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Estimating sexual knowledge of people with mild intellectual disability through a valid and reliable assessment scale: The ISK-ID

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Abstract

Background: Despite the relevance of assessing sexual knowledge in people with Intellectual Disability, there is a lack of appropriate assessment tools to measure this domain. The current study tests the psychometric properties of the new 'Inventory of Sexual Knowledge of people with Intellectual Disability' (ISK-ID).

Method: 345 individuals with mild intellectual disability completed the ISK-ID before and after the implementation of a sexual education program. Psychometric properties of the ISK-ID were analysed according to Multidimensional Item Response Theory (MIRT).

Results: Its underlying factorial structure, along with parameters derived from the MIRT (item discrimination, difficulty, and participant's ability), support the use of the ISK-ID as a measure of sexual knowledge. Moreover, the ISK-ID was able to detect changes in the level of sexual knowledge resulting from educational interventions (i.e., responsiveness).

Conclusions: The ISK-ID is an appropriate assessment tool to measure sexual knowledge in men and women with mild intellectual disability.

KEYWORDS
assessment, intellectual disability, multidimensional item response theory, sexual knowledge

1 | INTRODUCTION

People with intellectual disability experience different degrees of impairment in intellectual functioning and adaptive skills (American Psychiatric Association, 2013). However, intellectual disability does not affect affective and sexual needs, and the sexual development of people with this condition is similar to that of their counterparts without disabilities (Phasha & Runo, 2017). As a result, adults with intellectual disability may express similar sexual desires to those without disability, and many of them even show a similar pattern of sexual behaviour (in terms of sexual frequency, type of sexual behaviour and number of sexual partners) (Borawska-Charko et al., 2017; Gil-Llario et al., 2018; Whittle & Butler, 2018). However, sexuality in people with intellectual disability has been systematically associated with myths, stereotypes and false beliefs that foster negative attitudes (Gil-Llario et al., 2020) and limit their right to express and enjoy their sexuality (Franco et al., 2012).

As a result, people with intellectual disability face many challenges in the development and expression of their sexuality (Schaafsma et al., 2013). One of the main problems is related to their access to appropriate sexual education: most individuals with intellectual disability have limited opportunities to learn about sex

through structured programs. Thus, the level of sexual knowledge among people with intellectual disability is quite low. As a case in point, Siebelink et al. (2006) found that 76% of individuals with mild or moderate intellectual disability knew about the risks of getting sexually transmitted infection (STI), 59% recognized a picture of a condom, and only 51% were able to identify that a person in a picture was masturbating. These findings support other studies pointing out that when people with intellectual disability have some knowledge about sexuality, it tends to be superficial and focused on topics such as physiology, contraception and STIs (Schaafsma et al., 2017). This means that their knowledge in other important areas (e.g. dating and intimacy, affect, pleasure, sexual orientation, etc.) is often limited. This obvious lack of sexual knowledge impacts different aspects of their psychosexual development. For example, they are less able to discuss issues related to safe sex (Dukes & Mcguire, 2009), develop and practice socio-sexual skills (such as courtship) and initiate and maintain safe and positive intimate relationships with romantic/sexual partners (Jahoda & Pownall, 2014). Even more worrisome, people with intellectual disability and poor sexual knowledge are more vulnerable to suffering from sexual abuse or exploitation because they are not able to distinguish an appropriate display of affection from an act of sexual abuse, they are not able to identify situations where the risk of sexual abuse is high, and they lack appropriate self-protection skills (Gil-Llario et al., 2020). As a result, it has been estimated that individuals with intellectual disability are 4–10 times more likely to be victims of sexual abuse than people without intellectual disability (Reiter et al., 2007).

Therefore, it is crucial to identify the level of knowledge of people with intellectual disability about different sex-related topics, in order to plan and implement individualized interventions and structured sexual education programs tailored to their intellectual characteristics and a priori knowledge (McCann et al., 2019). At a practical level, assessing the level of sexual knowledge of individuals with intellectual disability allows us to identify priorities when implementing sexual education programs and assess their efficacy (comparing the level of sexual knowledge before and after an intervention). In addition, knowing what individuals with intellectual disability do and do not know keeps educators from saturating them with repetitive information, focusing programs on new and relevant information (important given their cognitive limitations).

Despite the relevance of assessing the level of sexual knowledge of people with intellectual disability, there is a lack of sound, standardized psychometric instruments to quantify this knowledge (Kramers-Olen, 2017). This gap is partially explained by the complexity of assessing a topic that comprises multiple areas (e.g., friendship, dating and intimacy, body part identification, menstruation, sexual interactions, contraception, pregnancy, abortion and childbirth, STDs, masturbation, homosexuality, etc.). Furthermore, the unique characteristics of people with intellectual disability in terms of cognitive impairments and the many factors affecting their sexual knowledge rule out the use of assessment measures designed for other populations (such as scales to measure sexual knowledge in children, people with physical disabilities, or the general population). After

an in-depth review of academic databases, Borawska-Charko et al. (2017) only identified six scales that assess sexual knowledge in people with intellectual disability. These scales were limited in different ways: (1) The majority were developed ad hoc for research purposes (meaning that their use for clinical purposes was not guaranteed); (2) Some of these measures did not report appropriate psychometric properties, and, in general, the methodological and psychometric approaches used to validate these scales were not appropriate; (3) These scales tended to mix the assessment of sexual knowledge and attitudes (e.g., Socio-Sexual Knowledge and Attitudes Test [SSKAT]; Edmonson & Wish, 1975), knowledge and sexual experience (e.g., Sexual Knowledge Interview Schedule [SKIS]; Forchuk et al., 1995) or knowledge and a variety of other sex-related variables (e.g., Sex-Ken; McCabe et al., 1999); and (4) Many of these scales were quite long. For example, the Sex-Ken scale (McCabe et al., 1999) contains 248 items and takes an hour to complete as a questionnaire and up to 3 h as an interview. Given that, people with intellectual disability may experience attention problems, the development of shorter and more reliable tools to assess sexual knowledge is warranted. Exceptions to these long measures are the Sexual Attitudes and Knowledge Questionnaire (SAK; Heighway & Webster, 2007) or the Assessment of Sexual Behaviour and Knowledge of people with Intellectual Disability (ASBKID) (Gil-Llario et al., 2020). However, these alternative measures are not without limitations. Despite its brevity (19 items) and appropriate psychometric properties (α = .82) (Langdon et al., 2007), the SAK is not advised for assessments focused only on sexual knowledge as it measures both sexual knowledge and attitudes. The ASBKID is also brief (32 items) and reliable (α between .74–.92); however, its accuracy depends on the degree of experience of the observer, as the ASBKID is an 'other-report' measure.

