Journal of Pediatric Nursing 85 (2025) 312–320

Contents lists available at ScienceDirect

Journal of Pediatric Nursing

journal homepage: www.pediatricnursing.org

Investigation of the relationship between sexual developmental characteristics of individuals with intellectual disabilities in adolescence and sexual communication skills of their parents

Tuğba Çetinol Taştemel [a,*], Gülendam Karadağ [b]

[a] Doctoral Program in Public Health Nursing, Institute of Health Sciences, Dokuz Eylul University, Izmir, Turkey
[b] Department, of Public Health Nursing, Faculty of Nursing, Dokuz Eylul University, Izmir, Turkey

ARTICLE INFO

Article history:
Received 29 January 2025
Revised 5 August 2025
Accepted 5 August 2025
Available online xxxx

Keywords:
Intellectual disability
Sexual communication
Sexual development
Puberty
Adolescence

ABSTRACT

Purpose: The study aimed to determine the relationship between the sexual developmental characteristics of individuals with intellectual disabilities in adolescence and their parents' sexual communication skills.
Design and methods: The descriptive, cross-sectional, and correlational design study conducted between January and March 2024 included the parents of 115 individuals with intellectual disabilities aged 10–19 years studying in a special education and rehabilitation center.
Results: The mean total score of the sexual communication scale for parents was 71.00 ± 13.73, and the mean total score of the sexual development characteristics scale for children with intellectual disabilities in adolescence was 111.51 ± 15.24. There was no positive and significant relationship between content, body language, anxiety scores, and sexual development characteristics scale score ($p > 0.05$), while there was a positive and significant relationship between the sub-dimension score of managing the process ($r = 0.19$; $p < 0.05$) and the sexual communication scale score for parents ($r = 0.20$; $p < 0.05$) and the sexual development characteristics scale score of children with intellectual disabilities.
Conclusions: It was found that parents' sexual communication skills had a significant but weak effect on their children's sexual development.
© 2025 Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

Introduction

Intellectual disability is a persistent and chronic condition that occurs when an individual has significant limitations in terms of intellectual functioning compared to his/her peers and shows inadequacy in adaptive behaviors (American Association on Intellectual and Developmental Disabilities (AAIDD), 2021; American Psychiatric Association, 2013; Ministry of National Education, 2006). Intellectual disability can occur before or after birth, and its main causes include genetic factors, malnutrition during pregnancy, birth trauma leading to asphyxia, and diseases and injuries leading to brain damage (Kuddo, 2012). Limitations in cognitive functions are manifested as problems in cognitive processes related to attention, memory, and generalization, and accordingly, learning of individuals with intellectual disabilities is slow and difficult compared to their peers (Sucuoğlu, 2009). Due to difficulties in understanding and expressing language, these individuals' language and speech development also progresses slowly (Acarlar, 2013).

Adolescence, the transition period from childhood to adulthood, is a stressful and stormy period of multifaceted development in physiological, sexual, self, social, and cognitive areas (American Psychiatric Association, 2013; Güven, 2021). Although the exact age of puberty varies from person to person, United Nations Educational, Scientific and Cultural Organization (UNESCO) considers adolescence to be between the ages of 15–25, while the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) consider it to be between the ages of 10–19 (Güzel, 2020).

Sexual development is one of the most basic facts of our health, which starts with the birth of the individual and has great effects on both physical and mental health, which concerns every individual, and causes social problems that are difficult to solve (Gokgoz et al., 2021). According to Freud, the founder of psychoanalytic theory, human personality is shaped by passing through psychosexual stages. The healthy completion of psychosexual stages has a positive effect on personality development (Ertaş, 2024). Sexual development has physical, social, emotional, and cognitive aspects. The physical aspects of sexual development encompass the development of sexual organs, bodily changes, and hormonal shifts. The social aspect involves embracing gender

* Corresponding author.
E-mail address: tugbacetinol@comu.edu.tr (T.Ç. Taştemel).

https://doi.org/10.1016/j.pedn.2025.08.005
0882-5963/© 2025 Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

roles as defined by society. The emotional aspects pertain to an individual's body image and comfort with their gender, while the cognitive aspects include thoughts, feelings, and beliefs about sexuality (C. Murphy, Lincoln, Meredith, Cross, & Rintell, 2016). As long as the sexual development of mentally disabled individuals has normally functioning hormonal systems, it progresses in the same order as healthy adolescents, but development may be slower (Burke et al., 2010; Whooten et al., 2018).

The most significant challenges that adolescents with intellectual disabilities face during adolescence are emotional and behavioral issues (Boyacıoğlu et al., 2018; Gürbüz, 2018). During this period, adolescents may exhibit behaviors such as irritability, aggression, self-harm, obsessive actions, and resistance to self-care—behaviors that may not be present in early childhood. These issues can often result in inappropriate behaviors, including uninvited acts of physical affection such as kissing, hugging, and touching, as well as more intimate behaviors like touching others' genitals, holding hands, or engaging in public masturbation (Boyacıoğlu et al., 2021). These behaviors can be attributed to a limited ability to understand social norms or difficulties in learning appropriate behaviors (Bayrak et al., 2011).

In this context, Erikson's Psychosocial Development Theory provides a crucial framework. According to Erikson, individuals go through eight stages of development throughout their lives and encounter a psychosocial crisis that must be resolved at each stage. Healthily resolving these crises has a positive effect on the individual's personality development. Furthermore, the theory emphasizes that an individual's character is shaped not only by individual factors but also by social interactions (Yalkılıç, 2020). From this perspective, guiding the psychosocial and psychosexual development of individuals with intellectual disabilities through appropriate education and support is crucial for them to develop a healthy sense of self and relational skills (Kurt & Kürtüncü, 2021).

In such situations, families often feel helpless and embarrassed by the negative reactions they may encounter from others (Hazar & Ayhan, 2022). Individuals with intellectual disabilities may not understand the need to control their sexual impulses, which can lead to public masturbation or other sexual behaviors. This often results in society perceiving them as having more sexual interest or engaging in more sexual behaviors than their peers. This perception arises because they are unable to grasp when and where sexual behaviors are appropriate, meaning they cannot regulate their sexual impulses (Bilge et al., 2013; Boyacıoğlu et al., 2018). In these cases, the issue is not the individual's self-stimulatory behavior itself, but rather the fact that such behavior is exhibited in public rather than in private spaces (N. A. Murphy & Elias, 2006).

