All responses are per mothers' report.

Individuals with Down syndrome who, per their mothers' report, understand consent differed from those who reportedly did not understand consent with respect to: a) reading level (5th grade or higher more likely to understand, 42.9% vs. 25.0%, p=0.018), b) use of social media (65.9% vs. 37.0%, p=0.007), c) participation in supervised group dates (64.3% vs 36.2%, p=0.008), d) participation in unsupervised group dates (28.6% vs. 4.2%, p=0.001), e) participation in supervised one-on-one dates (59.5% vs. 31.3%, p=0.007), f) participation in unsupervised one-on-one dates (28.6% vs. 6.3%, p=0.005), and g) history of having an exclusive romantic relationship (35.0% vs. 12.5%, p=0.012). Mothers who reported that their son or daughter with Down syndrome understands consent differed from those whose child did not with respect to a) having concerns about their child being in a romantic relationship (52.4% vs. 79.2%, p=0.007), b) having concerns that others may misinterpret their child's behavior as sexual (43.9% vs. 72.9%, p=0.005), and c) allowing their son or daughter to be sexually active now or in the future (92.5% vs. 72.7%, p=0.018). Responses did not differ significantly for the age and gender of the individual with Down syndrome, nor any of the other variables listed in tables 4.1 and 4.2. Although the associations were not statistically significant, there was a general trend that individuals with Down syndrome who a) expressed interest in romance (p=0.089) and b) had not received ABA therapy (p=0.081) were slightly more likely to understand consent than not understand, per their mothers' report. Associations that were not statistically significant are listed in Appendix A.

Table 4.1: Univariate Analysis: Child Factors vs. Understands Consent

Question	Do you believe your child understands consent?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Child Age	87					
12-17 years		17	36.2	14	35.0	**0.749**
18-25 years		18	38.3	13	32.5	
>25 years		12	25.5	13	32.5	
Child Gender	90					
Male		21	43.8	17	40.5	**0.754**
Female		27	56.3	25	59.5	
Reading Level	90					
2nd grade or lower		24	50.0	9	21.4	**0.018**
3rd-4th grade		12	25.0	15	35.7	
5th grade or higher		12	25.0	18	42.9	
Birth order	89					
Oldest		11	23.4	14	33.3	**0.448**
Middle		6	12.8	7	16.7	
Youngest		26	55.3	16	38.1	
Only Child		4	8.5	5	11.9	
Do you believe your child is interested in romance?	90					
No		11	22.9	4	9.5	**0.089**
Yes		37	77.1	38	90.5	
Social Media (Facebook, Instagram, Twitter, Snapchat)	87					
No		29	63.0	14	34.1	**0.007**
Yes		17	37.0	27	65.9	
To your knowledge, has your child been sexually intimate with another person?	90					
No		47	97.9	39	92.9	**0.336***
Yes		1	2.1	3	7.1	

Table 4.1 (Continued): Univariate Analysis: Child Factors vs. Understands Consent

Question	Do you believe your child understands consent?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
To your knowledge, does your child do any of the following?						
Masturbate	88					
No		24	52.2	18	42.9	**0.382**
Yes		22	47.8	24	57.1	
Use contraception	88					
No		44	95.7	37	88.1	**0.251***
Yes		2	4.3	5	11.9	
Has your child received any of the following therapies?						
ABA therapy	87					
No		35	76.1	37	90.2	**0.081**
Yes		11	23.9	4	9.8	
Speech Therapy	90					
No		2	4.2	3	7.1	**0.661***
Yes		46	95.8	39	92.9	
Has your child participated in any of the following dating behavior?						
Supervised group dates	89					
No		30	63.8	15	35.7	**0.008**
Yes		17	36.2	27	64.3	
Unsupervised group dates	90					
No		46	95.8	30	71.4	**0.001**
Yes		2	4.2	12	28.6	
Supervised one-on-one dates	90					
No		33	68.8	17	40.5	**0.007**
Yes		15	31.3	25	59.5	

Table 4.1 (Continued): Univariate Analysis: Child Factors vs. Understands Consent

Question	Do you believe your child understands consent?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Unsupervised one-on-one dates	90					
No		45	93.8	30	71.4	**0.005**
Yes		3	6.3	12	28.6	
Exclusive romantic relationship	88					
No		42	87.5	26	65.0	**0.012**
Yes		6	12.5	14	35.0	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

Table 4.2: Univariate Analysis: Parent Factors vs. Understands Consent

Question	Do you believe your child understands consent?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Parent Age	88					
Q1: <49 years		11	23.4	9	22.0	**0.442**
Q2: 49-53 years		15	31.9	10	24.4	
Q3: 54-58 years		12	25.5	8	19.5	
Q4: >58 years		9	19.1	14	34.1	
Parent Education	87					
Less than 4-year degree		19	40.4	13	32.5	**0.741**
4-year degree		15	31.9	14	35.0	
Graduate degree		13	27.7	13	32.5	
Have you received any specialized parent education/training for educating your child about sexual behavior and romance?	90					
No		31	64.6	23	54.8	**0.343**
Yes		17	35.4	19	45.2	
Do you have any concerns about your child with respect to:						
Abuse	90					
No		10	20.8	8	19.0	**0.833**
Yes		38	79.2	34	81.0	

Table 4.2 (Continued): Univariate Analysis: Parent Factors vs. Understands Consent

Question	Do you believe your child understands consent?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Pregnancy	90					
No		25	52.1	23	54.8	**0.799**
Yes		23	47.9	19	45.2	
STDs	89					
No		23	47.9	18	43.9	**0.705**
Yes		25	52.1	23	56.1	
Do you have concerns with your child being in a romantic relationship?	90					
No		10	20.8	20	47.6	**0.007**
Yes		38	79.2	22	52.4	
Are you worried that another person might misinterpret your child's behavior as having sexual content that was not intended?	89					
No		13	27.1	23	56.1	**0.005**
Yes		35	72.9	18	43.9	
Are you concerned that your child has misconceptions about sex?	89					
No		15	31.3	18	43.9	**0.218**
Yes		33	68.8	23	56.1	
Do you or would you allow your child to participate in dating?	90					
No		2	4.2	0	0.0	**0.479***
Yes		46	95.8	42	100.0	

Table 4.2 (Continued): Univariate Analysis: Parent Factors vs. Understands Consent

Question	Do you believe your child understands consent?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Do you or would you allow your child to participate in a sexually active relationship, now or in the future?	84					
No		12	27.3	3	7.5	**0.018**
Yes		32	72.7	37	92.5	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

3.4b Response to question, "Does your child know about sexual intercourse?"

Individuals with Down syndrome who were reported to know about sexual intercourse and those who were not were compared with respect to demographics, experiences with sexuality and romance, and parents' concerns regarding these topics. Tables 5.1 and 5.2 detail selected variables pertaining to the individual with Down syndrome and the survey respondent, respectively. All responses are per mothers' report.

Individuals with Down syndrome who, per their mothers' report, know about sexual intercourse differed from those who reportedly did not know about sexual intercourse with respect to: a) age (>25 years more likely to understand, 38.1% vs. 15.2%, $p<0.001$), b) gender (female more likely to understand, 69.8% vs. 47.9%, $p=0.035$), c) reading level (5^{th} grade or higher more likely to understand, 39.5% vs. 22.9%, $p=0.009$), d), social media use (72.1% vs. 24.4%, $p<0.001$), e) having been sexually intimate with someone (9.3% vs. 0.0%, $p=0.046$), f) contraception use (16.3% vs. 0.0%, $p=0.005$), g) receiving speech therapy (90.7% vs. 100.0%, $p=0.046$), h) participation in supervised group dates (65.1% vs. 34.8%, $p=0.004$), i) participation in unsupervised group dates (30.2% vs. 0.0%,

p<0.001), j) participation in supervised one-on-one dates (61.9% vs. 29.2%, p=0.002), k) participation in unsupervised one-on-one dates (30.2% vs. 2.1%, p<0.001), and l) history of having an exclusive romantic relationship (33.3% vs. 13.0%, p=0.023). Mothers who reported that their son or daughter with Down syndrome knows about sexual intercourse differed from those whose child did not with respect to a) parent age (>58 years more likely to report child understands, 41.9% vs. 10.6%, p=0.001) and b) allowing their son or daughter to be sexually active now or in the future (95.1% vs. 69.8%, p=0.002). Responses did not differ significantly for the remaining variables described in tables 5.1 and 5.2. Although the associations were not statistically significant, there was a general trend that individuals with Down syndrome who a) expressed interest in romance (p=0.081) and whose parents b) had sexual education training (p=0.054) and c) were not concerned others would misinterpret their child's behavior as sexual (p=0.100) were slightly more likely to know about sexual intercourse than not know about sexual intercourse, per their mothers' report. Associations that were not statistically significant are listed in Appendix A.

Table 5.1: Univariate Analysis: Child Factors vs. Knows about Sexual Intercourse

Question	**Does your child know about sexual intercourse?**					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Child Age	88					
12-17 years		26	56.5	6	14.3	
18-25 years		13	28.3	20	47.6	**<0.001**
>25 years		7	15.2	16	38.1	
Child Gender	91					
Male		25	52.1	13	30.2	**0.035**
Female		23	47.9	30	69.8	
Reading Level	91					
2nd grade or lower		25	52.1	9	20.9	
3rd-4th grade		12	25.0	17	39.5	**0.009**
5th grade or higher		11	22.9	17	39.5	

Table 5.1 (Continued): Univariate Analysis: Child Factors vs. Knows about Sexual Intercourse

Question	Does your child know about sexual intercourse?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Birth order	90					
Oldest		14	29.8	11	25.6	**0.345**
Middle		4	8.5	9	20.9	
Youngest		23	48.9	20	46.5	
Only Child		6	12.8	3	7.0	
Do you believe your child is interested in romance?	91					
No		11	22.9	4	9.3	**0.081**
Yes		37	77.1	39	90.7	
Social Media (Facebook, Instagram, Twitter, Snapchat)	88					
No		34	75.6	12	27.9	**<0.001**
Yes		11	24.4	31	72.1	
To your knowledge, has your child been sexually intimate with another person?	91					
No		48	100.0	39	90.7	**0.046***
Yes		0	0.0	4	9.3	
To your knowledge, does your child do any of the following?						
Masturbate	89					
No		23	48.9	18	42.9	**0.566**
Yes		24	51.1	24	57.1	
Use contraception	89					
No		46	100.0	36	83.7	**0.005***
Yes		0	0.0	7	16.3	

Table 5.1 (Continued): Univariate Analysis: Child Factors vs. Knows about Sexual Intercourse

Question	Does your child know about sexual intercourse?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Has your child received any of the following therapies?						
ABA therapy	88					
No		38	79.2	35	87.5	**0.301**
Yes		10	20.8	5	12.5	
Speech Therapy	91					
No		0	0.0	4	9.3	**0.046***
Yes		48	100.0	39	90.7	
Has your child participated in any of the following dating behavior?						
Supervised group dates	89					
No		30	65.2	15	34.9	**0.004**
Yes		16	34.8	28	65.1	
Unsupervised group dates	91					
No		48	100.0	30	69.8	**<0.001**
Yes		0	0.0	13	30.2	
Supervised one-on-one dates	90					
No		34	70.8	16	38.1	**0.002**
Yes		14	29.2	26	61.9	
Unsupervised one-on-one dates	91					
No		47	97.9	30	69.8	**<0.001**
Yes		1	2.1	13	30.2	
Exclusive romantic relationship	88					
No		40	87.0	28	66.7	**0.023**
Yes		6	13.0	14	33.3	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

Table 5.2: Univariate Analysis: Parent Factors vs. Knows about Sexual Intercourse

Question	Does your child know about sexual intercourse?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Parent Age	90					
Q1: <49 years		13	27.7	7	16.3	**0.001**
Q2: 49-53 years		19	40.4	6	14.0	
Q3: 54-58 years		10	21.3	12	27.9	
Q4: >58 years		5	10.6	18	41.9	
Parent Education	88					
Less than 4-year degree		16	34.0	15	36.6	**0.891**
4-year degree		15	31.9	14	34.1	
Graduate degree		16	34.0	12	29.3	
Have you received any specialized parent education/training for educating your child about sexual behavior and romance?	91					
No		33	68.8	21	48.8	**0.054**
Yes		15	31.3	22	51.2	
Do you have any concerns about your child with respect to:						
Abuse	90					
No		10	21.3	8	18.6	**0.752**
Yes		37	78.7	35	81.4	
Pregnancy	89					
No		27	57.4	21	48.8	**0.413**
Yes		20	42.6	22	51.2	
STDs	89					
No		24	51.1	17	40.5	**0.317**
Yes		23	48.9	25	59.5	
Do you have concerns with your child being in a romantic relationship?	91					
No		16	33.3	15	34.9	**0.876**
Yes		32	66.7	28	65.1	

Table 5.2 (Continued): Univariate Analysis: Parent Factors vs. Knows about Sexual Intercourse

Question	Does your child know about sexual intercourse?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Are you worried that another person might misinterpret your child's behavior as having sexual content that was not intended?	90					
No		16	34.0	22	51.2	**0.100**
Yes		31	66.0	21	48.8	
Are you concerned that your child has misconceptions about sex?	90					
No		16	34.0	15	34.9	**0.933**
Yes		31	66.0	28	65.1	
Do you or would you allow your child to participate in dating?	91					
No		2	4.2	0	0.0	**0.496***
Yes		46	95.8	43	100.0	
Do you or would you allow your child to participate in a sexually active relationship, now or in the future?	84					
No		13	30.2	2	4.9	**0.002**
Yes		30	69.8	39	95.1	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

3.4c Response to question, "Does your child understand that intercourse can lead to pregnancy/baby?"