An additional methodological limitation of all the available scales to assess sexual knowledge of people with intellectual disability is that they were developed from a Classical Test Theory (CTT) approach. This approach is limited in several ways (Rusch et al., 2017), particularly when it comes to assessing the level of knowledge. In this context, Item Response Theory (IRT) is proposed as a robust alternative to CTT. IRT assumes that items measure a single continuous latent variable (i.e., general knowledge), and that item responses are mutually independent (i.e., responses are not necessarily related to each other). In sum, IRT considers the item as a unit of measurement and, therefore, focuses more on the analysis of items than on the analysis of the global test. Furthermore, IRT makes it possible to estimate parameters that are useful when measuring knowledge, such as the level of difficulty of each item and its discriminatory power (i.e., the extent to which an item distinguishes between those scoring high and low on the variable of interest).

1.1 | The present study

Given the theoretical and methodological limitations of available scales to assess the level of sexual knowledge of people with intellectual disability, the current study sought to create and test

the psychometric properties of a new screening scale that could: (a) be used to assess sexual knowledge in adults with mild intellectual disability; (b) allow us to identify the level of knowledge in different domains, as well as a general index of sexual knowledge; and (c) monitor changes in sexual knowledge as a result of the implementation of sexual education programs. To reach these aims, we designed a new measure to assess the level of sexual knowledge in people with intellectual disability: The Inventory of Sexual Knowledge for people with Intellectual Disability (ISK-ID). In this study, we address some of the methodological and psychometric concerns that hindered the use of previous tools by using an IRT approach to evaluate the ISK-ID. Furthermore, participants were assessed twice (before and after the implementation of a sex-education program) in order to test whether the ISK-ID was able to capture changes in the level of sexual knowledge after a structured educational intervention (i.e., responsiveness). Finally, the sample employed for the validation of the ISK-ID (n_{T1} = 345; n_{T2} = 345) is one of the largest samples recruited for this aim in the field of intellectual disability.

2 | METHODS

2.1 | Development of the ISK-ID

For the construction of the ISK-ID, we performed an in-depth review of previous scales and tests in the literature on sexual knowledge in people with mild intellectual disability. In this review, we analysed the content (constructs and areas assessed), format (answer scales, written items vs. illustrated items, etc.), structure (factorial solutions) and procedures followed to validate the six measures included by Borawska-Charko et al. (2017), as well as other scales assessing sexual knowledge in people with intellectual disability not included in this review (e.g., the SAK [Heighway & Webster, 2007] or ASBKID [Gil-Llario, Morell-Mengual, et al., 2020]). Given that one of our central aims was to develop a measure able to capture changes in sexual knowledge resulting from structured educational interventions, another source of inspiration for the development of the ISK-ID were the components of different structured education programs for improving sexual knowledge in people with intellectual disability. To capture this aspect, we reviewed and identified the main areas addressed by programs aimed to increase sexual knowledge in people with intellectual disability (for a review, see Schwartz & Robertson, 2019). Some of these areas were: (a) hygiene; (b) menstruation; (c) reproductive system; (d) STDs and birth control; (e) sexual functioning; (f) sexual safety practices; (g) first impressions; (h) communication skills; (i) dating skills; (j) sexual harassment; or (k) sexual abuse. This review was performed by the members of the research team in charge of developing the ISK-ID.

Based on this search, we proposed a preliminary pool of items that we then shared with an advisory board composed of five external researchers and professionals working in support services for people with intellectual disability (psychologists, occupational therapists, social workers, etc.). The aim was to figure out which sex-related areas professionals considered more relevant in assessing sexual knowledge, in addition to increasing the content validity of the ISK-ID by reviewing proposed items and proposing new ones. Face-to-face meetings were arranged in which the panel of external experts were presented with the initial pool of items and provided feedback on the basis of their experience. This feedback was then employed to decide retention, rejection, rewording, or proposition of new items.

After this step, a pool of 117 dichotomous items (yes/no) was developed, assessing nine dimensions that the study researchers and professionals consulted found to be of interest: (1) intimacy (e.g., "For me, intimacy is a place where I can do private things"); (2) condom use ("I should use condoms during sexual intercourse"); (3) intimate hygiene ("I should change my underwear every day"); (4) sexual practices ("Oral sex involves using your mouth or tongue to stimulate your partner's genitals or anus"); (5) body image and sexual communication ("I will have a healthier body image if I tell myself nice things"); (6) dating, intimacy, and sexual assertiveness ("In a relationship, women should take care of the home, and men should work outdoors and make decisions"); (7) homosexuality ("Homosexuality is a valid sexual orientation"); (8) sexual health ("To prevent contracting an STI, I should use condoms"); and (9) concept of sexuality ("Dancing or taking a walk are considered sexual activities"). At this step, aggrupation of items on dimensions was theoretically driven (i.e., based on the area theoretically assessed by each item) and each dimension was made up of 13 dichotomous items. Each item was fully labelled to facilitate response. In order to increase the readability of the scale, items were designed in an easy-to-read format (Fajardo et al., 2014). Furthermore, we only included 12 items per page (14-point font size) to simplify the questionnaire for participants with possible vision problems. This version of the ISK-ID was administrated to test sexual knowledge in our sample (both in T1 and T2).