The communication between parents and children during childhood forms the basis for the relationships that the child will establish with other people throughout his/her life (Çağdaş & Arı, 1999; Yalçın, 2013). Healthy communication between parents and children enables children to become self-confident and self-controlled individuals, to adapt to society, and to establish healthy communication with people (Çağdaş & Arı, 1999; Köyceğiz & Özbey, 2019).

Communication between parents and children also plays an important role in children's sexual development (Diiorio et al., 2003). Children need proper guidance and direction from adults to understand their bodies and sexual development correctly (Kristiana et al., 2006). Individuals with intellectual disabilities have more difficulties in obtaining information on sexual issues than individuals with normal development (Çerçi, 2013).

Some individuals with intellectual disabilities may have limited access to accurate and qualified information about sexuality through friends or books due to their restricted social networks (Baines et al., 2018; Van Asselt-Goverts et al., 2015). Parents are the most appropriate source of solidarity in the field of sexual development of their children. Although many parents are aware of the importance of their role in sexual education, some may hesitate to communicate about sexuality (Ganji et al., 2017).

Parents of individuals with intellectual disabilities often believe that their children will always remain childlike, without sexual needs, and therefore do not require sexual education. They may fear that gaining sexual knowledge could lead to a desire to act on it or assume that avoiding discussions about sexuality will prevent their children from expressing sexual behaviors (Çifçi Tekinaslan & Eratay, 2013).

In many societies, issues related to sexuality are among taboo or stigmatized topics. For this reason, children cannot consult their parents for guidance on sexuality-related issues, and when they do, they may not receive satisfactory answers (Ganji et al., 2017). This situation may lead them to seek out inappropriate sources and engage in unhealthy sexual behaviors. Such behaviors can include displaying sexually explicit actions in public, an increased focus on their own sexuality, and developing relationships with individuals of the opposite sex without regard for social norms or appropriateness (Liu et al., 2023; Zhang et al., 2025).

Nurses, who play an important role in protecting and developing public health, have important duties and responsibilities in protecting and improving the health of adolescents with intellectual disabilities and their families (Çolak & Kahriman, 2022).

Pediatric nurses play a critical role in the healthy adolescence of children with intellectual disabilities. In this process, they can guide the parents of children with disabilities on sexual development and support their children to have a healthy sexual development process (Schubel et al., 2025).

Kurt (2022) implemented a sexual health and development education program for children with intellectual disabilities and stated that this program increased the level of knowledge about children's sexual health and development and their mothers' awareness of this issue. In another study, they evaluated the effectiveness of the health education given to the parents of children with disabilities between the ages of 10–19 for sexual health. They concluded that sexual health education was effective in increasing parental self-efficacy level and adolescent sexual health levels (Gündoğdu, 2022). While this information provided at an early age contributes to a more conscious management of the changes that occur during adolescence, it also helps to prevent inappropriate sexual behaviors (Yıldız & Cavkaytar, 2017).

Sexual behaviors among individuals with intellectual disabilities often stem from poor social skills, impaired judgement, and inadequate sexual education (Çakmak & Çakmak, 2011). Families, as the primary source of information about sexuality, play a crucial role in guiding their children. However, effective communication requires parents to develop strong sexual communication skills. These skills ensure accurate and open discussions about sexuality, which benefit not only the individual but also the family and society as a whole. This study aims to explore the relationship between the sexual developmental characteristics of adolescents with intellectual disabilities and their parents' sexual health communication skills (Erengin et al., 2024). It is observed that there are a limited number of studies in the literature that quantitatively examine the sexual development of individuals with intellectual disabilities. The findings to be obtained are expected to contribute to the development of sexual education policies for individuals with special needs, the structuring of parental counseling programs, and the creation of culturally sensitive public awareness strategies.

Research questions

1. How do parents rate the sexual development characteristics of their adolescent children with intellectual disability?
2. How do parents of adolescents with intellectual disability rate their sexual communication skills?
3. Is there a relationship between the sexual development characteristics of adolescents with intellectual disability and their parents' sexual communication skills?

Methods

This study was conducted using a cross-sectional and correlational design and was prepared in accordance with the Child-Centered Research Checklist for pediatric studies recommended by the EQUATOR Network (Foster et al., 2025).

Place and time of the study

The study was conducted between January and March 2024 at two special education and rehabilitation centers affiliated with the Ministry of National Education (MoNE) in the city center of Çanakkale province.

Population and sample of the study

This study was conducted using a non-probability sampling method to examine the relationship between the sexual development characteristics of individuals with intellectual disabilities and their parents' sexual communication skills. The study population consisted of parents of individuals aged 10 to 19 with intellectual disabilities who were enrolled in two special education and rehabilitation centers affiliated with the Ministry of National Education (MoNE) in Çanakkale. These two centers were selected through purposive sampling due to their accessibility and the availability of institutional permissions required to conduct the study. Moreover, both centers were preferred as they share similar socio-demographic characteristics and parent profiles, which contributes to the consistency of the research findings. The required sample size was calculated as 89 participants using the G*Power program, based on regression analysis with a significance level of 0.05, a statistical power of 95 %, and a medium effect size (0.15). To increase the power of the study and minimize the margin of error, the sample was expanded to 115 parents who signed informed consent forms and voluntarily agreed to participate. All data were collected through face-to-face interviews conducted only with parents. No questionnaires were administered directly to individuals with intellectual disabilities.

At the beginning of the study, 130 parents were informed about the aim and procedures of the research. Ten parents declined to participate, and five submitted incomplete questionnaires. As a result, only the data from 115 parents who fully completed the forms were included in the analysis. No imputation methods were applied; incomplete forms were excluded from the dataset (Fig. 1).

Inclusion Criteria

- Being the primary caregiver of an individual with intellectual disability aged 10–19
- Being 18 years of age or older
- Being literate

Exclusion Criteria

- Having a physical or mental condition that prevents participation in the data collection process

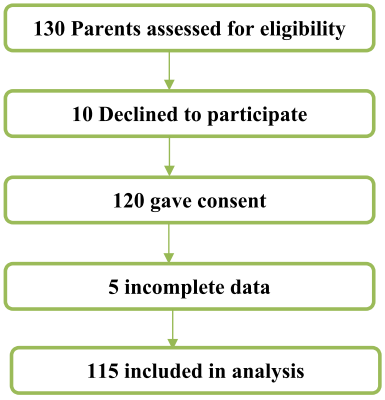


Fig. 1. Flow chart of participants' recruitment process.