Individuals with Down syndrome who were reported to understand that intercourse can lead to pregnancy and a baby and those who were reported to not understand were compared with respect to demographics, experiences with sexuality and romance, and parents' concerns regarding these topics. Tables 6.1 and 6.2 detail selected variables pertaining to the individual with Down syndrome and the survey respondent, respectively. All responses are per mothers' report.

Individuals with Down syndrome who, per their mothers' report, understand that intercourse can lead to pregnancy differed from those who reportedly did not understand this with respect to: a) age (>25 years more likely to understand, 43.6% vs. 14.6%, p=0.001), b) gender (female more likely to understand, 72.5% vs. 48.0%, p=0.019), c) reading level (5^{th} grade or higher more likely to understand, 42.5% vs. 26.0%, p=0.022), d), social media use (72.5% vs. 13.0%, p<0.001), e) contraception use (20.0% vs. 0.0%, p=0.001), f) receiving speech therapy (87.5% vs. 100.0%, p=0.015), g) participation in supervised group dates (70.0% vs. 34.7%, p=0.001), h) participation in unsupervised group dates (35.0% vs. 0.0%, p<0.001), i) participation in supervised one-on-one dates (64.1% vs. 32.0%, p=0.003), and j) participation in unsupervised one-on-one dates (30.0% vs. 6.0%, p=0.002). Mothers who reported that their son or daughter with Down syndrome understands that intercourse can lead to pregnancy differed from those whose child did not with respect to a) parent age (>58 years more likely to report child understands, 41.0% vs. 16.0%, p=0.015) and b) allowing their son or daughter to be sexually active now or in the future (92.1% vs. 72.9%, p=0.023). Responses did not differ significantly for the

remaining variables described in tables 6.1 and 6.2. Although the association was not statistically significant, there was a general trend that individuals with Down syndrome who had a history of being in an exclusive romantic relationship were more likely to understand that intercourse can lead to pregnancy and a baby than not understand, per their mothers' report (p=0.063). Associations that were not statistically significant are listed in Appendix A.

Table 6.1: Univariate Analysis: Child Factors vs. Understands Intercourse Leads to Pregnancy/Baby

Question	**Does your child understand that intercourse can lead to pregnancy/baby?**					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Child Age	87					
12-17 years		24	50.0	6	15.4	**0.001**
18-25 years		17	35.4	16	41.0	
>25 years		7	14.6	17	43.6	
Child Gender	90					
Male		26	52.0	11	27.5	**0.019**
Female		24	48.0	29	72.5	
Reading Level	90					
2nd grade or lower		24	48.0	8	20.0	**0.022**
3rd-4th grade		13	26.0	15	37.5	
5th grade or higher		13	26.0	17	42.5	
Birth order	89					
Oldest		12	24.5	11	27.5	**0.990**
Middle		8	16.3	6	15.0	
Youngest		24	49.0	19	47.5	
Only Child		5	10.2	4	10.0	
Do you believe your child is interested in romance?	90					
No		11	22.0	4	10.0	**0.129**
Yes		39	78.0	36	90.0	

Table 6.1 (Continued): Univariate Analysis: Child Factors vs. Understands Intercourse Leads to Pregnancy/Baby

Question	Does your child understand that intercourse can lead to pregnancy/baby?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Social Media (Facebook, Instagram, Twitter, Snapchat)	87					
No		34	72.3	11	27.5	**<0.001**
Yes		13	13.0	29	72.5	
To your knowledge, has your child been sexually intimate with another person?	90					
No		49	98.0	37	92.5	**0.319***
Yes		1	2.0	3	7.5	
To your knowledge, does your child do any of the following?						
Masturbate	88					
No		21	42.9	20	51.3	**0.431**
Yes		28	57.1	19	48.7	
Use contraception	88					
No		48	100.0	32	80.0	**0.001***
Yes		0	0.0	8	20.0	
Has your child received any of the following therapies?						
ABA therapy	87					
No		39	79.6	33	86.8	**0.375**
Yes		10	20.4	5	13.2	
Speech Therapy						
No		0	0.0	5	12.5	**0.015***
Yes		50	100.0	35	87.5	

Table 6.1 (Continued): Univariate Analysis: Child Factors vs. Understands Intercourse Leads to Pregnancy/Baby

Question	Does your child understand that intercourse can lead to pregnancy/baby?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Has your child participated in any of the following dating behavior?						
Supervised group dates	89					
No		32	65.3	12	30.0	**0.001**
Yes		17	34.7	28	70.0	
Unsupervised group dates	90					
No		50	100.0	26	65.0	**<0.001**
Yes		0	0.0	14	35.0	
Supervised one-on-one dates	89					
No		34	68.0	14	35.9	**0.003**
Yes		16	32.0	25	64.1	
Unsupervised one-on-one dates	90					
No		47	94.0	28	70.0	**0.002**
Yes		3	6.0	12	30.0	
Exclusive romantic relationship	88					
No		41	83.7	26	66.7	**0.063**
Yes		26	16.3	13	33.3	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

Table 6.2: Univariate Analysis: Parent Factors vs. Understands Intercourse Leads to Pregnancy/Baby

Question	Does your child understand that intercourse can lead to pregnancy/baby?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Parent Age	89					
Q1: <49 years		12	24.0	8	20.5	**0.015**
Q2: 49-53 years		19	38.0	5	12.8	
Q3: 54-58 years		11	22.0	10	25.6	
Q4: >58 years		8	16.0	16	41.0	
Parent Education	87					
Less than 4-year degree		16	32.7	14	36.8	**0.869**
4-year degree		18	36.7	12	31.6	
Graduate degree		15	30.6	12	31.6	
Have you received any specialized parent education/training for educating your child about sexual behavior and romance?	90					
No		32	64.0	21	52.5	**0.271**
Yes		18	36.0	19	47.5	
Do you have any concerns about your child with respect to:						
Abuse	90					
No		9	18.0	9	22.5	**0.596**
Yes		41	82.0	31	77.5	
Pregnancy	90					
No		29	58.0	19	47.5	**0.321**
Yes		21	42.0	21	52.5	
STDs	89					
No		24	48.0	16	41.0	**0.512**
Yes		26	52.0	23	59.0	

Table 6.2 (Continued): Univariate Analysis: Parent Factors vs. Understands Intercourse Leads to Pregnancy/Baby

Question	Does your child understand that intercourse can lead to pregnancy/baby?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Do you have concerns with your child being in a romantic relationship?	90					
No		16	32.0	15	37.5	**0.585**
Yes		34	68.0	25	62.5	
Are you worried that another person might misinterpret your child's behavior as having sexual content that was not intended?	89					
No		18	36.0	18	46.2	**0.333**
Yes		32	64.0	21	53.8	
Are you concerned that your child has misconceptions about sex?	89					
No		16	32.7	15	37.5	**0.633**
Yes		33	67.3	25	62.5	
Do you or would you allow your child to participate in dating?	90					
No		2	4.0	0	0.0	**0.501***
Yes		48	96.0	40	100.0	
Do you or would you allow your child to participate in a sexually active relationship, now or in the future?	86					
No		13	27.1	3	7.9	**0.023**
Yes		35	72.9	35	92.1	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

3.4d Response to question, "Does your child know how to decline sexual advances by someone who is interested in them?"

Individuals with Down syndrome who were reported to know how to decline sexual advances by someone who is interested in them and those who were reported to not know how to decline sexual advances were compared with respect to demographics, experiences with sexuality and romance, and parents' concerns regarding these topics. Tables 7.1 and 7.2 detail selected variables pertaining to the individual with Down syndrome and the survey respondent, respectively. All responses are per mothers' report.

Individuals with Down syndrome who, per their mothers' report, know how to decline sexual advances differed from those who reportedly did not know how to decline sexual advances with respect to: a) age (>25 years more likely to understand, 45.2% vs. 11.1%, p=0.001), b) reading level (5th grade or higher more likely to understand, 38.6% vs. 28.3%, p=0.043), c) social media use (63.6% vs. 32.6%, p=0.004), d) participation in supervised group dates (70.5% vs. 31.1%, p<0.001), e) participation in unsupervised group dates (27.3% vs. 4.3%, p=0.003), f) participation in supervised one-on-one dates (63.6% vs. 28.9%, p=0.001), g) participation in unsupervised one-on-one dates (27.3% vs. 6.5%, p=0.008), and h) history of having an exclusive romantic relationship (34.9% vs. 13.3%, p=0.018). Responses did not differ significantly for any of the remaining variables described in table 7.1, nor the parental variables in table 7.2. Although the associations were not statistically significant, there was a general trend that individuals with Down syndrome who a) expressed interested in romance (p=0.059) and whose parents b) are >58 years (p=0.055) are slightly more likely to know how to decline sexual advances than

not know how to decline sexual advances, per their mothers' report. Associations that were not statistically significant are listed in Appendix A.

Table 7.1: Univariate Analysis: Child Factors vs. Knows how to Decline Sexual Advances

Question	Does your child know how to decline sexual advances by someone who is interested in them?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Child Age	87					
12-17 years		22	48.9	8	19.0	**0.001**
18-25 years		18	40.0	15	35.7	
>25 years		15	11.1	19	45.2	
Child Gender	90					
Male		22	47.8	15	34.1	**0.186**
Female		24	52.2	29	65.9	
Reading Level	90					
2nd grade or lower		22	47.8	10	22.7	**0.043**
3rd-4th grade		11	23.9	17	38.6	
5th grade or higher		13	28.3	17	38.6	
Birth order						
Oldest	89	10	22.2	13	29.5	**0.715**
Middle		6	13.3	8	18.2	
Youngest		24	53.3	19	43.2	
Only Child		5	11.1	4	9.1	
Do you believe your child is interested in romance?	90					
No		11	23.9	4	9.1	**0.059**
Yes		34	76.1	40	90.9	
Social Media (Facebook, Instagram, Twitter, Snapchat)	87					
No		29	67.4	16	36.4	**0.004**
Yes		14	32.6	28	63.6	

Table 7.1 (Continued): Univariate Analysis: Child Factors vs. Knows how to Decline Sexual Advances

Question	Does your child know how to decline sexual advances by someone who is interested in them?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
To your knowledge, has your child been sexually intimate with another person?	87					
No		45	97.8	41	93.2	**0.355***
Yes		1	1.0	3	6.8	
To your knowledge, does your child do any of the following?						
Masturbate	88					
No		22	48.9	19	44.2	**0.658**
Yes		23	51.1	24	55.8	
Use contraception	88					
No		41	93.2	39	88.6	**0.713***
Yes		3	6.8	5	11.4	
Has your child received any of the following therapies?						
ABA therapy	87					
No		37	82.2	35	83.3	**0.891**
Yes		8	17.8	7	16.7	
Speech Therapy	90					
No		1	2.2	4	9.1	**0.198***
Yes		45	97.8	40	90.9	
Has your child participated in any of the following dating behavior?						
Supervised group dates	89					
No		31	68.9	13	29.5	**<0.001**
Yes		14	31.1	31	70.5	

Table 7.1 (Continued): Univariate Analysis: Child Factors vs. Knows how to Decline Sexual Advances