2.2 | Refinement and validation of the ISK-ID

2.2.1 | Participants and procedure

Data acquisition for the refinement and validation of the ISK-ID was conducted between 2017 and 2019. Participants were recruited from two support service networks for people with intellectual disability. Of the 54 daytime support services managed by the two institutions, 29 were selected to participate in this research. To ensure sample representativeness, we followed a stratified random sampling procedure based on population density to select these centres (Lohr, 2010). We prioritized the selection of centres located in urban areas with a medium population density, and we then completed the assessment in centres located in areas with high and low population densities. Thus, in the final sample, around 25% of the participants were from cities with a population

density >500,000, around 65% were from cities with a population density between 10,000 and 500,000, and around 15% were from cities with <10,000 inhabitants (considered rural areas). This recruitment procedure allowed us to obtain a representative sample of individuals with intellectual disability from urban and rural areas.

An average of 12 participants completed the assessment in each centre. To determine eligibility for the research, we established the following inclusion criteria: (1) age over 18 years old; (2) meeting the DSM-5 criteria for Intellectual Disability (mild severity); and (3) having enough communication and reading skills to carry out the study. Information about the intellectual disability diagnosis and severity was already registered in the participant's clinical records at the daytime support services. Participants' reading skills were assessed before the study by consulting their educational supervisors at the support service. As for the assessment procedure, two members of the research team with extensive experience in the assessment and treatment of people with intellectual disability carried out the data collection. Each participant was assessed individually in a private and quiet room of the support service. Only the participant and one of the evaluators were present while completing the assessment and evaluators kept their distance from participants to respect their privacy and create a comfortable situation. Participants were given a brief explanation about how to complete the assessment tools and, if needed, support was provided while they were filling them in (e.g., explaining the meaning of a word). The average time per assessment was 55 min, 10 of which were devoted to establishing rapport with the participant.

A total of 345 individuals with intellectual disability participated in the refinement and validation of the ISK-ID. Participants were assessed twice: before the implementation of a group intervention aimed to improve sexual knowledge (T1) and two weeks after finishing the program (T2). All the participants who completed the assessment in T1 participated in this educational intervention and completed the assessment in T2 (100% retention rate).

2.2.2 | Description of the group intervention

Between assessment in T1 and T2, participants completed a group intervention aimed to improve sexual knowledge. The program consisted of 16 structured group sessions (1 session per week; around 1 h per session) implemented through an interactive methodology (see Gil-Llario et al., 2019). The intervention was conducted by the professional caregivers in charge for the care of the participants with intellectual disability at the support services. Before the implementation of the program, professionals received extensive instruction in how to apply the program, as well as the required materials to implement the program. As for the content of the program, each session was devoted to address one of the following aspects: (a) concept of sexuality; (b) sexuality and intimacy; (c) body image and self-esteem; (d) communication; (e) sexual hygiene; (f) masturbation; (g) identity and sexual orientation; (h) dating skills (three sessions); (i)

sexual assertiveness; (j) sexual functioning and sexual safety practices; (k) STDs and birth control; (l) sexual abuse; and (m) romantic beliefs.

2.2.3 | Secondary measures

Besides assessing sexual knowledge through the ISK-ID, we obtained data on participants' characteristics through two sources. Participants in the study self-reported their sex, age, sexual behaviour, and relationship history, whereas the professionals responsible for their care at the support services were asked about their intellectual disability severity, age of intellectual disability diagnosis, and the presence of other physical/mental disorders (information available in the participants' clinical records).

2.2.4 | Data analysis

First, we performed descriptive analyses using SPSS (version 25.0) to explore sociodemographic, clinical and sexual behaviour of participants in validation of the ISK-ID. To compare these characteristics according to sex, t-tests (ordinal variables) and chi-square tests (categorical variables) were performed. Effect sizes for t-tests (i.e., Cohen's d) were computed with the G*Power software (Version 3.1.9.6), whereas effect sizes for categorical variables (i.e., Cramer's V) were calculated through the SPSS. For Cohen's d, effect sizes of above 0.20 were considered small, up to 0.50 were considered moderate, and greater than 0.80 were considered large (Cohen, 1988); for Cramer's V, these sizes corresponded to values of 0.10, 0.30 and 0.50, respectively (Ellis, 2010).

Different analyses were conducted to refine the initial version of the ISK-ID. First, we explored the percentage of missing responses, the percentage of right/wrong answers on each item, reliability when items were deleted and the correlation of each item with a latent dimension of sexual knowledge. These analyses were used to reduce the length of the ISK-ID from 117 items to 34 items (see Section 3.2, 'Refinement of the ISK-ID').

To evaluate the ISK-ID according to IRT, we conducted the following analysis. First, we explored the unidimensionality of the six domains of sexual knowledge measured by the ISK-ID using the RStudio software ("ltm" package [Rizopoulos, 2006]). Then, we explored multidimensionality using Mplus software (version 7.4). Multidimensionality is a central feature of a later elaboration of IRT: Multidimensional IRT (MIRT). MIRT is employed in test analysis when the measure has multiple dimensions (i.e., the majority of the scales in psychology) (Chalmers, 2012). This further theoretical and psychometric development assumes that, beyond unidimensionality, independent domains (here, specific sex-knowledge domains) represent a higher-order latent variable (i.e., general sexual knowledge). The next step was to calculate the items' parameters (i.e., item discrimination [a], item difficulty [b], multidimensional item discrimination [MDISC], and multidimensional item difficulty [MDIFF]), as well

as participants' ability (*Theta*). These analyses were performed using the "mirt" package (Chalmers, 2012).