Dependent and independent variables of the study

The dependent variable of the study was the sexual development characteristics of individuals with intellectual disabilities, and the independent variable was the sexual communication skills of parents.

Measures

A questionnaire form consisting of three parts was used as a data collection tool in the study. In the first part of the questionnaire form, there is a family and child identification form consisting of information on the degree of closeness, age, education level, gender, puberty status, and age of the child's pubertal onset.

Sexual Communication Scale for Parents (SCSP): The SCSP was developed by Artan et al. (2020) to determine the communication language used by parents in sexual education. The scale consists of 23 items and four subdimensions. The minimum score that can be obtained from the scale is 23, while the maximum score is 92. Items 1 to 7 assess the content of communication, items 8 to 12 assess body language, items 13 to 19 assess process management, and items 20 to 23 assess anxiety. For example, an item under the body language subdimension is: *"I speak with my usual facial expression."* This item aims to evaluate how parents use nonverbal communication elements, such as facial expressions, when discussing sexual issues.

The scale is scored using a four-point Likert-type system (1 = Not at all suitable for me, 4 = Completely suitable for me). There are no reverse-coded items in the content, body language, and process management subdimensions. However, all items in the anxiety subdimension are reverse-coded. Higher scores in each subdimension indicate more appropriate communication related to that specific aspect.

The item-total score correlations for all items ranged between 0.76 and 0.78. The Cronbach's alpha coefficients for the subdimensions ranged from 0.70 to 0.80. In this study, the overall Cronbach's alpha coefficient of the scale was calculated as 0.94, indicating high internal consistency.

Sexual Development Characteristics Scale for Adolescents with Intellectual Disabilities (SDCS-AID): This scale was developed by Gürbüz (2018) to assess the sexual development characteristics of adolescents with intellectual disabilities. The scale consists of 36 items and nine subdimensions: need for knowledge, sexual arousal, privacy and social safety, knowledge about physical development, sexual abuse, urge to achieve sexual satisfaction, sharing about sexual issues, emotional change, and sexual self-care.

An example item from the *Privacy and Social Safety* subdimension is: *"My child informs us if someone touches them without permission."* This item is intended to measure the child's awareness of personal boundaries, their understanding of privacy, and their ability to report inappropriate situations to caregivers.

The scale is rated on a five-point Likert-type scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The total score ranges from 36 to 180, with higher scores indicating more developed sexual characteristics in adolescents with intellectual disabilities. There are no reverse-coded items in the scale. In the original study, the Cronbach's alpha coefficient for the entire scale was reported as 0.86. In the present study, the internal consistency of the scale was calculated as 0.83.

Statistical analysis

SPSS (Statistical Package for Social Science) 21.0 program was used to analyze the data. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the sociodemographic characteristics of the participants and scale scores. To assess the relationships between parents' sexual communication skills and the sexual development characteristics of individuals with intellectual disabilities, the Pearson correlation coefficient was used, as both variables were measured on a continuous scale and assumptions of linearity and normality were met. To evaluate the predictive effect of parents' sexual communication skills on their children's sexual development, multiple linear regression analysis was conducted. Before regression, assumptions such as multicollinearity (VIF, tolerance) and normal distribution of residuals were checked. The level of statistical significance was set at $p < 0.05$, with a 95 % confidence interval used throughout the analyses.

Ethical considerations

Before the research was conducted, permission was obtained from the owners of the scales used in the research via e-mail. To conduct the research, permission was obtained from the Scientific Research Ethics Committee with the decision dated 03.08.2023 and numbered 10/36. Separate permission was obtained from each institution for the special education and rehabilitation centers where the research would be conducted. In addition, informed consent was obtained from the parents of the children, and data were collected.

Results

Of the 115 parents who participated in the study, 83.5 % were mothers of children with intellectual disabilities, 47 % of the parents were 36–45 years old, and 33 % were high school graduates. Of the individuals with intellectual disability, 53.9 % were male, 53 % were in the 10–14 age group, and 80.9 % had reached puberty (Table 1).

Table 1
Distribution of participants and their children with intellectual disability according to their descriptive information.

Identifying Information	n	%
Degree of parental closeness		
Mother	96	83.5
Father	19	16.5
Parental age		
35 years and below	22	19.1
36–45 years	54	47.0
46 years and older	39	33.9
Parental education level		
Primary School	34	29.6
Middle School	26	22.6
High School	38	33.0
University	17	14.8
Sex of the child		
Girl	53	46.1
Male	62	53.9
Age of the child		
10–14 years old	61	53.0
15–18 years old	42	36.5
Over 18 years old	12	10.4
Pubertal Status		
Pubertal	93	80.9
Prepubertal	22	19.1
Age of Puberty Onset		
9–10 years old	16	17.2
11 years old	24	25.8
12 years old	27	29.0
13 years old	13	14.0
14 years and older	13	14.0

The mean total score of the Sexual Communication Scale for Parents was determined to be 71.00 ± 13.73. According to the 95 % confidence interval, this value is expected to fall between 68.46 and 73.54. Considering the minimum (23) and maximum (92) possible scores on the scale, it can be stated that the sexual communication skill levels of the participating parents are at a moderate-to-high level. An examination of the subscales reveals that parents' skills in content, body language, managing the process, and anxiety are also at a moderate-to-high level (Table 2).

The mean total score of the Sexual Development Characteristics Scale for Children with Intellectual Disabilities was found to be 111.51 ± 15.24. According to the 95 % confidence interval, this score is expected to fall between 108.70 and 114.33. Given the minimum (36) and maximum (180) possible scores on the scale, it can be concluded that the overall sexual development characteristics of the children included in the study are at a moderate level. When examining the sub-dimensions of sexual development characteristics, it was found that the adolescents included in the study had low levels of 'Information Requirement', 'Privacy and Social Trust,' 'Information on Physical Development,' 'Emotional Change,' 'Sexual Arousal,' 'Sexual Harassment,' and 'Drive to Seek Sexual Satisfaction.' However, they exhibited a high level of 'Sharing Sexual Matters' and a moderate level of 'Sexual Self-Care' (Table 2).