Question	Does your child know how to decline sexual advances by someone who is interested in them?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Unsupervised group dates	90					
No		44	95.7	32	72.7	**0.003**
Yes		2	4.3	12	27.3	
Supervised one-on-one dates	89					
No		32	71.1	16	36.4	**0.001**
Yes		13	28.9	28	63.6	
Unsupervised one-on-one dates	90					
No		43	93.5	32	72.7	**0.008**
Yes		3	6.5	12	27.3	
Exclusive romantic relationship	88					
No		39	86.7	28	65.1	**0.018**
Yes		6	13.3	15	34.9	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

Table 7.2: Univariate Analysis: Parent Factors vs. Knows how to Decline Sexual Advances

Question	Does your child know how to decline sexual advances by someone who is interested in them?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Parent Age	89					
Q1: <49 years		12	26.1	8	18.6	**0.055**
Q2: 49-53 years		16	34.8	8	18.6	
Q3: 54-58 years		11	23.9	10	23.3	
Q4: >58 years		7	15.2	17	39.5	
Parent Education	87					
Less than 4-year degree		14	30.4	16	39.0	**0.581**
4-year degree		18	39.1	12	29.3	
Graduate degree		14	30.4	13	31.7	

Table 7.2 (Continued): Univariate Analysis: Parent Factors vs. Knows how to Decline Sexual Advances

Question	Does your child know how to decline sexual advances by someone who is interested in them?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Have you received any specialized parent education/training for educating your child about sexual behavior and romance?	90					
No		29	63.0	24	54.5	**0.413**
Yes		17	37.0	20	45.5	
Do you have any concerns about your child with respect to:						
Abuse	90					
No		8	17.4	10	22.7	**0.527**
Yes		38	82.6	34	77.3	
Pregnancy	90					
No		25	54.3	23	52.3	**0.844**
Yes		21	45.7	21	47.7	
STDs	89					
No		21	45.7	19	44.2	**0.889**
Yes		25	53.3	24	55.8	
Do you have concerns with your child being in a romantic relationship?	90					
No		14	30.4	17	38.6	**0.413**
Yes		32	69.6	27	61.4	
Are you worried that another person might misinterpret your child's behavior as having sexual content that was not intended?	89					
No		16	34.8	20	46.5	**0.260**
Yes		30	65.2	23	53.5	

Table 7.2 (Continued): Univariate Analysis: Parent Factors vs. Knows how to Decline Sexual Advances

Question	Does your child know how to decline sexual advances by someone who is interested in them?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Are you concerned that your child has misconceptions about sex?	89					
No		15	33.3	16	36.4	**0.764**
Yes		30	66.7	28	63.6	
Do you or would you allow your child to participate in dating?	90					
No		2	4.3	0	0.0	**0.495***
Yes		44	95.7	44	100.0	
Do you or would you allow your child to participate in a sexually active relationship, now or in the future?	86					
No		10	22.7	6	14.3	**0.315**
Yes		34	77.3	36	85.7	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

3.4e Response to question, "Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?"

Individuals with Down syndrome who were reported to understand what is and what is not acceptable behavior toward romantic interests and those who were reported to not understand acceptable behavior varied with respect to demographics, experiences with sexuality and romance, and parents' concerns regarding these topics. Tables 8.1 and 8.2 detail selected variables pertaining to the individual with Down syndrome and the survey respondent, respectively. All responses are per mothers' report.

Individuals with Down syndrome who, per their mothers' report, understand what is and what is not acceptable behavior toward romantic interests differed from those who reportedly did not understand what is acceptable behavior with respect to: a) age (>25 years more likely to understand, 36.0% vs. 15.4%, p=0.025), b) reading level (5th grade or higher more likely to understand, 43.1% vs. 19.5%, p=0.043), c) receiving ABA therapy (10.0% vs. 25.6%, p=0.050), d) participation in supervised group dates (69.4% vs. 29.3%, p<0.001), e) participation in unsupervised group dates (23.5% vs. 4.9%, p=0.013), f) participation in supervised one-on-one dates (68.6% vs. 17.5%, p<0.001), g) participation in unsupervised one-on-one dates (23.5% vs. 7.3%, p=0.036), and h) history of having an exclusive romantic relationship (36.7% vs. 7.5%, p=0.001). Mothers who reported that their son or daughter with Down syndrome understands what is and what is not acceptable behavior toward romantic interests differed from those whose child did not understand with respect to having concerns about their child regarding abuse (p=0.030). Responses did not differ significantly for any of the remaining variables described in tables 8.1 and 8.2. Although the associations were not statistically significant, there was a general trend that individuals with Down syndrome who a) are female (p=0.054), b) use social media (p=0.100), and c) did not receive speech therapy (p=0.063), and whose parents d) are >58 years (p=0.075) and e) were not concerned others would misinterpret their child's behavior as sexual (p=0.097) are slightly more likely to understand what is acceptable behavior toward romantic interests than not understand acceptable behavior, per their mothers' report. Associations that were not statistically significant are listed in Appendix A.

Table 8.1: Univariate Analysis: Child Factors vs. Understands What is Acceptable Behavior Toward Romantic Interests

Question	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Child Age	89					
12-17 years		19	48.7	12	24.0	**0.025**
18-25 years		14	35.9	20	40.0	
>25 years		6	15.4	18	36.0	
Child Gender	92					
Male		21	51.2	16	31.4	**0.054**
Female		20	48.8	35	68.6	
Reading Level	92					
2nd grade or lower		19	46.3	14	27.5	**0.043**
3rd-4th grade		14	34.1	15	29.4	
5th grade or higher		8	19.5	22	43.1	
Birth order	91					
Oldest		10	25.0	13	25.5	**0.990**
Middle		6	15.0	8	15.7	
Youngest		20	50.0	24	47.1	
Only Child		4	10.0	6	11.8	
Do you believe your child is interested in romance?						
No		9	22.0	6	11.8	**0.189**
Yes		32	78.0	45	88.2	
Social Media (Facebook, Instagram, Twitter, Snapchat)	89					
No		24	61.5	22	44.0	**0.100**
Yes		15	38.5	28	56.0	

Table 8.1 (Continued): Univariate Analysis: Child Factors vs. Understands What is Acceptable Behavior Toward Romantic Interests

Question	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
To your knowledge, has your child been sexually intimate with another person?	92					
No		40	97.6	48	94.1	**0.626***
Yes		1	2.4	3	5.9	
To your knowledge, does your child do any of the following?						
Masturbate	90					
No		17	41.5	25	51.0	**0.365**
Yes		24	58.5	24	49.0	
Use contraception						
No	90	37	92.5	44	88.0	**0.726***
Yes		3	7.5	6	12.0	
Has your child received any of the following therapies?						
ABA therapy	89					
No		29	74.4	45	90.0	**0.050**
Yes		10	25.6	5	10.0	
Speech Therapy	92					
No		0	0.0	5	9.8	**0.063***
Yes		41	100.0	46	90.2	
Has your child participated in any of the following dating behavior?						
Supervised group dates	90					
No		29	70.7	15	30.6	**<0.001**
Yes		12	29.3	34	69.4	

Table 8.1 (Continued): Univariate Analysis: Child Factors vs. Understands What is Acceptable Behavior Toward Romantic Interests

Question	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Unsupervised group dates	92					
No		39	95.1	39	76.5	**0.013**
Yes		2	4.9	12	23.5	
Supervised one-on-one dates	91					
No		33	82.5	16	31.4	**<0.001**
Yes		7	17.5	35	68.6	
Unsupervised one-on-one dates	92					
No		38	92.7	39	76.5	**0.036**
Yes		3	7.3	12	23.5	
Has had an exclusive romantic relationship	89					
No		37	92.5	31	63.3	**0.001**
Yes		3	7.5	18	36.7	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

Table 8.2: Univariate Analysis: Parent Factors vs. Understands What is Acceptable Behavior Toward Romantic Interests

Question	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Parent Age	91					
Q1: <49 years		10	24.4	11	22.0	**0.075**
Q2: 49-53 years		15	36.6	9	18.0	
Q3: 54-58 years		10	24.4	12	24.0	
Q4: >58 years		6	14.6	18	36.0	
Parent Education	89					
Less than 4-year degree		14	34.1	17	35.4	**0.855**
4-year degree		15	36.6	15	31.3	
Graduate degree		12	29.3	16	33.3	

Table 8.2 (Continued): Univariate Analysis: Parent Factors vs. Understands What is Acceptable Behavior Toward Romantic Interests

Question	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Have you received any specialized parent education/training for educating your child about sexual behavior and romance?	92					
No		26	63.4	29	56.9	**0.524**
Yes		15	36.6	22	43.1	
Do you have any concerns about your child with respect to:						
Abuse	91					
No		4	9.8	14	28.0	**0.030**
Yes		37	90.2	36	72.0	
Pregnancy	91					
No		23	56.1	26	52.0	**0.696**
Yes		18	43.9	24	48.0	
STDs	90					
No		17	41.5	23	46.9	**0.603**
Yes		24	58.5	26	53.1	
Do you have concerns with your child being in a romantic relationship?	92					
No		11	26.8	21	41.2	**0.151**
Yes		30	73.2	30	58.8	
Are you worried that another person might misinterpret your child's behavior as having sexual content that was not intended?	90					
No		13	31.7	24	49.0	**0.097**
Yes		28	68.3	25	51.0	

Table 8.2 (Continued): Univariate Analysis: Parent Factors vs. Understands What is Acceptable Behavior Toward Romantic Interests

Question	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?					
Variable	**N**	**No (#)**	**No (%)**	**Yes (#)**	**Yes (%)**	**p-value**
Are you concerned that your child has misconceptions about sex?	91					
No		12	29.3	20	40.0	**0.286**
Yes		29	70.7	30	60.0	
Do you or would you allow your child to participate in dating?	92					
No		2	4.9	0	0.0	**0.196***
Yes		39	95.1	51	100.0	
Do you or would you allow your child to participate in a sexually active relationship, now or in the future?	87					
No		8	19.5	8	17.4	**0.799**
Yes		33	80.5	38	82.6	

***=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.**

3.4f Reponses to five measures of sexual education comprehension by number of sexual education sources received

Responses to the five questions selected as measures of sexual education comprehension in the individual with Down syndrome differed significantly with respect to the number of sources of sexual education they received. Results are summarized in Tables 9.1 through 9.5. Compared with those who received sexual education from a single source or no sources, individuals with Down syndrome whose mothers reported that they

received multiple sources of sexual education were 3.571 times more likely to understand consent (83.3% vs. 16.7%, p=0.010), 9.344 times more likely to know about sexual intercourse (90.7% vs. 9.3%, p<0.001), 7.071 times more likely to understand that intercourse can lead to pregnancy/baby (90.0% vs. 10.0%, p<0.001), 4.872 times more likely to know how to decline sexual advances by someone who is interested in them (86.4% vs. 13.6%, p=0.002), and 3.227 times more likely to understand what is and what is not acceptable behavior toward romantic interests (82.0% vs. 18.0%, p=0.014).

