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The Functional Social Maturity Scale: a novel diagnostic method for assessing adaptive behaviour in the diagnostic process of intellectual development disorders

Funkcjonalna Skala Dojrzałości Społecznej: nowa metoda oceny zachowań adaptacyjnych w procesie diagnozy zaburzeń rozwoju intelektualnego


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Abstract

Introduction and objective: The diagnostic process of intellectual development disorders requires an assessment of both intellectual functioning and adaptive behaviour. However, it is important to acknowledge that adaptive behaviour may vary depending on cultural factors. Therefore, it is necessary to develop assessment tools that consider the specific cultural context to comprehensively evaluate all aspects of adaptive behaviour. This will ultimately lead to more accurate selection of therapeutic interventions for individuals with intellectual development disorders. The aim of the study was to present a newly developed method for assessing adaptive behaviour – the Functional Social Maturity Scale (FSMS). The differences in adaptive behaviour between typically developing participants and a group of individuals with disorders of intellectual development were also examined. **Materials and methods:** The FSMS was validated through confirmatory factor analysis and reliability analysis using a non-clinical sample ($N = 1,657$) and a clinical sample ($N = 61$) of individuals with disorders of intellectual development. **Results:** The study confirmed the hierarchical structure and precision of the FSMS. Notably, in Socio-Emotional and Activity domains, over a quarter of the clinical sample scored comparably to the general population. **Conclusions:** The study emphasises the importance of considering broader functional dimensions in the assessment of disorders of intellectual development, beyond intelligence alone. Furthermore, considering the wider context of the individual's functioning within the diagnostic process enhances the formulation of tailored support plans, the establishment of realistic intervention objectives, and the systematic evaluation of the effectiveness of implemented interventions. Additionally, the motor domain of development should be considered an important aspect of adaptive behaviour.

Keywords: adaptive behaviour, disorders of intellectual development, DID, IDD, assessment

Streszczenie

Wprowadzenie i cel: Proces diagnozy zaburzeń rozwoju intelektualnego wymaga oceny zarówno funkcjonowania intelektualnego, jak i zachowań adaptacyjnych. Należy jednak zwrócić uwagę, że zachowania adaptacyjne mogą być zróżnicowane kulturowo. W związku z tym konieczne jest opracowanie narzędzi diagnostycznych uwzględniających specyficzny kontekst kulturowy, co umożliwi ich rzetelną i trafną ocenę. Celem niniejszej pracy jest zaprezentowanie nowo opracowanej metody oceny funkcjonowania adaptacyjnego – Funkcjonalnej Skali Dojrzałości Społecznej (FSDS). Ponadto zbadano różnice w zakresie zachowań adaptacyjnych między osobami z populacji ogólnej a grupą osób z zaburzeniami rozwoju intelektualnego. **Materiał i metody:** W celu oszacowania własności psychometrycznych FSDS przeprowadzono badania walidacyjne z udziałem osób z populacji ogólnej ($N = 1657$) oraz osób z zaburzeniami rozwoju intelektualnego ($N = 61$). **Wyniki:** Wyniki przeprowadzonych badań potwierdziły hierarchiczną strukturę oraz wysoką rzetelność i trafność FSDS.

Ponadto wykazano, że w zakresie sfery społeczno-emocjonalnej i sfery aktywności ponad jedna czwarta grupy klinicznej uzyskała wyniki porównywalne do rezultatów osób z populacji ogólnej. **Wnioski:** Określenie poziomu funkcjonowania adaptacyjnego, a nie tylko intelektualnego w diagnozie zaburzeń rozwoju intelektualnego jest warunkiem koniecznym do postawienia trafnej diagnozy. Ponadto uwzględnienie szerszego kontekstu funkcjonowania osoby badanej w procesie diagnostycznym ułatwia opracowanie indywidualnych planów pomocy, określenie realnych celów do pracy oraz monitorowanie skuteczności wprowadzonych interwencji. Ważne jest również uwzględnienie sfery motorycznej, jako ważnego aspektu zachowań adaptacyjnych.