According to Table 3, there was no statistically significant relationship ($p > 0.05$) between the sub-dimensions of content, body language, and anxiety, and the total score of the Sexual Development Characteristics Scale for Adolescents with Intellectual Disabilities (SDCS-AID). However, a positive and statistically significant correlation was found between the "managing the process" sub-dimension ($r = 0.19$; $p < 0.05$) and the SDCS-AID score. Additionally, the total score of the Sexual Communication Scale for Parents (SCSP) was also positively correlated with the SDCS-AID score ($r = 0.20$; $p < 0.05$).

Table 4 shows the results of the multiple regression analysis of the effect of parents' sexual communication skills on the sexual development of individuals with intellectual disabilities. According to the first model, none of the sub-dimensions in the scale of parents' sexual communication skills had a significant effect on the sexual development of children with intellectual disabilities individually ($p > 0.05$). Since the overall model did not demonstrate statistical significance, these findings were not interpreted and were considered exploratory in nature. It is recommended that future studies with larger sample sizes verify these results.

Discussion

This study aimed to examine the relationship between the sexual developmental characteristics of adolescents with intellectual disabilities and their parents' sexual communication skills. In this study, in which 115 parents of children with intellectual disabilities participated, it was found that the sexual communication skill level of the parents was at a high level (Min.: 23; Max: 92; [71–23)/(92–23) = 69 %]. This finding shows that parents have the potential to actively contribute to their children's sexual development process. However, some findings in the literature suggest that this result is not always valid. For example, in Bilgiç's (2015) study with mothers of adolescents with intellectual disabilities, it was reported that only 40 % of parents had sexual communication skills. Cumabaeva's (2021) research also emphasized that parents were unable to convey sufficient information about sexuality to their children and had difficulty establishing open communication.

Parents' reluctance to talk about sexuality has been highlighted in various studies. For example, Güney (2022) states that parents feel uncomfortable talking about this topic, while Nagpal and Fernandes (2015) state that parents are reluctant to bring up these topics despite their desire to talk about them. However, N. A. Murphy ve Elias (2006) have shown that healthy parent-child sexual communication not only contributes to the child's sexual development but can also be

Table 2
Descriptive statistics of scale and subscale scores.

Scale and Subscale	Min.	Maks.	Mean(M)	SD	Skewness	Kurtosis	%95 CI Lower	%95 CI Upper
Sexual Communication Scale for Parents	**23**	**92**	**71.00**	**13.73**	**−0.84**	**0.72**	**68.46**	**73.54**
Content	7	28	22.43	5.24	−0.32	−0.62	21.46	23.39
Body Language	5	20	15.05	3.66	−0.76	0.67	14.37	15.73
Managing the Process	7	28	22.24	4.76	−0.95	0.67	21.36	23.12
Anxiety	4	16	9.72	3.44	0.34	−0.69	9.08	10.36
Sexual Development Characteristics Scale for Children with Intellectual Disabilities in Adolescence	**36**	**180**	**111.51**	**15.24**	**0.52**	**0,75**	**108.70**	**114.33**
Information Requirement	6	30	12.69	4.88	0.40	0.25	11.79	13.59
Sexual Arousal	6	30	22.29	5.69	−0.35	−0.80	21.24	22.48
Privacy and Social Trust	4	20	9.93	3.14	0.23	0.32	9.35	10.51
Information on Physical Development	4	20	10.39	3.68	0.58	0.25	9.71	11.07
Sexual Harassment	3	15	12.34	2.88	−0.95	022	11.80	12.87
The Drive to Achieve Sexual Satisfaction	4	20	14.83	3.93	−0.40	−0.46	14.11	15.56
Sharing Sexual Matters	3	15	11.85	2.24	−0.37	−0.17	11.44	12.27
Emotional Change	3	15	7.48	3.35	0.72	−0.18	6.86	8.10
Sexual Self-Care	3	15	9.71	3.22	0.11	−0.91	9.12	10.31

CI: Confidence Interval.

an important factor in protecting the child from possible sexual abuse. In this context, while the high sexual communication scores obtained from our study are encouraging, the differing results in the literature suggest that this issue may vary depending on cultural, educational, or individual factors.

According to parental assessments in the study, adolescents with mental disabilities were found to have an average level of sexual development. This situation indicates that there are areas in the development processes of these individuals that are open to support. When evaluated at the sub-dimension level, low levels of development were observed in the dimensions of “Need for Information,” “Privacy and Social Trust,” “Knowledge of Physical Development,” “Emotional Change,” “Sexual Arousal,” “Sexual Abuse,” and “Desire for Sexual Satisfaction” were found to be at a low level; “Sexual Self-Care” was found to be at a moderate level, and “Sharing Topics Related to Sexuality” was found to be at a high level.

These findings indicate that individuals with intellectual disabilities need more support in certain areas of sexual development, particularly in areas related to social adjustment, such as privacy and social confidence. However, the high score for “Sharing Topics Related to Sexuality” suggests that these individuals may be more open to talking about sexuality or may receive more guidance on this topic.

These results are consistent with similar studies in the literature. For example, Borawska-Charko (2019) reported that children with learning disabilities have moderate sexual development. This finding highlights the need to support sexual development not only in individuals with intellectual disabilities but also in those with cognitive differences in general. Belluzzo et al. (2025) examined the romantic and sexual relationship experiences of adolescents with intellectual disabilities, as well as individuals with severe mental illness and Down syndrome, and reported that their levels of sexual development were also moderate. This demonstrates that similar results are obtained across different types of developmental disabilities.

Güldağ (2022) and Çelik and Yücel (2023) also reported moderate sexual development in children with intellectual disabilities. In both studies, assessments were made based on children's self-perception, mothers' sexual attitudes, and parental reports, indicating that the measurements were indirect rather than direct. Kadak (2022) showed that children with intellectual disabilities had a similar level of sexual development to children with autism spectrum disorder. This finding contradicts the common prejudice that individuals with intellectual disabilities have lower levels of sexual development, demonstrating that they can reach a certain level of development.

The relationship between parents' sexual communication skills and their children's sexual development was found to be significant in some sub-dimensions. When evaluated based on total scores, a positive and significant relationship was found between parents' sexual communication skills and their children's sexual development levels. This result indicates that parents adopting an open, supportive, and accurate communication style can support their children's healthy sexual development.