Table 9.1: Number of Sources of Sexual Education vs. Understands Consent

Question	Do you believe your child understands consent?					
	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Sources of Sex Education	90					
Zero or One	27	20	41.7	7	16.7	0.010
Multiple	63	28	58.3	35	83.3	

Odds Ratio for Sex Ed Sources	3.571
95% CI	(1.322, 9.649)

Table 9.2: Number of Sources of Sexual Education vs. Knows about Sexual Intercourse

Question	Does your child know about sexual intercourse?					
	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Sources of Sex Education	90					
Zero or One	27	23	48.9	4	9.3	<0.001
Multiple	63	24	51.1	39	90.7	

Odds Ratio for Sex Ed Sources	9.344
95% CI	(2.879, 30.325)

Table 9.3: Number of Sources of Sexual Education vs. Knows Intercourse Leads to Pregnancy/Baby

Question	Does your child understand that intercourse can lead to pregnancy/baby?					
	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Sources of Sex Education	90					
Zero or One	26	22	44.0	4	10.0	<0.001
Multiple	64	28	56.0	36	90.0	

Odds Ratio for Sex Ed Sources	7.071
95% CI	(2.185, 22.881)

Table 9.4: Number of Sources of Sexual Education vs. Know how to Decline Sexual Advances

Question	Does your child know how to decline sexual advances by someone who is interested in them?					
	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Sources of Sex Education	90					
Zero or One	26	20	43.5	6	13.6	0.002
Multiple	64	46	56.5	44	86.4	

Odds Ratio for Sex Ed Sources	4.872
95% CI	(1.722, 13.780)

Table 9.5: Number of Sources of Sexual Education vs. Understands What is Acceptable Behavior Toward Romantic Interests

Question	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?					
	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Sources of Sex Education	91					
Zero or One	26	17	41.5	9	18.0	0.014
Multiple	65	24	58.5	41	82.0	

Odds Ratio for Sex Ed Sources	3.227
95% CI	(1.245, 8.361)

3.5 Multivariate analysis

Logistic regression was utilized to investigate the importance of number of sources of sexual education received (zero or one vs. two or more) as a predictor of understanding each of the five measures of sexual education comprehension, after accounting for differences in the age, gender, reading level (used as a proxy for developmental level), and other child or parental factors. Although age and gender of the individual with Down syndrome were not significant predictors for all five measures of sexual education comprehension, these variables were retained in the model to control for potential confounding effects, due to the varying age distribution between males and females in this sample. In the regression tables, the odds ratio is presented as "Exp(B)." After adjusting for differences in age, gender, and reading level of the respondents' children, individuals who received sexual education from multiple sources were more likely to understand four of the five measures of sexual education comprehension than those who receive sexual education from a single or no sources. In the multivariate model, number of sexual education sources received was no longer significantly associated with the outcome variable understanding

what is and what is not acceptable behavior toward romantic interests. Compared with those who received sexual education from a single or no sources, individuals with Down syndrome whose mothers reported that they received multiple sources of sexual education were 3.017 times more likely to understand consent (p=0.040; 95%CI: 1.050, 8.673), 9.344 times more likely to know about sexual intercourse (p=0.001; 95% CI: 2.416, 33.611), 5.174 times more likely to understand that intercourse can lead to pregnancy/baby (p=0.011; 95% CI: 1.454, 18.415) and 3.351 times more likely to know how to decline sexual advances by someone who is interested in them (p=0.038; 95% CI: 1.069, 10.503). The findings are summarized in Tables 10.1-10.5.

Table 10.1: Effects of age, gender, and development on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.104	0.539	4.202	1	0.040	3.017	1.050	8.673
Age 12-17			0.344	2	0.842			
Age 18-25	-0.301	0.542	0.308	1	0.579	0.740	0.256	2.143
Age >25	-0.059	0.582	0.010	1	0.919	0.942	0.301	2.947
Reads at/above a 5th grade level	0.652	0.488	1.786	1	0.181	1.919	0.738	4.993
Gender (M vs F)	-0.205	0.477	0.185	1	0.667	0.815	0.320	2.074
Constant	-0.933	0.542	2.960	1	0.085	0.393		

Included in Analysis: (N) = 87

Table 10.2: Effects of age, gender, and development on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	2.198	0.672	10.713	1	0.001	9.011	2.416	33.611
Age 12-17			12.351	2	0.002			
Age 18-25	2.049	0.654	9.824	1	0.002	7.760	2.155	27.945
Age >25	2.128	0.703	9.171	1	0.002	8.399	2.119	33.295
Reads at/above a 5th grade level	0.054	0.587	0.008	1	0.927	1.055	0.334	3.337
Gender (M vs F)	0.491	0.549	0.797	1	0.372	1.633	0.556	4.795
Constant	-3.402	0.808	17.715	1	<0.001	0.033		

Included in Analysis: (N) = 87

Table 10.3: Effects of age, gender, and development on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.644	0.648	6.441	1	0.011	5.174	1.454	18.415
Age 12-17			8.490	2	0.014			
Age 18-25	1.285	0.615	4.366	1	0.037	3.613	1.083	12.055
Age >25	1.936	0.678	8.153	1	0.004	6.931	1.835	26.181
Reads at/above a 5th grade level	0.085	0.539	0.025	1	0.875	1.088	0.379	3.130
Gender (M vs F)	0.556	0.527	1.113	1	0.291	1.743	0.621	4.893
Constant	-2.895	0.766	14.304	1	<0.001	0.055		

Included in Analysis: (N) = 87

Table 10.4: Effects of age, gender, and development on whether individuals who received sexual education from multiple sources are more likely to know how to decline sexual advances

Question:	Does your child know how to decline sexual advances by someone who is interested in them?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.209	0.583	4.306	1	0.038	3.351	1.069	10.503
Age 12-17			9.805	2	0.007			
Age 18-25	0.775	0.563	1.892	1	0.169	2.170	0.720	6.546
Age >25	2.140	0.685	9.763	1	0.002	8.502	2.221	32.551
Reads at/above a 5th grade level	-0.087	0.533	0.026	1	0.871	0.917	0.322	2.608
Gender (M vs F)	0.089	0.513	0.030	1	0.863	1.093	0.400	2.990
Constant	-1.848	0.635	8.479	1	0.004	0.157		

Included in Analysis: (N) = 87

Table 10.5: Effects of age, gender, and development on whether individuals who received sexual education from multiple sources are more likely to understand what is acceptable behavior toward romantic interests

Question:	Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.761	0.530	2.061	1	0.151	2.141	0.757	6.052
Age 12-17			4.389	2	0.111			
Age 18-25	0.791	0.537	2.175	1	0.140	2.206	0.771	6.315
Age >25	1.272	0.636	3.999	1	0.046	3.568	1.026	12.415
Reads at/above a 5th grade level	0.806	0.523	2.375	1	0.123	2.239	0.803	6.242
Gender (M vs F)	0.303	0.490	0.383	1	0.536	1.354	0.519	3.534
Constant	-1.377	0.565	5.954	1	0.015	0.252		

Included in Analysis: (N) = 88

Additional variables that were significantly associated with outcome in the univariate analyses were incorporated into the logistic regression model with age, gender, and reading level of the individual with Down syndrome, which are summarized in Tables 10.6-10.38. The number of sources of sexual education received remained significantly associated with prediction of whether the individual with Down syndrome understands the measure of sexual education comprehension after accounting for differences in age, gender, reading level, and additional variables as noted below. Adjusted odds ratios and confidence intervals for number of sources of sexual education are summarized:

1) Do you believe your child understands consent? (Tables 10.6-10.8)

a. The individual with Down syndrome has been in an exclusive romantic relationship (p=0.035; OR: 3.366; 95% CI: 1.086, 10.433)
b. The respondent expressed concern for their child being in a romantic relationship (p=0.006; OR: 6.360; 95% CI: 1.702, 23.756)
c. The respondent expressed concern for others to misinterpret their child's behavior as sexual (p=0.041; OR: 3.413; 95% CI: 1.049, 11.099)

2) Does your child know about sexual intercourse? (Tables 10.9-10.18)

a. The individual with Down syndrome uses social media (p=0.012; OR: 6.342: 95% CI: 1.512, 26.599)
b. The individual with Down syndrome has participated in supervised group dates (p=0.001; OR: 9.263: 95% CI: 2.384, 35.988)
c. The individual with Down syndrome has participated in unsupervised group dates (p=0.008; OR: 6.361: 95% CI: 1.636, 24.739)

d. The individual with Down syndrome has participated in supervised one-on-one dates (p=0.002; OR: 8.121; 95% CI: 2.132, 30.937)
e. The individual with Down syndrome has participated in unsupervised one-on-one dates (p=0.005; OR: 6.691; 95% CI: 1.753, 25.541)
f. The individual with Down syndrome has been in an exclusive romantic relationship (p=0.002; OR: 8.079; 95% CI: 2.154, 30.294)
g. To the respondent's knowledge, the individual with Down syndrome has been sexually intimate with another person (p=0.005; OR: 6.691; 95% CI: 1.753, 25.541)
h. To the respondent's knowledge, the individual with Down syndrome uses contraception (p=0.002; OR: 10.553; 95% CI: 2.412, 46.165)
i. The individual with Down syndrome has received speech therapy (p=0.001; OR: 11.155; 95% CI: 2.622, 47.458)
j. The respondent allows or would allow their child to participate in a sexually active relationship (p=0.004; OR: 9.203; 95% CI: 2.071, 40.889)

3) Does your child understand that intercourse can lead to pregnancy/baby? (Tables 10.19-10.24)

a. The individual with Down syndrome has participated in supervised group dates (p=0.022; OR: 4.590; 95% CI: 1.240, 16.992)
b. The individual with Down syndrome has participated in supervised one-on-one dates (p=0.020; OR:4.610; 95% CI: 1.271, 16.702)
c. The individual with Down syndrome has participated in unsupervised one-on-one dates (p=0.025; OR: 4.350; 95% CI: 1.202, 15.741)

d. To the respondent's knowledge, the individual with Down syndrome uses contraception (p=0.021; OR: 5.327; 95% CI: 1.283, 22.125)

e. The individual with Down syndrome has received speech therapy (p=0.010; OR: 6.269; 95% CI: 1.537, 25.570)

f. The respondent allows or would allow their child to participate in a sexually active relationship (p=0.020; OR: 4.905; 95% CI: 1.288, 18.673)

Table 10.6: Effects of age, gender, development, and history of being in an exclusive romantic relationship on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.214	0.577	4.422	1	0.035	3.366	1.086	10.433
Age 12-17			1.762	2	0.414			
Age 18-25	-0.776	0.595	1.704	1	0.192	0.460	0.143	1.476
Age >25	-0.546	0.633	0.743	1	0.389	0.579	0.167	2.005
Reads at/above a 5th grade level	0.482	0.522	0.852	1	0.356	1.619	0.582	4.508
Gender (M vs F)	-0.187	0.512	0.133	1	0.715	0.830	0.304	2.264
Has been in an exclusive romantic relationship	1.391	0.616	5.098	1	0.024	4.020	1.202	13.452
Constant	-1.052	0.575	3.348	1	0.067	0.349		

Included in Analysis: (N) = 85

Table 10.7: Effects of age, gender, development, and parental concern for child being in a romantic relationship on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.850	0.672	7.570	1	0.006	6.360	1.702	23.756
Age 12-17			0.806	2	0.668			
Age 18-25	-0.489	0.591	0.686	1	0.407	0.613	0.193	1.951
Age >25	-0.447	0.646	0.480	1	0.488	0.639	0.180	2.266
Reads at/above a 5th grade level	0.713	0.548	1.693	1	0.193	2.040	0.697	5.974
Gender (M vs F)	-0.080	0.525	0.024	1	0.878	0.923	0.330	2.579
Parental concern for child being in a romantic relationship	-2.103	0.627	11.241	1	0.001	0.122	0.036	0.417
Constant	0.031	0.626	0.002	1	0.961	1.031		

Included in Analysis: (N) = 87

Table 10.8: Effects of age, gender, development, and parental concern for others to misinterpret child's behavior as sexual on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.228	0.602	4.162	1	0.041	3.413	1.049	11.099
Age 12-17			0.919	2	0.632			
Age 18-25	-0.510	0.572	0.796	1	0.372	0.600	0.196	1.842
Age >25	-0.473	0.634	0.556	1	0.456	0.623	0.180	2.161
Reads at/above a 5th grade level	0.610	0.519	1.381	1	0.240	1.841	0.665	5.094
Gender (M vs F)	-0.379	0.511	0.550	1	0.458	0.685	0.251	1.864
Parental concern for others to misinterpret child's behavior as sexual	-1.221	0.502	5.909	1	0.015	0.295	0.110	0.789
Constant	-0.012	0.697	0.000	1	0.986	0.988		

Included in Analysis: (N) = 86

Table 10.9: Effects of age, gender, development, and social media use on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.847	0.732	6.376	1	0.012	6.342	1.512	26.599
Age 12-17			7.921	2	0.019			
Age 18-25	1.658	0.702	5.578	1	0.018	5.251	1.326	20.793
Age >25	1.947	0.755	6.656	1	0.010	7.007	1.597	30.752
Reads at/above a 5th grade level	-0.261	0.640	0.166	1	0.684	0.770	0.220	2.702
Gender (M vs F)	0.699	0.600	1.356	1	0.244	2.012	0.620	6.526
Uses social media	1.655	0.596	7.723	1	0.005	5.233	1.629	16.812
Constant	-3.751	0.941	15.894	1	<0.001	0.024		

Included in Analysis: (N) = 84

Table 10.10: Effects of age, gender, development, and participation in supervised group dates on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	2.226	0.692	10.335	1	0.001	9.263	2.384	35.988
Age 12-17			10.862	2	0.004			
Age 18-25	2.022	0.696	8.434	1	0.004	7.554	1.930	29.569
Age >25	2.300	0.780	8.706	1	0.003	9.975	2.165	45.965
Reads at/above a 5th grade level	0.212	0.613	0.119	1	0.730	1.236	0.372	4.104
Gender (M vs F)	0.566	0.563	1.010	1	0.315	1.761	0.584	5.309
Has been on supervised group dates	0.063	0.611	0.011	1	0.917	1.065	0.321	3.532
Constant	-3.526	0.827	18.187	1	<0.001	0.029		