Finally, we assessed the responsiveness of the ISK-ID by comparing scale scores before and after the implementation of the sex education program previously described (*t*-test; Cohen's *D*). Responsiveness is defined as "the ability of an outcome measure to detect changes over time in the construct to be measured" (Mokkink et al., 2010, 2018) and is considered as a crucial feature when selecting a scale to measure changes derived from particular interventions.

3 | RESULTS

3.1 | Participants' characteristics

The sample recruited for the refinement and validation of the ISK-ID consisted of 345 participants with mild intellectual disability, 54.1% (*n* = 190) men and 44.9% (*n* = 155) women (Table 1). Participants' ages ranged between 19 and 67 years old (*M* = 37.77; *SD* = 10.50). The majority lived with their parents or guardians (77.3%; *n* = 256),

followed by 10.6% (*n* = 35) who lived in nursing home/hospital settings for people with intellectual disability, 8.5% (*n* = 28) who lived in community facilities with different degrees of supervision, and 3.6% (*n* = 12) who lived alone. As for the age of diagnosis of the intellectual disability, 42.2% of the participants (*n* = 146) were diagnosed before the age of eight.

Regarding sexual behaviour and relationship history, 73.3% (*n* = 253) reported having had at least one boyfriend/girlfriend. The most prevalent sexual behaviours were masturbation (66.7%; *n* = 230), vaginal intercourse (33.6%; *n* = 116), mutual masturbation (31%; *n* = 230), and oral sex (20.6%; *n* = 71). Finally, 23.3% of the participants self-reported having been victims of unwanted sexual touching/kissing, and 23.3% (*n* = 81) reported that they had been victims of sexual abuse.

3.2 | Refinement of the ISK-ID

Given that the initial version of the ISK-ID was lengthy (117 items; about 45 min to complete), we conducted different analyses to

TABLE 1 Participants' characteristics

	Total (*n* = 345) % or M (*SD*)	Female (*n* = 155) % or M (*SD*)	Male (*n* = 190) % or M (*SD*)	Effect size
Age	37.77 (10.50)	37.48 (10.47)	38.00 (10.55)	*d* = 0.05
Age category (19–35)	43%	44.1%	42.1%	*V* = 0.04
Age category (36–52)	45.7%	46.1%	45.4%	
Age category (53–69)	11.3%	9.9%	9.3%	
Residence type				
With relatives (with parents, siblings, guardians, etc.)	77.3%	79.1%	76%	*V* = 0.08
Community living (shared apartment with complete/partial supervision)	8.5%	7.4%	9.3%	
Nursing home/hospital setting (nursing home, congregate care, etc.)	10.6%	8.8%	12%	
Independent living (alone or with others with no supervision)	3.6%	4.7%	2.7%	
Age of intellectual disability diagnosis				
From birth	21%	20%	21.6%	*V* = 0.05
Between 1 and 8 years old	65.9%	67.2%	66%	
Between 9 and 18 years old	7.8%	8.6%	7.1%	
Older than 19 years old	5.3%	4.2%	5.3%	
Sexual behaviour and relationship history				
Have you ever had a boyfriend/girlfriend?	73.3%	83.2%	65%	*V* = 0.21
Masturbation	66.7%	48%	82.2%	*V* = 0.4
Mutual masturbation	31%	34.1%	28.5	*V* = 0.12
Oral sex	20.6%	22.2%	19.2%	*V* = 0.12
Vaginal sex	33.6%	37.3%	30.5%	*V* = 0.13
Self-reported sexual abuse indicators				
Unwanted sexual touching/kissing	23.3%	27.7%	19.2%	*V* = 0.1
Sexual abuse	23.3%	35.9%	12.9%	*V* = 0.27

refine and reduce the number of items before testing the validity of the scale. These analyses were conducted post-hoc (i.e., after all the participants completed the initial version of the ISK-ID). In particular, we removed from the ISK-ID: (a) items with ≥25% of missing data (i.e., items that generated confusion in people with intellectual disability and therefore were not answered by a notable proportion of the sample – as expressed by the participants to evaluators after the assessment session) (*n* = 35); (b) items answered correctly by more than 95% of the sample (i.e., extremely easy items) (*n* = 31); (c) items answered correctly by ≤5% of the sample (i.e., extremely difficult items) (*n* = 3); (d) items that decreased the Cronbach's alpha of the scale by ≥0.2 points (i.e., items that, when included, reduced the total scale reliability) (*n* = 10); and (e) items not significantly correlated – or inversely correlated – with an index of 'general sexual knowledge' resulting from the sum of the score on each item of the ISK-ID (i.e., items with an increased probability of being answered correctly when the level of 'general sexual knowledge' as expressed by the total score on the ISK-ID was lower or items that were not related to 'general sexual knowledge' at all) (*n* = 4). After item deletion, our test included a total of 34 dichotomous items covering six different sex-related topics: 'Concept of sexuality', 'Body Image and sexual communication', 'Sexual Practices', 'Homosexuality', 'Dating, intimacy, and sexual assertiveness', and 'Sexual Health'. This is the definitive version of the ISK-ID employed for conducting subsequent data analysis and is included as an Appendix (see Table A1 for the original Spanish version; see Table A2 for the English version).

3.3 | Dimensionality Testing

The first step to determine the dimensionality of the refined version of the ISK-ID was to ensure that each of the six dimensions of the ISK-ID was unidimensional. To do so, we computed the "unidimTest" function from the "ltm" package (Rizopoulos, 2006). This test confirmed that the six dimensions of the ISK-ID were unidimensional (*p* > .05).

The second step in our MIRT approach was to test the multidimensionality of the ISK-ID. The aim was to determine whether the six unidimensional domains of the ISK-ID measured a common underlying factor – that is, general sexual knowledge. For this purpose, Mplus software was used. The scree plot showed that there were six factors with eigenvalues above 1. These six factors matched the sexuality domains confirmed in a previous step.