When compared with the literature, Güney (2022) found no significant relationship between parents' communication skills and children's sexual development, while Öncü et al. (2019) and Borawska-Charko (2019) identified a positive relationship between these two variables. In this context, the findings of our study generally align with the limited number of studies in the literature; however, the low level of relationship indicates the need for diversification of studies in the field and more in-depth analyses.

In conclusion, it can be said that education and guidance efforts aimed at improving parents' sexual communication skills are an important factor in supporting the healthy sexual development of individuals with intellectual disabilities. Future studies should address the causal aspect of this relationship, the effect of intervening variables, and their implications for different socio-cultural groups in a more comprehensive manner.

Strengths of the study

This study is one of a limited number of studies examining the relationship between the sexual development characteristics of adolescents with intellectual disabilities and their parents' sexual communication skills. In this respect, it has the potential to fill an important gap in the literature. Furthermore, the fact that it addresses a topic such as sexual development, which is considered difficult and sensitive to discuss in many cultures, increases the importance of the study's findings. Furthermore, the fact that the study includes parents of individuals with special needs highlights a situation that is not commonly encountered in the literature. Working with these groups requires meticulous attention to both access challenges and ethical responsibilities. The use of validated and reliable scales for data collection enhances the methodological strength of the study. The findings are thought to be instructive in terms of the development of parent education programs, social awareness initiatives, and culturally adapted nursing interventions.

Study limitations

Along with the useful data obtained from this study, some limitations must also be acknowledged. First, since the study was conducted using a cross-sectional design, only correlations between variables

Table 3
Correlation analysis of the relationship between parents' sexual communication skills and sexual development of individuals with intellectual disabilities.

Scale and Subscale	Content	Body Language	Managing the Process	Anxiety	SCSP	Information Requirement	Sexual Arousal	Privacy and Social Trust	Information on Physical Development	Sexual Harassment	The Drive to Achieve Sexual Satisfaction	Sharing Sexual Matters	Emotional Change	Sexual Self-Care	SDCS-AID
Content	1														
Body Language	0.74**	1													
Managing the Process	0.81**	0.75**	1												
Anxiety	−0.14	−0.24*	−0.2*	1											
SCSP	0.88**	0.88**	0.91**	−0.44**	1										
Information Requirement	−0.02	0.13	−0.04	0.05	0.01	1									
Sexual Arousal	0.32**	0.26**	0.32**	−0.13	0.34**	−0.07	1								
Privacy and Social Trust	−0.26**	−0.13	−0.05	0.13	−0.20*	−0.06	−0.33**	1							
Information on Physical Development	−0.20*	−0.15	−0.04	0.07	−0.16	0.06	−0.05	0.35**	1						
Sexual Harassment	0.22*	0.12	0.25**	−0.19*	0.25**	−0.10	0.61**	−0.24**	−0.16	1					
The Drive to Achieve Sexual Satisfaction	0.01	0.13	0.11	−0.09	0.12	−0.03	0.28**	−0.05	0.02	0.33**	1				
Sharing Sexual Matters	−0.14	−0.14	−0.09	−0.02	−0.12	0.07	0.00	0.26**	0.09	0.13	0.25**	1			
Emotional Change	−0.06	−0.01	0.03	−0.05	0.00	0.03	0.13	0.01	0.37**	0.18	0.23*	0.17	1		
Sexual Self-Care	−0.05	−0.06	−0.01	−0.24**	0.03	0.11	0.28**	−0.16	0.24*	0.26**	0.27**	0.12	0.37**	1	
SDCS-AID	0.12	0.16	0.19*	−0.17	0.20*	0.31**	0.66**	−0.29**	0.28**	0.58**	0.56**	0.28**	0.55**	0.65**	1

SCSP: Sexual Communication Scale for Parents; SDCS-AID: Sexual Development Characteristics Scale for Children with Intellectual Disabilities in Adolescence *$p < 0.05$ **$p < 0.01$.

Table 4
Multiple regression analysis results for the effect of parents' sexual communication skills on the sexual development of individuals with intellectual disabilities.