Included in Analysis: (N) = 86

Table 10.11: Effects of age, gender, development, and participation in unsupervised group dates on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.850	0.693	7.129	1	0.008	6.361	1.636	24.739
Age 12-17			9.728	2	0.008			
Age 18-25	2.088	0.714	8.540	1	0.003	8.068	1.989	32.729
Age >25	1.890	0.757	6.230	1	0.013	6.623	1.501	29.222
Reads at/above a 5th grade level	-0.591	0.666	0.788	1	0.375	0.554	0.150	2.042
Gender (M vs F)	1.015	0.618	2.692	1	0.101	2.758	0.821	9.267
Has been on unsupervised group dates	21.460	>10,000	0.000	1	0.998	>100,000	0.000	
Constant	-3.529	0.867	16.570	1	<0.001	0.029		

Included in Analysis: (N) = 87

Table 10.12: Effects of age, gender, development, and participation in supervised one-on-one dates on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	2.094	0.682	9.420	1	0.002	8.121	2.132	30.937
Age 12-17			7.969	2	0.019			
Age 18-25	1.835	0.725	6.410	1	0.011	6.263	1.513	25.914
Age >25	1.951	0.768	6.462	1	0.011	7.036	1.563	31.672
Reads at/above a 5th grade level	0.058	0.588	0.010	1	0.921	1.060	0.335	3.359
Gender (M vs F)	0.466	0.552	0.712	1	0.399	1.593	0.540	4.699
Has been on supervised one-on-one dates	0.319	0.615	0.269	1	0.604	1.375	0.412	4.588
Constant	-3.331	0.806	17.082	1	<0.001	0.036		

Included in Analysis: (N) = 86

Table 10.13: Effects of age, gender, development, and participation in unsupervised one-on-one dates on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.901	0.683	7.735	1	0.005	6.691	1.753	25.541
Age 12-17			9.832	2	0.007			
Age 18-25	2.011	0.666	9.118	1	0.003	7.473	2.025	27.571
Age >25	1.672	0.744	5.046	1	0.025	5.325	1.238	22.909
Reads at/above a 5th grade level	-0.248	0.628	0.156	1	0.693	0.780	0.228	2.672
Gender (M vs F)	0.664	0.574	1.339	1	0.247	1.943	0.631	5.988
Has been on unsupervised one-on-one dates	2.297	1.196	3.687	1	0.055	9.948	0.953	103.782
Constant	-3.302	0.815	16.421	1	<0.001	0.037		

Included in Analysis: (N) = 87

Table 10.14: Effects of age, gender, development, and history of being in an exclusive romantic relationship on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	2.089	0.674	9.598	1	0.002	8.079	2.154	30.294
Age 12-17			10.597	2	0.005			
Age 18-25	2.003	0.671	8.899	1	0.003	7.412	1.988	27.635
Age >25	1.974	0.721	7.484	1	0.006	7.198	1.750	29.604
Reads at/above a 5th grade level	-0.088	0.609	0.021	1	0.886	0.916	0.278	3.023
Gender (M vs F)	0.511	0.559	0.834	1	0.361	1.666	0.557	4.984
Has been in an exclusive romantic relationship	0.330	0.683	0.233	1	0.629	1.391	0.365	5.309
Constant	-3.305	0.810	16.640	1	<0.001	0.037		

Included in Analysis: (N) = 85

Table 10.15: Effects of age, gender, development, and history of being sexually intimate with someone on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.901	0.683	7.735	1	0.005	6.691	1.753	25.541
Age 12-17			9.832	2	0.007			
Age 18-25	2.011	0.666	9.118	1	0.003	7.473	2.025	27.571
Age >25	1.672	0.744	5.046	1	0.025	5.325	1.238	22.909
Reads at/above a 5th grade level	-0.248	0.628	0.156	1	0.693	0.780	0.228	2.672
Gender (M vs F)	0.664	0.574	1.339	1	0.247	1.943	0.631	5.988
Child has been sexually intimate with another person	2.297	1.196	3.687	1	0.055	9.948	0.953	103.782
Constant	-3.302	0.815	16.421	1	<0.001	0.037		

Included in Analysis: (N) = 87

Table 10.16: Effects of age, gender, development, and use of contraception on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	2.356	0.753	9.793	1	0.002	10.553	2.412	46.165
Age 12-17			12.723	2	0.002			
Age 18-25	2.353	0.738	10.158	1	0.001	10.517	2.474	44.699
Age >25	2.503	0.792	9.977	1	0.002	12.216	2.585	57.722
Reads at/above a 5th grade level	0.112	0.647	0.030	1	0.863	1.118	0.315	3.974
Gender (M vs F)	0.439	0.598	0.539	1	0.463	1.551	0.480	5.010
Child uses contraception	21.471	>10,000	0.000	1	0.999	>100,000	0.000	
Constant	-3.920	0.938	17.469	1	<0.001	0.020		

Included in Analysis: (N) = 85

Table 10.17: Effects of age, gender, development, and history of receiving speech therapy on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	2.412	0.739	10.658	1	0.001	11.155	2.622	47.458
Age 12-17			12.426	2	0.002			
Age 18-25	2.136	0.699	9.344	1	0.002	8.469	2.152	33.324
Age >25	2.370	0.742	10.198	1	0.001	10.698	2.498	45.821
Reads at/above a 5th grade level	-0.081	0.614	0.017	1	0.896	0.923	0.277	3.073
Gender (M vs F)	0.510	0.578	0.780	1	0.377	1.666	0.537	5.171
Child has received speech therapy	21.979	>10,000	0.000	1	0.999	>100,000	0.000	
Constant	-3.775	0.891	17.931	1	<0.001	0.023		

Included in Analysis: (N) = 87

Table 10.18: Effects of age, gender, development, and parental allowance for child to be sexually active on whether individuals who received sexual education from multiple sources are more likely to know about sexual intercourse

Question:	Does your child know about sexual intercourse?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	2.219	0.761	8.508	1	0.004	9.203	2.071	40.889
Age 12-17			11.945	2	0.003			
Age 18-25	2.334	0.738	9.997	1	0.002	10.321	2.429	43.866
Age >25	2.317	0.802	8.357	1	0.004	10.146	2.109	48.816
Reads at/above a 5th grade level	-0.473	0.667	0.502	1	0.479	0.623	0.169	2.305
Gender (M vs F)	0.694	0.611	1.290	1	0.256	2.002	0.604	6.638
Parent allows/would allow child to be sexually active	2.865	0.970	8.720	1	0.003	17.541	2.620	117.442
Constant	-5.896	1.419	17.262	1	<0.001	0.003		

Included in Analysis: (N) = 83

Table 10.19: Effects of age, gender, development, and participation in supervised group dates on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.524	0.668	5.207	1	0.022	4.590	1.240	16.992
Age 12-17			6.521	2	0.038			
Age 18-25	1.064	0.647	2.699	1	0.100	2.897	0.814	10.306
Age >25	1.856	0.729	6.480	1	0.011	6.401	1.533	26.727
Reads at/above a 5th grade level	0.109	0.564	0.037	1	0.847	1.115	0.369	3.370
Gender (M vs F)	0.640	0.540	1.402	1	0.236	1.896	0.658	5.467
Has been on supervised group dates	0.604	0.567	1.131	1	0.287	1.829	0.601	5.561
Constant	-3.020	0.786	14.775	1	<0.001	0.049		

Included in Analysis: (N) = 86

Table 10.20: Effects of age, gender, development, and participation in supervised group dates on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.528	0.657	5.415	1	0.020	4.610	1.273	16.702
Age 12-17			5.250	2	0.072			
Age 18-25	1.006	0.684	2.165	1	0.141	2.736	0.716	10.456
Age >25	1.700	0.742	5.250	1	0.022	5.472	1.279	23.423
Reads at/above a 5th grade level	0.103	0.542	0.036	1	0.850	1.108	0.383	3.206
Gender (M vs F)	0.523	0.531	0.972	1	0.324	1.687	0.596	4.774
Has been on supervised one-on-one dates	0.423	0.580	0.531	1	0.466	1.526	0.489	4.760
Constant	-2.837	0.764	13.799	1	<0.001	0.059		

Included in Analysis: (N) = 86

Table 10.21: Effects of age, gender, development, and participation in unsupervised one-on-one dates on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.470	0.656	5.018	1	0.025	4.350	1.202	15.741
Age 12-17			6.186	2	0.045			
Age 18-25	1.223	0.616	3.932	1	0.047	3.396	1.014	11.368
Age >25	1.657	0.708	5.475	1	0.019	5.243	1.309	21.006
Reads at/above a 5th grade level	-0.043	0.556	0.006	1	0.938	0.958	0.322	2.845
Gender (M vs F)	0.625	0.536	1.363	1	0.243	1.869	0.654	5.339
Has been on unsupervised one-on-one dates	0.997	0.792	1.586	1	0.208	2.711	0.574	12.806
Constant	-2.812	0.760	13.681	1	<0.001	0.060		

Included in Analysis: (N) = 87

Table 10.22: Effects of age, gender, development, and use of contraception on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.673	0.727	5.302	1	0.021	5.327	1.283	22.125
Age 12-17			8.967	2	0.011			
Age 18-25	1.504	0.694	4.689	1	0.030	4.498	1.153	17.538
Age >25	2.265	0.766	8.748	1	0.003	9.627	2.147	43.177
Reads at/above a 5th grade level	0.074	0.593	0.016	1	0.901	1.077	0.337	3.442
Gender (M vs F)	0.449	0.566	0.629	1	0.428	1.567	0.516	4.756
Child uses contraception	21.453	13303.649	0.000	1	0.999	>1,000,000	0.000	
Constant	-3.237	0.881	13.490	1	<0.001	0.039		

Included in Analysis: (N) = 85

Table 10.23: Effects of age, gender, development, and history of receiving speech therapy on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.836	0.717	6.548	1	0.010	6.269	1.537	25.570
Age 12-17			8.818	2	0.012			
Age 18-25	1.331	0.659	4.077	1	0.043	3.786	1.040	13.784
Age >25	2.104	0.713	8.708	1	0.003	8.200	2.027	33.170
Reads at/above a 5th grade level	-0.024	0.564	0.002	1	0.966	0.976	0.323	2.950
Gender (M vs F)	0.548	0.552	0.984	1	0.321	1.729	0.586	5.102
Child has received speech therapy	21.819	18428.840	0.000	1	0.999	>1,000,000	0.000	
Constant	-3.219	0.849	14.372	1	<0.001	0.040		

Included in Analysis: (N) = 87

Table 10.24: Effects of age, gender, development, and history of being sexually intimate with someone on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.661	0.652	6.494	1	0.011	5.266	1.468	18.898
Age 12-17			8.509	2	0.014			
Age 18-25	1.300	0.618	4.425	1	0.035	3.668	1.093	12.314
Age >25	1.966	0.688	8.173	1	0.004	7.144	1.856	27.504
Reads at/above a 5th grade level	0.073	0.541	0.018	1	0.892	1.076	0.373	3.106
Gender (M vs F)	0.576	0.533	1.170	1	0.279	1.779	0.626	5.055
Child has been sexually intimate with another person	-0.376	1.307	0.083	1	0.774	0.686	0.053	8.901
Constant	-2.920	0.773	14.248	1	<0.001	0.054		

Included in Analysis: (N) = 87

The number of sources of sexual education received was no longer significantly associated with prediction of whether the individual with Down syndrome understands the measure of sexual education comprehension after accounting for differences in age, gender, reading level, and additional variables as noted below:

1) Do you believe your child understands consent? (Tables 10.25-10.30)

a. The individual with Down syndrome uses social media (p=0.301)
b. The individual with Down syndrome has participated in supervised group dates (p=0.087)
c. The individual with Down syndrome has participated in unsupervised group dates (p=0.129)

d. The individual with Down syndrome has participated in supervised one-on-one dates (p=0.090)
e. The individual with Down syndrome has participated in unsupervised one-on-one dates (p=0.122)
f. The respondent allows or would allow their child to participate in a sexually active relationship (p=0.136)