3.4 | MIRT parameters of the ISK-ID

When items are dichotomous, the "2PL method" (Two-Parameter Logistic method) is the most widely used approach to estimate item parameters (Brown & Abdulnabi, 2017). Thus, we employed the 2PL method to analyse our data. Item parameters were analysed using the "mirt" package (Chalmers, 2012). The "2PL method" returns two parameters: *a* (i.e., slope parameter –item discrimination power) and

b (i.e., item location – item difficulty). Results for items' *a* and *b* can be seen in Table 2.

Parameter *a* ranges between −∞ to +∞. Items with negative values are considered problematic (i.e., participants with high levels of latent ability are less likely to respond correctly to more difficult items). This means that the items discriminate poorly and should be removed from the model. In our model, all the items obtained positive *a* values (between 0.016–30.67). The *b* parameter corresponds to item difficulty and indicates how difficult it is to achieve a 50% probability of getting the right answer on a certain item, given the level of latent ability. Parameter *b* ranges between −∞ to +∞. Positive values indicate an increased probability of correctly answering an item and vice versa. In our sample, only 5 of the 34 items on the ISK-ID obtained negative *b* values.

The aforementioned *a* and *b* parameters measure difficulty and discrimination power for the particular sexual knowledge domain in which each item is grouped (e.g., item 1 difficulty and discrimination power are computed by comparing its performance with results from the other three items included in factor 1 – not the overall scale); if we want to assess multidimensional difficulty and discrimination power (i.e., difficulty and discrimination power of each item compared to the overall scale), these parameters should be converted into multidimensional difficulty (MDIFF) and multidimensional discrimination (MDISC) parameters. Results for MDIFF and MDISC, along with the % of correct answers on each item, are also displayed in Table 2.

MDIFF typically ranges from −3.00 to +3.00. Negative values indicate that the item is difficult compared to the other items on the scale, whereas negative values indicate that the item is easy. Items outside this range are considered extremely easy (when negative) or extremely difficult (when positive). As Table 2 shows, 28 of the 34 items on the ISK-ID obtained a negative MDIFF value, indicating that the majority of the items on the scale were easy (appropriate, given that the scale is designed to assess sexual knowledge in people with intellectual disability). Three items (items 15, 26 and 34) were below −3, which means that they were very easy. Six items obtained positive MDIFF values (between 0.02 and 1.17), which means that they were moderate to slightly difficult.

MDISC typically ranges from 0 to 2. Items with values within this range are considered to have good discriminant power, whereas items with values above 2 are considered to have high to very high discriminant power. In our study, 23 of the 34 items on the ISK-ID had appropriate discriminant power, whereas 11 items had very high discrimination power (MDISC between 3.44 and 10.71).

Results for *Theta* (i.e., the sample's ability in particular domains of sexual knowledge and in the general knowledge factor) are also displayed in Table 2. *Theta* values typically range between −3 and +3. Positive values indicate that participants tend to have good performance in the domain, whereas negative values indicate that the performance tends to be poor. As Table 2 reveals, the *theta* value for the global test ability was positive (0.0035), indicating that participants had moderate ability on the latent trait (i.e., had moderate levels of 'general sexual knowledge'). The highest *theta* value

TABLE 2 MIRT parameters of the ISK-ID

	% correct answers	a	b	MDIFF	MDISC	Theta M (SD)
Concept of sexuality						
Item 1	35%	0.58	−0.68	1.17	0.58	−0.0037 (0.78)
Item 2	69.2%	10.72	5.13	−0.48	10.71	
Item 3	51.9%	9.19	−0.19	0.02	9.19	
Item 4	44.6%	0.58	−0.27	0.46	0.58	
Body Image and sexual communication						
Item 5	71.9%	8.26	4.78	−0.58	8.25	−0.0061 (0.80)
Item 6	42.4%	4.41	−1.07	0.24	4.41	
Item 7	69.1%	0.40	0.83	−2.05	0.40	
Item 8	68.2%	0.42	0.078	−1.86	0.42	
Item 9	75.4%	0.80	1.25	−1.54	0.81	
Sexual practices						
Item 10	87.1%	0.86	2.15	−2.50	0.86	0.0036 (0.78)
Item 11	62.3%	30.46	10.72	−0.35	10.46	
Item 12	75.2%	5.28	3.98	−0.75	5.28	
Item 13	56.7%	0.47	0.27	−0.59	0.46	
Item 14	77.2%	0.79	1.36	−1.73	0.79	
Item 15	69.1%	0.21	0.81	−3.81	0.21	
Item 16	45.1%	0.36	−0.22	0.60	0.36	
Homosexuality						
Item 17	64%	0.91	0.65	−0.71	0.91	0.0112 (0.65)
Item 18	85.8%	3.65	4.20	−1.15	3.65	
Item 19	77.8%	1.58	1.73	−1.10	1.58	
Dating, intimacy and assertiveness						
Item 20	38.9%	9.13	−2.92	0.32	9.13	0.0089 (0.81)
Item 21	67%	3.55	1.71	−0.48	3.55	
Item 22	85.3%	0.65	1.88	−2.87	0.65	
Item 23	81.9%	0.78	1.67	−2.13	0.78	
Item 24	81.1%	0.69	1.56	−2.26	0.69	
Item 25	64.9%	0.58	0.64	−1.10	0.58	
Item 26	76.6%	0.26	1.19	−3.1	0.26	
Item 27	58.3%	0.42	0.33	−0.78	0.42	
Sexual health						
Item 28	63.4%	30.67	12.13	−0.40	10.67	0.0070 (0.75)
Item 29	78.1%	3.44	3.05	−0.89	3.44	
Item 30	85.3%	1.35	2.25	−1.67	1.34	
Item 31	70.8%	0.87	1.00	−1.14	0.87	
Item 32	84.2%	0.85	1.85	−2.19	0.84	
Item 33	58.3%	0.35	0.29	−0.83	0.35	
Item 34	77.8%	0.16	1.23	−3.08	0.16	
General sexual knowledge						0.0035 (0.40)

(0.0112) was reached in the 'Homosexuality' domain, whereas the lowest value corresponded to the 'Body Image and sexual communication' domain (−0.0061). This result indicated that participants

had moderate levels of knowledge about tolerance towards homosexuality and poor comprehension of how to have a positive body image or communicate sexually. Similarly, participants had low

levels of knowledge about the 'concept of sexuality' (−0.0037); by contrast, they had good knowledge in terms of information about sexual practices ('Sexual practices'), information about healthy sexual relationships ('Sexual health'), and awareness of how to interact with their partner in a relationship ('Dating, intimacy, and sexual assertiveness').