Model	Dependent Variable	Independent Variables	B	SHB	β	t	p	Tolerance	VIF
		Fixed	2.825	0.564		5.010	0.000		
		Content	−0.035	0.075	−0.079	−0.468	0.641	0.304	3.293
1	*SDCS-AID*	Body Language	0.005	0.019	0.039	0.259	0.796	0.380	2.634
		Managing the Process	0.018	0.016	0.193	1.132	0.260	0.297	3.372
		Anxiety	−0.017	0.013	−0.131	−1.359	0.177	0.925	1.081
$R^2 = 0.055\ \Delta R^2 = 0.021\ F((4,_{110})) = 1.604\ p = 0.178$									
		Fixed	2.715	0.824		3.294	0.001		
		Content	−0.087	0.109	−0.133	−0.798	0.427	0.304	3.293
2	*Information Requirement*	Body Language	0.078	0.027	0.431	2.897	**0.005**	0.380	2.634
		Managing the Process	−0.034	0.024	−0.241	−1.430	0.156	0.297	3.372
		Anxiety	0.015	0.018	0.079	0.828	0.410	0.925	1.081
$R^2 = 0.075\ \Delta R^2 = 0.041\ F((4,_{110})) = 2.218\ p = 0.072$									
		Fixed	21.603	6.866		3.146	0.002		
		Content	1.025	0.910	0.183	1.127	0.262	0.304	3.293
3	*Sexual Arousal*	Body Language	−0.031	0.226	−0.020	−0.136	0.892	0.380	2.634
		Managing the Process	0.209	0.196	0.175	1.066	0.289	0.297	3.372
		Anxiety	−0.113	0.154	−0.068	−0.735	0.464	0.925	1.081
$R^2 = 0.119\ \Delta R^2 = 0.087\ F((4,_{110})) = 3.699\ p = 0.007$									
		Fixed	−3.603	3.706		−0.972	0.333		
		Content	−2.000	0.491	−0.646	−4.073	**0.000**	0.304	3.293
4	*Privacy and Social Trust*	Body Language	0.020	0.122	0.023	0.161	0.873	0.380	2.634
		Managing the Process	0.320	0.106	0.485	3.022	**0.003**	0.297	3.372
		Anxiety	0.144	0.083	0.158	1.735	0.086	0.925	1.081
$R^2 = 0.160\ \Delta R^2 = 0.130\ F((4,_{110})) = 5.243\ p = 0.001$									
5	*Information on Physical Development*	Fixed	1.692	0.671	2.522	0.013			
		Content	−0.240	0.089	−0.444	−2.699	**0.008**	0.304	3.293
		Body Language	−0.017	0.022	−0.114	−0.777	0.439	0.380	2.634
		Managing the Process	0.048	0.019	0.415	2.491	**0.014**	0.297	3.372
		Anxiety	0.012	0.015	0.074	0.780	0.437	0.925	1.081
$R^2 = 0.095\ \Delta R^2 = 0.062\ F((4,_{110})) = 2.882\ p = 0.026$									
		Fixed	14.095	3.513		4.013	0.000		
		Content	0.471	0.465	0.166	1.012	0.314	0.304	3.293
6	*Sexual Harrasment*	Body Language	−0.175	0.115	−0.222	−1.517	0.132	0.380	2.634
		Managing the Process	0.150	0.101	0.247	1.488	0.140	0.297	3.372
		Anxiety	−0.138	0.079	−0.164	−1.749	0.083	0.925	1.081
$R^2 = 0.102\ \Delta R^2 = 0.070\ F((4,_{110})) = 3.137\ p = 0.017$									
		Fixed	6.249	4.943	1.264	0.209			
	The Drive to	Content	−1.099	0.655	−0.284	−1.679	0.096	0.304	3.293
7	*Achieve Sexual*	Body Language	0.197	0.162	0.184	1.215	0.227	0.380	2.634
	Satisfaction	Managing the Process	0.158	0.141	0.191	1.119	0.266	0.297	3.372
		Anxiety	−0.051	0.111	−0.044	−0.459	0.647	0.925	1.081
$R^2 = 0.045\ \Delta R^2 = 0.010\ F((4,_{110})) = 1.297\ p = 0.276$									
		Fixed	11.357	2.839		4.000	0.000		
		Content	−0.323	0.376	−0.146	−0.859	0.392	0.304	3.293
8	*Sharing Sexual Matters*	Body Language	−0.076	0.093	−0.124	−0.816	0.417	0.380	2.634
		Managing the Process	0.053	0.081	0.113	0.655	0.514	0.297	3.372
		Anxiety	−0.031	0.064	−0.048	−0.493	0.623	0.925	1.081
$R^2 = 0.029\ \Delta R^2 = 0.000\ F((4,_{110})) = 0.820\ p = 0.515$									
		Fixed	2.849	4.263		0.668	0.505		
		Content	−0.760	0.565	−0.230	−1.346	0.181	0.304	3.293
9	*Emotional Change*	Body Language	−0.015	0.140	−0.017	−0.110	0.913	0.380	2.634
		Managing the Process	0.155	0.122	0.220	1.273	0.206	0.297	3.372
		Anxiety	−0.040	0.095	−0.041	−0.417	0.678	0.925	1.081
$R^2 = 0.023\ \Delta R^2 = 0.000\ F((4,_{110})) = 0.650\ p = 0.628$									
		Fixed	12.595	3.991	3.156	0.002			
		Content	−0.139	0.529	−0.044	−0.262	0.794	0.304	3.293
10	*Sexual Self-Care*	Body Language	−0.125	0.131	−0.142	−0.951	0.343	0.380	2.634
		Managing the Process	0.049	0.114	0.072	0.425	0.672	0.297	3.372
		Anxiety	−0.248	0.089	−0.265	−2.775	**0.006**	0.925	1.081
$R^2 = 0.074\ \Delta R^2 = 0.040\ F((4,_{110})) = 2.184\ p = 0.075$									

could be identified, and no causal inferences could be made. The fact that the participants were selected from two specific education and rehabilitation centers limits the generalizability of the findings to other institutions and regions. Since the data are based on parental self-reports, there is a possibility of social desirability and recall bias, which may affect the accuracy of measurements dealing with sensitive topics such as sexuality. Furthermore, this study did not include between-group comparisons of parents' demographic characteristics (e.g., age, gender, education level) with their sexual communication skills and their children's sexual development levels. This constitutes an important limitation in terms of identifying the potential effects of these variables. In future studies, using larger and more diverse socio-cultural groups, longitudinal designs, multiple data sources (such as teacher or clinician reports), and analytical approaches that control for confounding variables are expected to enhance the validity and applicability of the findings.

Conclusions

This study investigates the relationship between the sexual development characteristics of individuals with intellectual disabilities and their parents' sexual communication skills. It was determined that

parents' sexual communication skills were at a high level. This shows that parents are generally competent in talking about sexuality with their children. Parents with higher education levels had better sexual communication skills than those with lower education levels. Children's level of sexual development was generally found to be at an intermediate level. Parents' sexual communication skills have an important effect on children's sexual development, but this effect needs to be strengthened. In this direction;

- Training programs should be organized for parents to communicate more effectively with their children about sexuality. These trainings should be organized in collaboration with experts from different disciplines such as pediatric and public health nurses, psychologists, child development specialists, and special education teachers.
- Supportive materials and accessible educational opportunities should be provided for parents with low levels of education. Public health nurses should make home visits to assess the level of knowledge of individuals with disabilities and their parents and organize individualized education programs accordingly.
- To increase the level of sexual development of children, programs including informative activities and counseling services can be created by pediatric and public health nurses for parents in schools.
- It is recommended that pediatric and public health nurses receive advanced training in sexual health and communication and share this information with parents and children.
- Academic studies to be conducted in the field of nursing are thought to contribute greatly to the development of evidence-based practices by evaluating the effectiveness of different methods to strengthen the relationship between the sexual development of individuals with intellectual disabilities and parents' sexual communication skills.

CRediT authorship contribution statement

Tuğba Çetinol Taştemel: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Gülendam Karadağ:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Funding

The authors received no financial support for this article's research, authorship, and/or publication.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We thank the families who participated in the research. Funding was not received for the study.

References

Acarlar, F. (2013). Inclusion model and characteristics of children with special needs. In B. Sucuoğlu, & H. Bakkaloğlu (Eds.), *Inclusion in preschool: What, when, where, why, how, who* (p. 26) (1st ed.). Kök Publishing.