2) Does your child understand that intercourse can lead to pregnancy/baby? (Tables 10.31-10.32)

a. The individual with Down syndrome uses social media (p=0.104)
b. The individual with Down syndrome has participated in unsupervised group dates (p=0.069)

3) Does your child know how to decline sexual advances by someone who is interested in them? (Tables 10.33-10.38)

a. The individual with Down syndrome uses social media (p=0.149)
b. The individual with Down syndrome has participated in supervised group dates (p=0.094)
c. The individual with Down syndrome has participated in unsupervised group dates (p=0.095)
d. The individual with Down syndrome has participated in supervised one-on-one dates (p=0.053)
e. The individual with Down syndrome has participated in unsupervised one-on-one dates (p=0.067)

f. The individual with Down syndrome has been in an exclusive romantic relationship (p=0.065)

Table 10.25: Effects of age, gender, development, and social media use on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.600	0.579	1.071	1	0.301	1.821	0.585	5.671
Age 12-17			1.086	2	0.581			
Age 18-25	-0.635	0.613	1.072	1	0.300	0.530	0.159	1.763
Age >25	-0.291	0.621	0.220	1	0.639	0.748	0.222	2.523
Reads at/above a 5th grade level	0.531	0.501	1.121	1	0.290	1.701	0.636	4.544
Gender (M vs F)	-0.052	0.492	0.011	1	0.916	0.949	0.362	2.492
Uses social media	1.000	0.544	3.380	1	0.066	2.719	0.936	7.899
Constant	-0.930	0.560	2.756	1	0.097	0.395		

Included in Analysis: (N) = 84

Table 10.26: Effects of age, gender, development, and participation in supervised group dates on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.946	0.553	2.926	1	0.087	2.576	0.871	7.616
Age 12-17			1.323	2	0.516			
Age 18-25	-0.693	0.603	1.320	1	0.251	0.500	0.153	1.631
Age >25	-0.467	0.674	0.480	1	0.489	0.627	0.167	2.349
Reads at/above a 5th grade level	0.598	0.512	1.364	1	0.243	1.818	0.667	4.957
Gender (M vs F)	-0.148	0.488	0.092	1	0.762	0.862	0.331	2.246
Has been on supervised group dates	0.964	0.552	3.054	1	0.081	2.622	0.889	7.732
Constant	-1.028	0.552	3.473	1	0.062	0.358		

Included in Analysis: (N) = 86

Table 10.27: Effects of age, gender, development, and participation in unsupervised group dates on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.838	0.552	2.304	1	0.129	2.311	0.784	6.818
Age 12-17			0.819	2	0.664			
Age 18-25	-0.486	0.559	0.757	1	0.384	0.615	0.206	1.838
Age >25	-0.385	0.616	0.390	1	0.532	0.681	0.204	2.276
Reads at/above a 5th grade level	0.369	0.523	0.499	1	0.480	1.447	0.519	4.032
Gender (M vs F)	-0.022	0.502	0.002	1	0.964	0.978	0.366	2.614
Has been on unsupervised group dates	1.869	0.862	4.702	1	0.030	6.481	1.197	35.092
Constant	-0.833	0.545	2.338	1	0.126	0.435		

Included in Analysis: (N) = 87

Table 10.28: Effects of age, gender, development, and participation in supervised one-on-one dates on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.941	0.554	2.881	1	0.090	2.561	0.865	7.588
Age 12-17			2.249	2	0.325			
Age 18-25	-0.966	0.653	2.185	1	0.139	0.381	0.106	1.370
Age >25	-0.775	0.700	1.228	1	0.268	0.461	0.117	1.815
Reads at/above a 5th grade level	0.591	0.508	1.355	1	0.244	1.806	0.668	4.883
Gender (M vs F)	-0.236	0.490	0.232	1	0.630	0.790	0.302	2.063
Has been on supervised one-on-one dates	1.262	0.583	4.679	1	0.031	3.533	1.126	11.084
Constant	-0.901	0.551	2.673	1	0.102	0.406		

Included in Analysis: (N) = 87

Table 10.29: Effects of age, gender, development, and participation in unsupervised one-on-one dates on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.858	0.554	2.395	1	0.122	2.358	0.796	6.989
Age 12-17			0.955	2	0.620			
Age 18-25	-0.428	0.552	0.602	1	0.438	0.652	0.221	1.923
Age >25	-0.574	0.650	0.780	1	0.377	0.563	0.158	2.014
Reads at/above a 5th grade level	0.493	0.513	0.926	1	0.336	1.638	0.600	4.473
Gender (M vs F)	-0.163	0.492	0.109	1	0.741	0.850	0.324	2.229
Has been on unsupervised one-on-one dates	1.664	0.772	4.651	1	0.031	5.281	1.164	23.964
Constant	-0.796	0.545	2.133	1	0.144	0.451		

Included in Analysis: (N) = 87

Table 10.30: Effects of age, gender, development, and parental allowance for child to be sexually active on whether individuals who received sexual education from multiple sources are more likely to understand consent

Question:	Do you believe your child understands consent?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.841	0.564	2.222	1	0.136	2.320	0.767	7.012
Age 12-17			0.968	2	0.616			
Age 18-25	-0.082	0.574	0.021	1	0.886	0.921	0.299	2.837
Age >25	0.497	0.647	0.591	1	0.442	1.644	0.463	5.843
Reads at/above a 5th grade level	0.610	0.515	1.403	1	0.236	1.841	0.671	5.051
Gender (M vs F)	-0.242	0.507	0.227	1	0.633	0.785	0.291	2.122
Parent allows/would allow child to be sexually active	1.294	0.729	3.150	1	0.076	3.648	0.874	15.233
Constant	-1.987	0.845	5.524	1	0.019	0.137		

Included in Analysis: (N) = 81

Table 10.31: Effects of age, gender, development, and social media use on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.138	0.699	2.649	1	0.104	3.121	0.793	12.289
Age 12-17			5.332	2	0.070			
Age 18-25	0.723	0.675	1.145	1	0.285	2.060	0.548	7.740
Age >25	1.669	0.727	5.269	1	0.022	5.308	1.276	22.075
Reads at/above a 5th grade level	-0.313	0.592	0.279	1	0.597	0.731	0.229	2.335
Gender (M vs F)	0.766	0.571	1.800	1	0.180	2.152	0.702	6.593
Uses social media	1.666	0.594	7.855	1	0.005	5.289	1.650	16.954
Constant	-2.993	0.843	12.595	1	<0.001	0.050		

Included in Analysis: (N) = 84

Table 10.32: Effects of age, gender, development, and participation in unsupervised group dates on whether individuals who received sexual education from multiple sources are more likely to understand sexual intercourse can lead to pregnancy/baby

Question:	Does your child understand that intercourse can lead to pregnancy/baby?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.217	0.669	3.303	1	0.069	3.376	0.909	12.538
Age 12-17			5.423	2	0.066			
Age 18-25	1.203	0.676	3.170	1	0.075	3.330	0.886	12.523
Age >25	1.646	0.737	4.986	1	0.026	5.188	1.223	22.012
Reads at/above a 5th grade level	-0.606	0.634	0.914	1	0.339	0.545	0.157	1.890
Gender (M vs F)	1.184	0.631	3.524	1	0.060	3.269	0.949	11.257
Has been on unsupervised group dates	21.803	10528.067	0.000	1	0.998	2943956418.818	0.000	
Constant	-3.030	0.827	13.423	1	<0.001	0.048		

Included in Analysis: (N) = 87

Table 10.33: Effects of age, gender, development, and social media use on whether individuals who received sexual education from multiple sources are more likely to know how to decline sexual advances

Question:	Does your child know how to decline sexual advances by someone who is interested in them?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.891	0.617	2.083	1	0.149	2.437	0.727	8.172
Age 12-17			8.151	2	0.017			
Age 18-25	0.441	0.609	0.525	1	0.469	1.554	0.471	5.125
Age >25	1.929	0.702	7.557	1	0.006	6.883	1.740	27.234
Reads at/above a 5th grade level	-0.311	0.557	0.312	1	0.576	0.733	0.246	2.182
Gender (M vs F)	0.122	0.528	0.054	1	0.817	1.130	0.402	3.181
Uses social media	0.824	0.565	2.130	1	0.144	2.281	0.754	6.900
Constant	-1.711	0.650	6.933	1	0.008	0.181		

Included in Analysis: (N) = 84

Table 10.34: Effects of age, gender, development, and participation in supervised group dates on whether individuals who received sexual education from multiple sources are more likely to know how to decline sexual advances

Question:	Does your child know how to decline sexual advances by someone who is interested in them?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.018	0.609	2.801	1	0.094	2.769	0.840	9.125
Age 12-17			7.706	2	0.021			
Age 18-25	0.411	0.608	0.457	1	0.499	1.509	0.458	4.972
Age >25	1.996	0.748	7.119	1	0.008	7.360	1.699	31.892
Reads at/above a 5th grade level	-0.115	0.570	0.041	1	0.840	0.891	0.292	2.724
Gender (M vs F)	0.144	0.532	0.073	1	0.786	1.155	0.407	3.276
Has been on supervised group dates	0.958	0.559	2.936	1	0.087	2.607	0.871	7.799
Constant	-1.972	0.655	9.068	1	0.003	0.139		

Included in Analysis: (N) = 86

Table 10.35: Effects of age, gender, development, and participation in unsupervised group dates on whether individuals who received sexual education from multiple sources are more likely to know how to decline sexual advances

Question:	Does your child know how to decline sexual advances by someone who is interested in them?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	0.992	0.594	2.789	1	0.095	2.696	0.842	8.631
Age 12-17			7.827	2	0.020			
Age 18-25	0.647	0.575	1.266	1	0.261	1.909	0.619	5.888
Age >25	1.941	0.697	7.752	1	0.005	6.968	1.777	27.327
Reads at/above a 5th grade level	-0.376	0.575	0.429	1	0.513	0.686	0.222	2.118
Gender (M vs F)	0.274	0.538	0.260	1	0.610	1.316	0.458	3.776
Has been on unsupervised group dates	1.521	0.909	2.802	1	0.094	4.576	0.771	27.153
Constant	-1.790	0.636	7.919	1	0.005	0.167		

Included in Analysis: (N) = 87

Table 10.36: Effects of age, gender, development, and participation in supervised one-on-one dates on whether individuals who received sexual education from multiple sources are more likely to know how to decline sexual advances

Question:	Does your child know how to decline sexual advances by someone who is interested in them?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.153	0.597	3.730	1	0.053	3.166	0.983	10.198
Age 12-17			6.350	2	0.042			
Age 18-25	0.535	0.639	0.700	1	0.403	1.707	0.488	5.975
Age >25	1.797	0.740	5.898	1	0.015	6.032	1.414	25.727
Reads at/above a 5th grade level	-0.211	0.546	0.149	1	0.699	0.810	0.278	2.363
Gender (M vs F)	0.153	0.519	0.087	1	0.768	1.166	0.422	3.222
Has been on supervised one-on-one dates	0.651	0.575	1.284	1	0.257	1.918	0.622	5.914
Constant	-1.887	0.643	8.606	1	0.003	0.152		

Included in Analysis: (N) = 86

Table 10.37: Effects of age, gender, development, and participation in unsupervised one-on-one dates on whether individuals who received sexual education from multiple sources are more likely to know how to decline sexual advances

Question:	Does your child know how to decline sexual advances by someone who is interested in them?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.085	0.591	3.364	1	0.067	2.959	0.928	9.432
Age 12-17			7.420	2	0.024			
Age 18-25	0.724	0.566	1.635	1	0.201	2.062	0.680	6.256
Age >25	1.935	0.711	7.414	1	0.006	6.926	1.720	27.893
Reads at/above a 5th grade level	-0.188	0.548	0.117	1	0.732	0.829	0.283	2.427
Gender (M vs F)	0.132	0.518	0.065	1	0.799	1.141	0.414	3.145
Has been on unsupervised one-on-one dates	0.767	0.788	0.948	1	0.330	2.154	0.460	10.093
Constant	-1.789	0.633	8.001	1	0.005	0.167		

Included in Analysis: (N) = 87

Table 10.38: Effects of age, gender, development, and history of being in an exclusive romantic relationship on whether individuals who received sexual education from multiple sources are more likely to know how to decline sexual advances