3.5 | Responsiveness of the ISK-ID

To determine the responsiveness of the ISK-ID (i.e., the ability of the ISK-ID to capture changes in the level of sexual knowledge as a result of an educational intervention), we compared the scores in each sexual knowledge domain before and after the implementation of a sex education program (Table 3). Mean Scores in the domains of 'Body image and sexual communication', 'Sexual practices', 'Homosexuality', and 'Dating, intimacy, and sexual assertiveness' significantly increased after the implementation of the educational intervention (d between 0.25 and 0.34). Scores in the first factor ('Concept of sexuality') also increased after the implementation of the program, but the differences did not reach statistical significance ($d = 0.14$). Finally, the level of knowledge after the intervention decreased slightly in one domain: 'sexual health'.

4 | DISCUSSION

This study aimed to develop, refine, and test the psychometric properties of the ISK-ID, a brief screening measure to assess sexual knowledge in men and women with mild intellectual disability. This scale was developed to overcome some of the limitations that discourage the use of available assessment scales, such as their length, complexity of administration, and the time required to complete them. The ISK-ID is a 34-item scale designed to be applied as a self-report measure that takes about 20 min to complete. Compared to previous scales, such as the 'Sex-Ken scale' (between 1–3 h to complete; McCabe et al., 1999), the 'Assessment of Sexual Knowledge' (44 min; Galea et al., 2004) or the 'General Sexual Knowledge

Questionnaire' (35 min; Talbot & Langdon, 2006), the time required to complete the ISK-ID fits the suggestion by Siebelink et al. (2006) to avoid assessments longer than 30 min to prevent attention problems due to cognitive fatigue. Furthermore, items are written in an easy-to-read format and rated on a dichotomous scale (*Yes/No*), thus helping individuals with intellectual disability to understand the item content and provide reliable responses (Fajardo et al., 2014).

Another important limitation of the available scales to assess sexual knowledge is the fact that they usually measure other related but independent domains, such as sexual attitudes (e.g., the SSKAT; Edmonson & Wish, 1975), sexual experiences (e.g., the SKIS; Forchuk et al., 1995) or various other sex-related variables (e.g., Sex-Ken; McCabe et al., 1999). As a result, scores derived from these scales are considered imperfect measures of sexual knowledge. In contrast, the ISK-ID provides a 'pure' measure of sexual knowledge across six different sexuality domains: (a) knowledge about what kind of sexual activities may be considered sexual or not depending on the context ('concept of sexuality'); (b) knowledge about how to have a positive body image and communicate sexually ('body image and sexual communication'); (c) knowledge about the nature of different sexual practices, such as masturbation, oral sex, or vaginal and anal intercourse ('sexual practices'); (d) knowledge about sexual diversity ('homosexuality'); (e) knowledge about how to interact with a romantic/sexual partner in the context of an intimate relationship ('dating, intimacy, and sexual assertiveness'); and (f) knowledge about how to prevent STIs and unwanted pregnancy ('sexual health'). These six domains cover the most important areas when assessing sexual knowledge (Borawska-Charko et al., 2017; Kramers-Olen, 2017). As for the factorial structure of the ISK-ID, we demonstrated that these six domains of sexual knowledge are unidimensional at a first level and multidimensional at a second level. This means that individuals with intellectual disability may exhibit an appropriate level of sexual knowledge in one domain, but not in the others, and that the sum of all these domains provides an accurate picture of the level of overall sexual knowledge.

As Borawska-Charko et al. (2017) pointed out, another common limitation of the available scales is that little attention has been paid to testing their psychometric properties. Among the studies that assess

TABLE 3 Scores on the ISK-ID domains before and after the implementation of a sex education program

	Before intervention ($n_{T1} = 345$) M (SD)	After intervention ($n_{T2} = 345$) M (SD)	t	d
ISK-ID domains				
Concept of sexuality	2.12 (1.32)	2.34 (0.85)	1.73	0.14
Body image and sexual communication	3.35 (1.28)	3.86 (1.19)	4.55***	0.33
Sexual practices	4.78 (1.69)	5.39 (1.61)	4.65***	0.34
Homosexuality	2.34 (0.87)	2.57 (0.72)	3.82***	0.25
Assertiveness in a relationship	5.48 (1.85)	6.19 (1.90)	4.76***	0.34
Sexual health	5.68 (1.77)	5.63 (2.09)	−0.16	0.04