American Association on Intellectual and Developmental Disabilities (AAIDD) (2021). Definition of intellectual disability. Retrieved April 22, 2024, from https://www.aaidd.org/intellectual-disability/definition.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

Artan, İ., Ceylan, Ş., & Adıbatmaz, F. B. K. (2020). Ebeveynler için cinsel iletişim ölçeği: Güvenirlik ve geçerlik çalışması [Sexual Communication Scale for Parents: A reliability and validity study]. *Hacettepe University Faculty of Health Sciences Journal*, *7*(2), 136–158. https://doi.org/10.21020/husbfd.735860.

Baines, S., Emerson, E., Robertson, J., & Hatton, C. (2018). Sexual activity and sexual health among young adults with and without mild/moderate intellectual disability. *BMC Public Health*, *18*, 667. https://doi.org/10.1186/s12889-018-5572-9.

Bayrak, G., Başgül, Ş. S., & Gündüz, T. (2011). Sexuality and education in children with special needs. *Sexual education in the family* (p. 157). Timaş Publications.

Belluzzo, M., Giaquinto, V., Esposito, C., De Alfieri, E., & Amodeo, A. L. (2025). Sexual health education for young adults diagnosed with severe mental illness, intellectual disability, and autism: A pilot study on the eITPoSA psycho-educational intervention. *Sexes*, *6*(2), 21. https://doi.org/10.3390/sexes6020021.

Bilge, A., Çeber, E., Demirelöz, M., & Akmese, Z. B. (2013). Determination of the effectiveness of sexual and reproductive health education for the parents of individuals with developmental disability. *Turkey Clinics Journal of Medical Sciences*, *33*(3), 648. https://doi.org/10.5336/medsci.2012-30037.

Bilgiç, E. (2015). *The views of mothers of mentally disabled adolescents on sexual education.* (Master's thesis)Nişantaşı University Institute of Social Sciences.

Borawska-Charko, M. (2019). *An examination of the sexual health knowledge, experiences, and needs of people with learning disabilities.* (Doctoral dissertation). Anglia Ruskin University Faculty of Science and Engineering.

Boyacıoğlu, N. E., Karaçam, Z. D., & Özcan, N. K. (2018). Sexuality despite obstacles: Sexuality in children with intellectual disability. *Journal of Health Sciences and Professions*, *5*(2), 275–280. https://doi.org/10.17681/hsp.291360.

Boyacıoğlu, N. E., Karaçam, Z. D., Özcan, N. K., & Sert, O. (2021). The views of parents of adolescents with intellectual disability about their children's sexuality: A qualitative study. *Journal of Psychiatric Nursing*, *12*(3), 216–226. https://doi.org/10.14744/phd.2021.60251.

Burke, L. M., Kalpakjian, C. Z., Smith, Y. R., & Quint, E. H. (2010). Gynecologic issues of adolescents with down syndrome, autism, and cerebral palsy. *Journal of Pediatric and Adolescent Gynecology*, *23*(1), 11–15. https://doi.org/10.1016/j.jpag.2009.04.005.

Çağdaş, A., & Arı, R. (1999). The effects of mother-child communication language training on the social development of 4–5-year-old children. *Journal of Selçuk University Institute of Social Sciences*, *5*, 391–407.

Çakmak, S., & Çakmak, S. (2011). *Sexual education practices in children in need of special education.* Vize Publishing.

Çelik, Ö., & Yücel, S. (2023). Investigation of sexual development characteristics of adolescents with intellectual disabilities through parent reports. *Journal of Van Yüzüncü Yıl University Faculty of Education*, *20*(3), 801–825. https://doi.org/10.33711/yyuefd.1235813.

Çerçi, G. (2013). *Investigation of knowledge levels and attitudes of families with children with mental disabilities towards the mental development and education of their children.* (Unpublished master's thesis)Dokuz Eylül University Institute of Educational Sciences.

Çifçi Tekinaslan, İ., & Eratay, E. (2013). Investigation of parental behaviors of individuals with intellectual disabilities in the process of adaptation to adolescence. *NWSA-Education Sciences*, *8*(3), 363–374. https://doi.org/10.12739/NWSA.2013.8.3.1C0592.

Çolak, B., & Kahriman, İ. (2022). High-risk child group: Street children, the problems they face, and nursing approaches. *Journal of General Health Sciences*, *4*(1), 81–91. https://doi.org/10.51123/jgehes.2022.45.

Cumabaeva, A. (2021). *Investigation of the problems experienced by parents with mentally disabled children during adolescence with their children.* (Master's thesis).Kyrgyzstan-Turkey Manas University Institute of Social Sciences.

Diiorio, C., Pluhar, E., & Belcher, L. (2003). Parent-child communication about sexuality: A review of the literature from 1980–2002. *Journal of HIV/AIDS Prevention & Education for Adolescents & Children*, *5*(3–4), 7–32. https://doi.org/10.1300/J129v05n03_02.

Erengin, M., Nuri, C., & Bağlama, B. (2024). The relationship between the attitudes towards sex education and gender perceptions of parents of children with special needs. *Turkish International Journal of Special Education and Guidance & Counselling (TIJSEG)*, *13*(2), 115–138. https://www.tijseg.org.

Ertaş, Ö. N. (2024). *Examining the relationship between father involvement levels, sexual communication towards their children, and religious attitudes of fathers who have children between the ages of 3–6.* (Master's thesis).Istanbul Kültür University Institute of Postgraduate Education.

Foster, M., Whitehead, L. L., O'Sullivan, T. A., Hill, J., & Mörelius, E. (2025). A child-centred research checklist to improve the design and reporting of paediatric research studies: A descriptive mixed methods study. *International Journal of Nursing Studies*, *162*, Article 104958. https://doi.org/10.1016/j.ijnurstu.2024.104958.

Ganji, J., Emamian, M. H., Maasoumi, R., Keramat, A., & Khoei, E. M. (2017). The existing approaches to sexuality education targeting children: A review article. *Iranian Journal of Public Health*, *46*(7), 890–898.

Gokgoz, C., Demirci, A. D., & Kabukcuoglu, K. (2021). Sexual behaviors and education in adolescents and young adults with Down syndrome: A grounded theory study of experiences and opinions of their mothers in Turkey. *Research in Developmental Disabilities*, *112*, Article 103907. https://doi.org/10.1016/j.ridd.2021.103907.

Güldağ, Ö. (2022). *Examining the self and sexual development of normally developing and mentally disabled children and their mothers' attitudes towards sexual identity development.* (Master's thesis).Marmara University Institute of Educational Sciences.