Question:	Does your child know how to decline sexual advances by someone who is interested in them?							
							95% C.I. for Exp(B)	
Variables	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Received sex education from multiple sources	1.088	0.591	3.395	1	0.065	2.969	0.933	9.449
Age 12-17			7.693	2	0.021			
Age 18-25	0.630	0.585	1.158	1	0.282	1.877	0.596	5.909
Age >25	1.916	0.697	7.567	1	0.006	6.795	1.735	26.613
Reads at/above a 5th grade level	-0.276	0.557	0.245	1	0.620	0.759	0.255	2.261
Gender (M vs F)	0.060	0.525	0.013	1	0.909	1.062	0.380	2.969
Has been in an exclusive romantic relationship	0.860	0.622	1.917	1	0.166	2.364	0.699	7.993
Constant	-1.766	0.638	7.664	1	0.006	0.171		

Included in Analysis: (N) = 85

IV. DISCUSSION

Sexual health education for individuals with intellectual disability, including Down syndrome, is often an uncomfortable and unfamiliar topic for parents, caregivers, and healthcare providers. Many incorrectly assume that individuals with Down syndrome are inherently asexual, which may limit this population's access to accurate sexual health information and ability to explore sexuality (Medina-Rico et al., 2017). Sexual education has been demonstrated to reduce risky behavior, disease transmission, and unintended pregnancy; improve body image and quality of life; help prevent sexual abuse and misunderstandings; and is recommended for individuals with cognitive disabilities (SIECUS, 2004). Although resources exist for parents and healthcare providers to facilitate sexual education for individuals with Down syndrome, the most effective approach to educating this population about sexual health is not well established. The aims of this study were to identify potential predictors of sexual education comprehension among individuals with Down syndrome and determine whether receiving sexual education from multiple sources, versus a single source or no sources, is associated with increased comprehension. This was evaluated by analyzing the mothers' perceptions of their son's or daughter's abilities, as acquired via a survey of parents of individuals with Down syndrome. Understanding the factors that may influence whether an individual with Down syndrome understands key sexual health concepts, such as consent and that sexual intercourse can lead to pregnancy, can help healthcare providers identify those individuals who may need additional support.

4.1 Evaluation of variables' association with measures of sexual education comprehension

This study investigated the effects of multiple sources of sexual education, as well as additional variables related to experience with sexuality and romance and parental concerns about these topics, on sexual education comprehension among individuals with Down syndrome. Five measures of sexual education comprehension were used, based on parental report of whether the individual understands consent, knows about sexual intercourse, understands intercourse can lead to pregnancy and a baby, knows how to decline sexual advances, and understands what is acceptable behavior toward romantic interests.

Age, gender, and developmental level have previously been associated with differences in sexual expression and experience, as these variables impact an individual's maturity. In this study, older individuals with Down syndrome (age >25) were more likely to understand four out of five measures of comprehension as compared to those who were in the younger groups (age 18-25 and age 12-17). Age was not significantly associated with understanding consent. It seems logical that older individuals would be more knowledgeable about intercourse and behavior, as age is a factor in social maturity. Female individuals with Down syndrome were more likely to understand consent, know how to decline sexual advances, and understand what is acceptable behavior toward romantic partners than their male counterparts. However, gender was not significantly associated with knowledge of sexual intercourse and that it can lead to pregnancy and a baby. Literature suggests that gender differences in sexual behavior exist among individuals with intellectual disability, so it is reasonable that gender may also contribute to understanding of sexual education learning outcomes (Medina-Rico et al., 2017). However, the females in

this study's sample skewed to the upper end of the age range, so it may be that the significant association of gender with comprehension was confounded by the age distribution within each gender. Compared to those who read at a 4th grade level or lower, individuals with Down syndrome whose mothers reported they read at a level equivalent to that of a 5th grader or higher were more likely to understand all five learning outcomes. Reading level, used as a proxy for developmental level in this study, is positively associated with comprehension of sexual education. This is reasonable, given that knowledge of sexual intercourse and related aspects increase as bodies and minds develop.

Several variables related to the individual's independence and experiences with sexuality and romance were positively associated with sexual education comprehension. Social media was significantly or nearly significantly associated with all five outcomes. This finding may suggest that individuals who use social media have a higher developmental level than their non-user peers and are therefore more likely to understand the key learning outcomes of sexual education. As compared to non-users, those who used social media were more likely to read at a 5th grade level or higher (66.7% vs. 41.0%, p=0.021), so both of these variables appear to be measures of developmental level. Use of social media could also be a measure of parent permissiveness, as parents who allow their children to use social media may be more open to their child receiving information related to sexual health. Additionally, social media is a potential source of sexual education, so users may be more likely to have exposure to topics like intercourse and therefore a greater understanding of sexual education learning outcomes.

Dating history was consistently a significant predictor of understanding of the five measures of sexual education comprehension. Participation in supervised and

unsupervised dates, in both group or one-on-one settings, was positively associated with the five measures of sexual education comprehension. Those who have dated may have a higher functioning level than their peers, therefore increasing the likelihood they understand the basics of sexual education. Another possibility is that, if an individual with Down syndrome has dated, their parents may have ensured their son or daughter received sexual education prior to dating. Most parents in the sample expressed concerns about their child with respect to abuse, so they may take preventative measures when preparing their child for dating, resulting in greater likelihood they know about topics such as sexual intercourse and consent.

With regard to associations that exhibited general trends but did not reach statistical significance, some variables were consistently associated with the five measures of sexual education comprehension. A mother's indication that her child had expressed interest in romance was not significantly associated with understanding of all five outcomes but nevertheless suggestive of an association. Intuitively, one might reason that mothers of individuals demonstrating an interest in romance would want to provide their child with sexual health information to ensure their safety prior to engagement in romantic and/or sexual relations. Additionally, individuals who expressed interest in romance might be of a higher developmental level and more equipped to understand basic sexual education concepts. However, interest in romance was not significantly associated with reading level ($p=0.950$), so it may be related to other aspects of development, such as emotional intelligence, which may not correlate as closely with reading level. Although the association between interest in romance and understanding measures of sexual education comprehension was not statistically significant, this may be a true association and worth

investigating in a larger sample. There was a general trend that individuals with Down syndrome who received speech and/or ABA therapies were less likely to understand the measures of sexual education comprehension. In our study, we utilized reading level as a proxy for developmental level of the individual with Down syndrome. However, these associations may be other reflections of developmental level. In our sample, reading level was not significantly associated with receipt of speech therapy ($p=0.323$) nor ABA therapy ($p>0.999$). Parental concern for others to misinterpret their child's behavior as sexual, which was slightly associated with a few outcomes, could also be related to the child's developmental level. Concern may be greater for those individuals who have lower cognitive abilities. However, this variable was not significantly associated with reading level ($p=0.641$).

Although there was a trend that parent age greater than 58 years was loosely associated with increased comprehension, this may be attributed to the distribution of parent ages in the sample, with maternal ages clustered around the late forties to late fifties. Few individuals in our sample were included in this category, so this finding may be due to chance rather than a true association. Age of the mother and her child with Down syndrome are also correlated, as older mothers are more likely to have older children. Given this association, this study focused on age of the individual with Down syndrome as a predictor of sexual education comprehension, as it was more strongly associated with reported understanding than parent age.

One unexpected finding was that receipt of specialized training by mothers to educate their children about sexuality education was not significantly associated with parental report of improved learning outcomes in their children. SIECUS (2001)

recommends that parents of individuals with intellectual disabilities undergo training to learn how to provide sexual education more tailored to their children, so one might assume specialized training would improve learning outcomes in the recipients. It could be that those who received training were less confident in their abilities to educate their child or that their child had a lower cognitive level, both of which could hinder understanding in the individual with Down syndrome. Parents who received training may have greater awareness of their child's abilities, resulting in more accurate report of the level of comprehension in their child. Those who did not receive training may overestimate their son's or daughter's understanding of the outcomes. However, it is also possible that currently available training programs for parents of children with Down syndrome and other intellectual disabilities may not be effective in providing parents with the necessary skills to educate their sons and daughters about sexuality and related topics.

Overall, most of the variables related to parental concerns, including abuse, pregnancy, sexually transmitted diseases, and their child having misconceptions about sex, were not significantly associated with the reported sexual education comprehension in their sons and daughters with Down syndrome. It is possible that parental concern may not be related to their child's understanding of sexual education, as parent perceptions of risks may depend less on their child's abilities and more on the parent's personality and worldview. With some factors, such as parental concern for abuse, there was little variability in our sample, so that may have also contributed to the lack of power to detect a potential association between parental concerns and understanding of sexual education learning outcomes in their sons and daughters with Down syndrome.

4.2 Impact of number of sources of sexual education on reported understanding of five measures of sexual education comprehension

Of the 93 respondents who provided information about their child's experience with sexual education, 66 (71.0%) reported that their son or daughter with Down syndrome received sexual education from two or more sources, such as parents, siblings, teachers, and peers, and 27 (29.0%) reported that their son or daughter received information about sexual health from a single source or no sources. When the number of sources of sexual education an individual with Down syndrome received was compared to their understanding of five measures of sexual education comprehension, receiving education from multiple sources was positively associated with reported comprehension. Depending on the specific measure of comprehension, individuals who had received sexual education from multiple sources were 3.2 to 9.3 times more likely to be reported to understand the learning outcome than those who had received sexual health information from one or zero sources. Given that other variables could be confounding factors in these associations, the effect of number of sources of sexual education on learning outcomes was evaluated in multivariate analyses.

Since age, gender, and developmental level are factors in maturity and were frequently significantly associated with the five outcomes in the univariate analyses, these variables were incorporated into each multivariate model. After accounting for differences in age, gender, and reading level, receiving multiple sources of sexual education remained a statistically significant predictor of understanding of four out of five measures of sexual education comprehension. The odds ratios were somewhat lower in multivariate models, ranging from 3.0 to 9.0, but the associations were still statistically significant. However, for

the remaining measure of sexual education comprehension, the association between number of sexual education sources and understanding acceptable behavior toward romantic interests was no longer statistically significant in the multivariate analysis. It could be that age and developmental level may have more of an influence on understanding acceptable sexual behavior than sexual education. This variable may be more of an assessment of development than knowledge learned from sexual education.

For the four measures of sexual education comprehension that remained significant after accounting for differences in age, gender, and reading level, additional analyses were undertaken to explore the potential effects on comprehension. When additional variables identified to have statistically significant associations in the univariate analyses were incorporated into the multivariate models, multiple sources of sexual education remained a significant predictor of reported understanding of consent, knowledge of sexual intercourse, and understanding that intercourse can lead to pregnancy and a baby in several analyses. Having received sexual education from multiple sources was no longer significantly associated with knowing how to decline sexual advances once additional variables, such as social media use and experience with dating, were added to the model.

The results suggest that, independent of potentially confounding factors, the number of sources of sexual education an individual with Down syndrome receives is positively correlated with understanding of the key sexual education outcomes. Receiving education from multiple sources likely indicates that the individual was given information about sexual health multiple times. As SIECUS (2004) recommends that sexual education be provided multiple times at different stages of childhood development, one could reason that repeated exposure to information would increase knowledge. This information is

valuable, as it can help shape the sexual education of individuals with Down syndrome to increase their comprehension. With greater knowledge of sexual education basics, individuals with Down syndrome may have more opportunities to express themselves sexually and in a safe and appropriate manner. If parents feel that their child has a thorough understanding of sexuality and romance, they may be more permissive with their child with respect to dating and other expressions of sexuality, allowing their son or daughter with Down syndrome greater individual freedoms. Additionally, parents may be less concerned about potential harms to their children if they know their son or daughter is knowledgeable about concepts like consent and how to decline sexual advances.

4.3 Limitations of this study

While the results suggest that the number of sexual education sources an individual with Down syndrome receives is associated with his or her understanding of the five selected measures of comprehension, there are several limitations to this study. Since this study included data from a survey of parents of individuals with Down syndrome, we utilized parental report to determine whether an individual with Down syndrome understood the five measures of sexual education comprehension. Current literature evaluating parental knowledge of adolescent sexual experience suggests that approximately 82-87% of parents have an accurate perception of their child's experience (Potter et al., 2017; Mollborn and Everett, 2010). Although the study by Potter et al. suggests parents are often accurate in assessing their children's experience with sexuality, it is possible that relying on their report may have led to inaccurate data. Parents of individuals with Down syndrome may be uncomfortable with discussing their son's or

daughter's understanding of sexual education measures, leading to inaccurate reporting of their actual comprehension of the five measures of sexual education comprehension. Due to the low number of responses from fathers of individuals with Down syndrome, only mothers' responses were analyzed in this study. Mothers and fathers may have different perceptions of their child's abilities and experiences with sexuality and romance. Additionally, mothers' report of their child's reading level was utilized as a proxy for developmental level. Parents may not have a clear idea of their child's reading level, which could lead to over- or underestimation of ability.