these properties, the majority do so from a CTT approach, which is limited in several ways when it comes to measuring knowledge (see Rusch et al., 2017). In contrast, psychometric properties of the ISK-ID were tested through a more appropriate methodological approach: the MIRT. Instead of focusing on classical parameters (e.g., internal consistency), MIRT focuses on parameters such as multidimensional item discrimination, multidimensional item difficulty, and the participant's ability (Ackerman et al., 2003; Chalmers, 2012). Through this approach, we have demonstrated that most of the items on the ISK-ID are appropriate to distinguish between individuals with high and low levels of sexual knowledge, and that a subset of items (11 out of 34) have very high discriminant power. Regarding the items' difficulty, the ISK-ID consists mainly of easy items and some moderate-to-difficult items. As a result, between 35% and 85.3% of the participants correctly answered the ISK-ID questions. This scaling according to the items' difficulty is optimal for assessing sexual knowledge in people with obvious intellectual problems, which requires the inclusion of a large number of easy items. Furthermore, the inclusion of some moderate-to-difficult items keeps individuals with a good level of sexual knowledge from answering all the questions correctly, thus avoiding potential ceiling effects. Finally, the assessment of the ability in different sexuality domains revealed that participants had good knowledge in terms of information about healthy sexual relationships ('Sexual health'). This result coincides with previous studies pointing out that individuals with intellectual disability often exhibit accurate levels of knowledge about topics related to sexual health (e.g., physiology, contraception, or STIs) (Schaafsma et al., 2017). Participants in this study also showed good ability when answering items related to different sexual practices ('sexual practices') and how to interact with their partners in an intimate relationship ('dating, intimacy and sexual assertiveness'). This finding is not as common in the literature, and it is probably due to the nature of the sample (i.e., individuals attending services where they receive continuous support – sometimes even educational interventions aimed to improve basic social abilities).

In order to assess the responsiveness of the ISK-ID, we compared the scores on this scale before and after the implementation of an intervention designed to improve sexual knowledge (Gil-Llario et al., 2019). This approach revealed that the ISK-ID was sensitive to changes in sexual knowledge resulting from educational interventions. In particular, participants showed a significant improvement in their level of sexual knowledge in four of the six domains: 'Body image and sexual communication', 'Sexual practices', 'Homosexuality', and 'Dating, intimacy, and sexual assertiveness'. This makes the ISK-ID an appropriate scale to measure changes in the level of sexual knowledge as a result of the implementation of sexual education programs.

At a methodological level, Borawska-Charko et al. (2017) found that 11 out of 25 of the reviewed studies about sexual knowledge in people with intellectual disability assessed samples with less than 25 participants; sample sizes ranged between 4 and 300, with an average of 60 participants per study. In this research, we recruited and assessed a sample of 345 individuals with mild intellectual disability. Moreover, participants were representative of both urban

and rural areas, which is important given the differences in the treatment of people with intellectual disability based on this aspect (Wark et al., 2014). Despite the face validity of our methodological approach, it is still relevant to audit the methodological quality of the ISK-ID according to standardized criteria. A useful resource to do so is the COSMIN checklist, a set of criteria designed for assessing the methodological quality of studies on measurement properties of health outcomes directly reported by patients (Mokkink et al., 2010, 2018). When applied to the development of the ISK-ID, these criteria highlight some important strengths, but also certain limitations that should be addressed in future studies. In terms of strengths, the development of the ISK-ID is aligned with COSMIN recommendations on the definition of the scale aim, description of the process followed to generate the ISK-ID, and specification of the target population. Other strengths of our research are the use of the MIRT for the assessment of certain aspects of the structural validity and internal consistency of the ISK-ID (including the report of relevant parameters such as the theta or the MDIFF), the use of an appropriate sample size, and the assessment of responsiveness. However, this study was also limited in several ways. First, we did not conduct a pilot study assessing participants' opinions about the scale (readability, difficulty, etc.) before testing its psychometric properties in the whole sample. Furthermore, in this study we did not test the criterion validity of the ISK-ID. Thus, future research should carefully examine the relationship between the ISK-ID and other measures or indicators of sexual knowledge (i.e., convergent validity), its independence from related yet distinct constructs such as sexual attitudes (discriminant validity), and its predictive power over future outcomes (predictive validity).

5 | CONCLUSION

The present study shows the usefulness of the ISK-ID as an instrument for the assessment of sexual knowledge in people with intellectual disability. Its brevity, simplicity and 'responsiveness' support its use as a screening measure to identify areas in which the level of sexual knowledge is insufficient or to assess the efficacy of programs aimed to improve sexual knowledge. In any case, further research is required to assess important properties not addressed in this study, such as criterion validity.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

MDG and RBA were the PI for the study. MDG and RBA were involved in the study design and supervision. MDG, JCC, OFG, MEM

and RBB participated in recruiting participants, collecting data, analysis/interpretation of data, and/or writing of the paper. All authors read and approved the final manuscript.

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APPENDIX

TABLE A1   Spanish version of the Inventory of Sexual Knowledge for people with Intellectual Disability (ISK-ID)

1	Una parte del cuerpo como por ejemplo la oreja, es sexual según la persona que la toca y la situación en la que estamos	Sí	No
2	Pasear o bailar son actividades sexuales	Sí	No
3	Una actividad como por ejemplo bailar, es sexual según la persona y el momento	Sí	No
4	Dos chicos pueden tener relaciones sexuales	Sí	No
5	Si tengo un cuerpo bonito, tengo una imagen corporal positiva	Sí	No
6	Tengo imagen corporal positiva cuando me gusta mi cuerpo tal y como es	Sí	No
7	Tengo una imagen corporal saludable cuando me digo cosas bonitas como por ejemplo ¡qué bien me queda esta camiseta!	Sí	No
8	Cuando hablamos con una persona son importantes las palabras, los gestos y el tono de voz	Sí	No
9	Cuando hablo con una persona tengo que asegurarme que me entiende	Sí	No
10	Si me masturbo me reñirán porque es algo malo que no puedo hacer	Sí	No
11	Masturbarse es darse placer en los genitales como por ejemplo en el pene o en la vagina	Sí	No
12	Solo los chicos pueden masturbarse	Sí	No
13	Puedo masturbarme pero no lo puedo hacer muchas veces al día ni cuando estoy haciendo otras cosas	Sí	No
14	Puedo masturbarme en los sitios que quiera	Sí	No
15	Cuando el pene entra dentro de la vagina o del ano se llama penetración	Sí	No
16	El sexo oral es cuando lamo los genitales como, por ejemplo, el pene de un chico o la vulva de una chica	Sí	No
17	La homosexualidad es algo normal	Sí	No
18	Está mal que dos hombres o dos mujeres se besen en la boca	Sí	No
19	Si un amigo o amiga me dice que es homosexual le sigo apoyando y siendo su amigo/a	Sí	No
20	Mi novio/a me dice que cortemos la relación. Lo acepto aunque me duela. Dos personas son novios o novias cuando las dos quieren	Sí	No
21	Los novios o novias son para siempre. Seguimos siendo novios/as aunque no quiera mi pareja	Sí	No
22	Llevo mucho tiempo saliendo con mi pareja y no hemos tenido relaciones sexuales. Un día me apetece intimar con mi novio/a. Como no quiere, tengo que obligarla	Sí	No