Gündoğdu, G. (2022). *Evaluation of the effectiveness of health education provided to parents of children with disabilities aged 10–19 on sexual health.* [Master's thesis, Zonguldak Bülent Ecevit University]Council of Higher Education Thesis Center.

Güney, A. (2022). *Investigation of the relationship between parents' attitudes towards sexual education and communication language and sexual development of children.* (Master's thesis)Karabük University Institute of Postgraduate Education.

Gürbüz, S. (2018). *Evaluation of sexual development characteristics of individuals with intellectual disabilities during adolescence based on parental opinions: A scale development*

study. [Unpublished master's thesis]Abant İzzet Baysal University, Institute of Educational Sciences.
Güven, D. (2021). Comprehensive sexuality education and individuals with autism spectrum disorder. *Journal of Social and Humanities Sciences Research*, *8*(66), 284–300. https://doi.org/10.26450/jshsr.2299.
Güzel, E. (2020). Adultized child 'tween' and the concept of 'threshold'. *Global Media Journal TR Edition*, *10*(20), 219–231.
Hazar, Z., & Ayhan, A. B. (2022). Investigation of the experiences of mothers with mentally disabled children in adolescence. *International Journal of Human Studies*, *5*(9), 215–238. https://doi.org/10.35235/uicd.1088313.
Kadak, B. E. (2022). *Comparison of sexual development characteristics of children with autism spectrum disorder and children with mental deficiency between the ages of 11–18.* (Master's thesis).Üsküdar University Institute of Social Sciences.
Köyceğiz, M., & Özbey, S. (2019). Examining the relationship between communication skills of parents with preschool children and their children's social skills and problem behaviors. *Gazi University Gazi Faculty of Education Journal*, *39*(3), 1707–1734.
Kristiana, S., Jamaris, M., & Sumantri, M. S. (2006). Utilization of demonstration methods as sex education in early childhood. *International Journal of Multidisciplinary and Current Research*, *6*, 811–814. https://doi.org/10.14741/ijmcr/v.6.4.21.
Kuddo, A. (2012). *Public employment services and activation policies.* (Social Protection & Labor Discussion Paper no. 1215)World Bank. https://documents1.worldbank.org/curated/zh/261871468184139230/pdf/689380NWP00PUB0ction0and0labor01215.pdf.
Kurt, A. (2022). *Determining the effectiveness of sexual health and development education provided to children with intellectual disabilities.* [Doctoral dissertation, Zonguldak Bülent Ecevit University]Council of Higher Education Thesis Center.
Kurt, A., & Kürtüncü, M. (2021). The importance of sexual development education in adolescent children with intellectual disabilities. *Celal Bayar University Journal of Health Sciences Institute*, *8*(2), 353–357. https://doi.org/10.34087/cbusbed.795223.
Liu, W., Li, J., Li, H., & Zheng, H. (2023). Adaptation of global standards of comprehensive sexuality education in China: Characteristics, discussions, and expectations. *Children*, *10*(2), Article 409. https://doi.org/10.3390/children10020409.
Ministry of National Education (2006). *Regulation on special education services.* Official Gazette May 31, 2006, no. 26184.
Murphy, C., Lincoln, S., Meredith, S., Cross, E. M., & Rintell, D. (2016). Sex education and intellectual disability: Practices and insight from pediatric genetic counselors. *Journal of Genetic Counseling*, *25*(3), 552–560. https://doi.org/10.1007/s10897-015-9909-6.
Murphy, N. A., Elias, E. R., & Council on Children With Disabilities (2006). Sexuality of children and adolescents with developmental disabilities. *Pediatrics*, *118*(1), 398–403. https://doi.org/10.1542/peds.2006-1115.
Nagpal, A. N., & Fernandes, C. (2015). Attitude of parents towards sex education. *The International Journal of Indian Psychology*, *2*(4), 38–43. https://doi.org/10.25215/0204.060.
Öncü, E., Aktaş, G., Köksoy Vayısoğlu, S., & Karakuş, E. (2019). Sexual development characteristics of adolescents with intellectual disabilities and difficulties experienced by families: A descriptive study. *Mersin University Journal of Health Sciences*, *12*(3), 413–425. https://doi.org/10.26559/mersinsbd.553739.
Schubel, L., Busog, D. N., Tabaie, A., Lemke, M., Foltz, D., Badolato, G., ... Miller, K. (2025). Leading the way in pediatric sexual health screenings: Evaluating pediatric emergency department workflows for the integration of STI screening tools. *Frontiers in Health Services*, *5*, Article 1493318. https://doi.org/10.3389/frhs.2025.1493318.
Sucuoğlu, B. (2009). *Mentally disabled people and their education.* Kök Publishing.
Van Asselt-Goverts, A. E., Embregts, P. J. C. M., Hendriks, A. H. C., Wegman, K. M., & Teunisse, J. P. (2015). Do social networks differ? Comparison of the social networks of people with intellectual disabilities, people with autism spectrum disorders and other people living in the community. *Journal of Autism and Developmental Disorders*, *45*, 1191–1203. https://doi.org/10.1007/s10803-014-2279-3.
Whooten, R., Schmitt, J., & Schwartz, A. (2018). Endocrine manifestations of down syndrome. *Current Opinion in Endocrinology, Diabetes, and Obesity*, *25*(1), 61–66. https://doi.org/10.1097/MED.0000000000000382.
Yalçın, H. (2013). The effects of mother-child communication training. *Süleyman Demirel University Faculty of Arts and Sciences Journal of Social Sciences*, *28*, 179–194.
Yalkılıç, B. (2020). *Preschool teachers' views and practices regarding sexual development and education: A situational analysis.* (Unpublished master's thesis)Istanbul Okan University.
Yıldız, G., & Cavkaytar, A. (2017). Effectiveness of a sexual education program for mothers of young adults with intellectual disabilities on mothers' attitudes toward sexual education and the perception of social support. *Sexuality and Disability*, *35*(1), 3–19. https://doi.org/10.1007/s11195-016-9465-5.
Zhang, R., Lu, L., Yu, Y., Zhou, Z., Xia, H., Yan, R., & Ye, Y. (2025). Theory of planned behavior-based cross-sectional study of family sex education for preschoolers in China: Rural-urban comparative analysis. *BMC Public Health*, *25*, Article 1130. https://doi.org/10.1186/s12889-025-22365-4.