The size of the sample analyzed in this study was relatively small, which limited the power of our analyses. With regard to the demographics of the sample, most mothers who completed the survey self-identified as Caucasian (84.9%) and had a bachelor's or graduate degree (63.7%). Down syndrome occurs in all racial groups, so the sample is not necessarily representative of the population. As the original survey was only available in English, this may have limited non-English speakers' ability to participate. Additionally, more highly educated mothers may be more aware of the importance of sexual education and be more inclined to provide their children with resources to learn about sexuality and romance.

Although the survey included questions about the sources of sexual education the individual with Down syndrome received, there was no measure for the quality or effectiveness of each of these sources. In this sample, mothers were most often reported to be a provider of sexual information. This is consistent with the current literature, which suggests that typically developing adolescents tend to rely more heavily on their mothers for information about sexual health information than their fathers (Bleakley et al., 2009).

Although SIECUS (2004) states that "parents are – and ought to be – their children's primary sexuality educators," other sources of information, such as schools and community groups, are also valuable.

There was a high reported rate of sexual education for the individuals with Down syndrome in this study. This may not be reflective of the population as a whole. Parents of individuals with Down syndrome who are uncomfortable with the topic may not have clicked on the survey or been more likely to drop out before completing the required questions. This self-selection bias could explain the discrepancy between the reported rate of sexual education in our sample (85%) and among individuals with intellectual disability in the literature, which is reportedly 53-56% for adults (Martinez et al., 2010).

4.4 Future directions

This study evaluated whether a person with Down syndrome received sexual education from multiple sources but did not specify which sources. Literature suggests that, in the general population, information from parents, teachers, peers, and media can have varying effects on sexual behavior and learning outcomes (Bleakley et al., 2010). Future studies could investigate whether receiving sexual education from both familial sources and those outside the family unit, such as teachers, healthcare providers, and peers, rather than from only one or the other is still a valuable predictor of sexual education comprehension in individuals with Down syndrome. Additionally, studies could explore the effectiveness of each type of source within the Down syndrome population.

Cultural differences exist between and among different races and ethnicities. Due to the lack of diversity of the sample population, we were unable to explore the effects of

reported race and ethnicity on number of sexual education sources received. This could be addressed in a future study with a more diverse sample of individuals with Down syndrome. Furthermore, it might be worth investigating the effects of reported religious and spiritual beliefs on the number of sexual education sources an individual with Down syndrome receives and on comprehension, as some religions are more restrictive with regard to expressions of sexuality.

In this study, reading level was utilized as a proxy for the developmental level of the individual with Down syndrome. However, there was no direct assessment of the individuals' abilities. In future studies, it would be impactful for researchers to directly evaluate the developmental level of individuals with Down syndrome and compare this to our results, to determine whether reported reading level is a good representation of developmental level. Additionally, researchers could directly assess knowledge of the five measures of sexual education by interviewing individuals with Down syndrome, instead of receiving this information through their parents. Future surveys of parents of individuals with Down syndrome related to sexuality and romance in their children could also target fathers specifically, as this study only analyzed responses from mothers.

Although the associations were not statistically significant, several variables in this study, including interest in romance and use of supportive therapies, were consistently suggestive of an association with reported sexual education comprehension. These general trends could be true associations that, due to the small sample size, were not detected in this study. Future studies with larger samples could investigate whether these trends might be significant predictors of understanding of sexual education within the Down syndrome population.

4.5 Conclusions

Despite recommendations from SIECUS and other groups that promote sexual education, parents and healthcare providers of individuals with Down syndrome may have reservations about providing sexual education to this population. However, sexual education is a crucial part of development for people, regardless of cognitive ability. The results of this study support the idea that receiving sexual education from multiple sources may improve learning outcomes within the Down syndrome community. Understanding what factors may predict understanding of key sexual education learning outcomes in individuals with Down syndrome can aid healthcare providers and caregivers in identifying those families that may need additional support to educate their child about sexual health. Healthcare providers, including genetic counselors and geneticists, can provide families with the resources necessary to ensure their son or daughter with Down syndrome receives adequate sexual education. They may also act as sources of information about sexual health, especially in cases where parents may be less inclined to provide sexual education to their children. If the finding that multiple sources of sexual education has a positive effect on learning outcomes in the Down syndrome population is replicated in future studies, this knowledge can be implemented into future programs designed for individuals with Down syndrome and potentially others with intellectual disability. With more comprehensive and varied sources of sexual education, individuals with Down syndrome will be better equipped to handle issues related to sexuality and romance.

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APPENDIX A: Non-Significant Associations

The following variables were not significantly associated with responses to the question "Do you believe your child understands consent?" in the univariate analyses.

a. Age of the individual with Down syndrome (p=0.749)
b. Gender of the individual with Down syndrome (p=0.754)
c. Birth order of the individual with Down syndrome (p=0.448)
d. The individual with Down syndrome has been sexually intimate with another person (p=0.336)
e. The individual with Down syndrome masturbates (p=0.382)
f. The individual with Down syndrome uses contraception (p=0.251)
g. The individual with Down syndrome has received speech therapy (p=0.661)
h. Age of the mother of the individual with Down syndrome (p=0.442)
i. Education level of the mother of the individual with Down syndrome (p=0.741)
j. The mother of the individual with Down syndrome has received specialized training for educating her child about sexual behavior and romance (p=0.343)
k. The mother of the individual with Down syndrome has concerns about her child with respect to abuse (p=0.833)
l. The mother of the individual with Down syndrome has concerns about her child with respect to pregnancy (p=0.799)
m. The mother of the individual with Down syndrome has concerns about her child with respect to STDs (p=0.705)
n. The mother of the individual with Down syndrome is concerned that her child has misconceptions about sex (p=0.218)

o. The mother of the individual with Down syndrome allows or would allow her child to participate in dating (p=0.479)

The following variables were not significantly associated with responses to the question “Does your child know about sexual intercourse?” in the univariate analyses.

a. Birth order of the individual with Down syndrome (p=0.345)
b. The individual with Down syndrome masturbates (p=0.566)
c. The individual with Down syndrome has received ABA therapy (p=0.301)
d. Education level of the mother of the individual with Down syndrome (p=0.891)
e. The mother of the individual with Down syndrome has concerns about her child with respect to abuse (p=0.752)
f. The mother of the individual with Down syndrome has concerns about her child with respect to pregnancy (p=0.413)
g. The mother of the individual with Down syndrome has concerns about her child with respect to STDs (p=0.317)
h. The mother of the individual with Down syndrome has concerns with her child being in a romantic relationship (p=0.876)
i. The mother of the individual with Down syndrome is concerned that her child has misconceptions about sex (p=0.933)
j. The mother of the individual with Down syndrome allows or would allow her child to participate in dating (p=0.496)

The following variables were not significantly associated with responses to the question “Does your child understand that intercourse can lead to pregnancy/baby?” in the univariate analyses.

a. Birth order of the individual with Down syndrome (p=0.990)
b. The individual with Down syndrome expressed interest in romance (p=0.129)
c. The individual with Down syndrome has been sexually intimate with another person (p=0.319)
d. The individual with Down syndrome masturbates (p=0.431)
e. The individual with Down syndrome has received ABA therapy (p=0.375)
f. Education level of the mother of the individual with Down syndrome (p=0.869)
g. The mother of the individual with Down syndrome has received specialized training for educating her child about sexual behavior and romance (p=0.271)
h. The mother of the individual with Down syndrome has concerns about her child with respect to abuse (p=0.596)
i. The mother of the individual with Down syndrome has concerns about her child with respect to pregnancy (p=0.321)
j. The mother of the individual with Down syndrome has concerns about her child with respect to STDs (p=0.512)
k. The mother of the individual with Down syndrome has concerns with her child being in a romantic relationship (p=0.585)
l. The mother of the individual with Down syndrome is worried that another person might interpret her child's behavior as having sexual content that was not intended (p=0.333)
m. The mother of the individual with Down syndrome is concerned that her child has misconceptions about sex (p=0.633)

n. The mother of the individual with Down syndrome allows or would allow her child to participate in dating (p=0.501)

The following variables were not significantly associated with responses to the question "Does your child know how to decline sexual advances by someone who is interested in them?" in the univariate analyses.

a. Gender of the individual with Down syndrome (p=0.186)
b. Birth order of the individual with Down syndrome (p=0.715)
c. The individual with Down syndrome has been sexually intimate with another person (p=0.355)
d. The individual with Down syndrome masturbates (p=0.658)
e. The individual with Down syndrome uses contraception (p=0.713)
f. The individual with Down syndrome has received ABA therapy (p=0.891)
g. The individual with Down syndrome has received speech therapy (p=0.198)
h. Education level of the mother of the individual with Down syndrome (p=0.581)
i. The mother of the individual with Down syndrome has received specialized training for educating her child about sexual behavior and romance (p=0.413)
j. The mother of the individual with Down syndrome has concerns about her child with respect to abuse (p=0.527)
k. The mother of the individual with Down syndrome has concerns about her child with respect to pregnancy (p=0.844)
l. The mother of the individual with Down syndrome has concerns about her child with respect to STDs (p=0.889)

m. The mother of the individual with Down syndrome has concerns with her child being in a romantic relationship (p=0.413)
n. The mother of the individual with Down syndrome is worried that another person might interpret her child's behavior as having sexual content that was not intended (p=0.260)
o. The mother of the individual with Down syndrome is concerned that her child has misconceptions about sex (p=0.764)
p. The mother of the individual with Down syndrome allows or would allow her child to participate in dating (p=0.495)
q. The mother of the individual with Down syndrome allows or would allow her child to participate in a sexually active relationship (p=0.315)

The following variables were not significantly associated with responses to the question "Does your child understand what is and what is not acceptable behavior towards someone they are romantically interested in?" in the univariate analyses.

a. Birth order of the individual with Down syndrome (p=0.990)
b. The individual with Down syndrome expressed interest in romance (p=0.189)
c. The individual with Down syndrome has been sexually intimate with another person (p=0.626)
d. The individual with Down syndrome masturbates (p=0.365)
e. The individual with Down syndrome uses contraception (p=0.726)
f. Education level of the mother of the individual with Down syndrome (p=0.855)
g. The mother of the individual with Down syndrome has received specialized training for educating her child about sexual behavior and romance (p=0.524)

h. The mother of the individual with Down syndrome has concerns about her child with respect to pregnancy (p=0.696)
i. The mother of the individual with Down syndrome has concerns about her child with respect to STDs (p=0.603)
j. The mother of the individual with Down syndrome has concerns with her child being in a romantic relationship (p=0.151)
k. The mother of the individual with Down syndrome is concerned that her child has misconceptions about sex (p=0.286)
l. The mother of the individual with Down syndrome allows or would allow her child to participate in dating (p=0.196)
m. The mother of the individual with Down syndrome allows or would allow her child to participate in a sexually active relationship (p=0.799)

APPENDIX B: Univariate analysis: reading level vs. additional potential measures of developmental level

Question	Does your child use social media (Facebook, Instagram, Twitter, and/or Snapchat?)					
Variable	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Reading level	91					
4th grade or lower		36	59.0	25	41.0	0.021
5th grade or higher		19	33.3	20	66.7	

*=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.

Question	Do you believe your child is interested in romance?					
Variable	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Reading level	94					
4th grade or lower		11	17.2	64	82.8	0.950
5th grade or higher		5	16.7	30	83.3	

*=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.

Question	Has your child received ABA therapy?					
Variable	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Reading level	91					
4th grade or lower		51	83.6	10	16.4	>0.999*
5th grade or higher		25	83.3	5	16.7	

*=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.

Question	Has your child received speech therapy?					
Variable	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Reading level	94					
4th grade or lower		2	3.1	62	96.9	0.323*
5th grade or higher		3	10.0	27	90.0	

*=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.

Question	Are you worried that another person might misinterpret your child's behavior as having sexual content that was not intended?					
Variable	N	No (#)	No (%)	Yes (#)	Yes (%)	p-value
Reading level	92					
4th grade or lower		25	39.7	38	44.8	0.641
5th grade or higher		13	60.3	16	55.2	

*=Fisher's Exact Test. All other p-values calculated by Pearson's Chi-Squared Test.