(Continues)

TABLE A1   (Continued)

23	En una relación de pareja es normal que el hombre decida las cosas y la mujer haga las cosas de la casa	Sí	No
24	Si mi pareja me pide que le envíe una foto mía desnudo/a por WhatsApp tengo que decir que no. No sé quién puede acabar viéndola	Sí	No
25	Mi pareja quiere hacer una práctica sexual nueva. Yo no quiero hacerla. Le digo que no estoy preparado/a y que la haremos cuando me sienta preparado/a	Sí	No
26	El maltrato psicológico en una pareja es cuando discuten porque no están de acuerdo en algo	Sí	No
27	El maltrato psicológico es cuando insultamos, humillamos y avergonzamos a otra persona cuando discutimos	Sí	No
28	Cuando tenemos sexo oral y queremos evitar tener una Infección de Transmisión Sexual (ITS) usamos el preservativo	Sí	No
29	Para evitar una Infección de Transmisión Sexual sólo hay que tener limpia la boca y mi zona íntima	Sí	No
30	Si tengo sexo oral no voy a tener una Infección de Transmisión Sexual porque soy muy limpio/a. Eso solo les pasa a otras personas	Sí	No
31	Mi pareja me dice que no usemos el preservativo para tener relaciones sexuales. Tengo que decirle que hay que ponérselo para prevenir Infecciones de Transmisión Sexual y que no nos quedemos embarazados	Sí	No
32	Si mi pareja es limpia y no parece que tenga ninguna enfermedad, podemos tener relaciones sin el preservativo	Sí	No
33	Los métodos anticonceptivos sirven para no quedarnos embarazados	Sí	No
34	Los métodos anticonceptivos sirven para tener buena higiene	Sí	No

TABLE A2 English version of the Inventory of Sexual Knowledge for people with Intellectual Disability (ISK-ID)

1	A part of the body such as the ear is sexual or not depending on the person who touches it and the situation	Yes	No
2	Walking or dancing are sexual activities	Yes	No
3	An activity such as dancing is sexual or not depending on the person and the situation	Yes	No
4	Two men can have sexual intercourse	Yes	No
5	If a have a beautiful body, I will have a positive body image	Yes	No
6	I have a positive body image when I like my body as it is	Yes	No
7	I have a positive body image when I say nice things to myself. For instance: I look good in this shirt!	Yes	No
8	When we talk with someone, words, gestures and tone of voice are important	Yes	No
9	When I talk to someone, I have to be sure that he/she understands me	Yes	No
10	If I masturbate, I will be punished because it is bad and I shouldn't do it	Yes	No
11	Masturbating is pleasuring your genitals, such as the penis or vagina	Yes	No
12	Only men can masturbate	Yes	No
13	I can masturbate, but not too often or when I am doing other things	Yes	No
14	I can masturbate when and where I want	Yes	No
15	When the penis is inside the vagina or the anus, it is called intercourse	Yes	No
16	Oral sex is when I lick genitals, such as the penis or the vulva	Yes	No
17	Homosexuality is normal	Yes	No
18	It is wrong for two men or two women to kiss on the mouth	Yes	No
19	If a friend tells me that he/she is homosexual, I support him/her	Yes	No
20	My boyfriend/girlfriend says that he/she wants to break up with me. I accept it, even if it hurts me. Two people are in a relationship when both agree	Yes	No
21	Boyfriends/girlfriends are forever. Therefore, I do not break up with my boyfriend/girlfriend even if he/she wants to	Yes	No
22	I have been dating my boyfriend/girlfriend for a long time and we have not had sex. I want to have sex with him/her. Given that he/she doesn't want to, I should force him/her	Yes	No
23	In an intimate relationship, it is normal for men to decide important things and for women to be in charge of home responsibilities	Yes	No

TABLE A2 (Continued)

24	If my boyfriend/girlfriend asks me to send a sexual picture by WhatsApp, I should say no. I don't know who will see it	Yes	No
25	My boyfriend/girlfriend wants to do a new sexual practice. I don't want to. I tell him/her that I am not ready yet and that we will do it when I feel ready	Yes	No
26	Psychological maltreatment is when a couple argues	Yes	No
27	Psychological maltreatment is when someone insults, humiliates, and embarrasses his/her partner	Yes	No
28	When I have oral sex and I want to prevent a Sexual Transmitted Infection (STI), I use a condom	Yes	No
29	To prevent a Sexual Transmitted Infection (STI), I should clean my mouth and privates	Yes	No
30	I am not going to have a Sexual Transmitted Infection (STI) because I am clean. This only happens to other people	Yes	No
31	My boyfriend/girlfriend tells me that he/she doesn't want to use a condom. I should tell him/her that we should use one to prevent Sexually Transmitted Infections (STIs) and unwanted pregnancy	Yes	No
32	If my boyfriend/girlfriend is clean and looks healthy, we can have sexual intercourse without a condom	Yes	No
33	Contraceptive methods are useful to prevent unwanted pregnancies	Yes	No
34	Contraceptives help to have good hygiene	Yes	No