Słowa kluczowe: zachowania adaptacyjne, zaburzenia rozwoju intelektualnego, DID, IDD, diagnoza

INTRODUCTION

Adaptive behaviour is defined as a set of cognitive (conceptual), social, and practical skills learned over a lifetime to function effectively on an everyday basis (Schalock et al., 2021). The first definition of this concept was proposed by Doll (1936). According to this author, reliance should not be placed solely on indicators of intellectual functioning (e.g. intelligence quotient, IQ) in the process of diagnosing intellectual disabilities. It is advisable to assess more complex aspects of an individual's daily functioning, where intellectual functioning is only an element and not an ultimate determinant of social maturity (Doll, 1953). This concept was considered to be entirely distinct from intellectual ability and impossible to evaluate based solely on the IQ score (Bölte and Poustka, 2002; Price et al., 2018). The skills in question are aimed at preserving individual's full autonomy in terms of health and safety, hygiene, communication, socially acceptable behaviour, study and work, recreation or socialising (Ditterline et al., 2008; Navas et al., 2012; Tassé et al., 2012). It is worth emphasising that both major classifications of diseases and mental disorders, the ICD-11 (World Health Organization, 2022) and the DSM-5 (American Psychiatric

Association, 2022), have brought to light the importance of considering adaptive behaviour in the context of broadly understood diagnosis of disabilities. Tab. 1 presents a comparison of the basic diagnostic criteria for intellectual disability across both classifications. The ICD-11 (World Health Organization, 2022) provides detailed descriptions of behavioural indicators in three areas of adaptive behaviour: conceptual, social, and practical (Schalock et al., 2021; Tassé et al., 2012; World Health Organization, 2022), which are also referenced in the presented measure. Crucially, the ICD-11 (World Health Organization, 2022) emphasises that these behavioural indicators should be used by clinicians as a key tool in assessing the severity of intellectual developmental disorders (mild, moderate, severe or profound) in conjunction with intelligence tests, or as an alternative in situations where standard measurement methods are not applicable due to various reasons, such as the individual's cultural or linguistic background. Regrettably, from a comprehensive perspective on disabilities, the ICD-11 fails to distinguish a crucial aspect of adaptive behaviours, namely the motor domain (World Health Organization, 2022). It is of particular significance during early developmental stages, where psychomotor development takes place (Carr, 2006; Romero Martínez et al., 2018). Research also shows that the course of motor

	ICD-11	DSM-5
Terminology	Disorders of intellectual development (DID)	Intellectual developmental disorder (IDD)
Defining feature	Below average intellectual functioning and adaptive behaviour that are approximately two or more SDs below mean, based on appropriately normed, individually administered standardised tests. In situations where appropriately normed and standardised tests are not available, assessment of intellectual functioning requires greater reliance on clinical judgment based on appropriate evidence and assessment, which may include the use of behavioural indicators of intellectual functioning	Intellectual function and adaptive function confirmed by both clinical assessment and individualised, standardised intelligence testing
Adaptive behaviour	Defined in terms of conceptual, practical, and social domains	Defined in terms of conceptual, practical, and social domains
Subclassification	Based on intellectual function and adaptive behavioural assessment Mild, moderate, severe and profound classifications based on standardised testing or, if unavailable, clinical assessment can be used Provisional and unspecified type included	Based on adaptive function abilities Mild, moderate, severe and profound classifications based on clinical assessments of adaptive functioning Unspecified type and global developmental delay included
Comorbidity	Presence of co-occurring neurodevelopmental disorders and other psychiatric disorders. Provisional category is used when formal assessment is difficult due to comorbid condition	Presence of co-occurring conditions and their impact on assessment explained. Unspecified IDD category is used when formal assessment is difficult due to comorbid condition

Tab. 1. Comparison of diagnostic criteria for intellectual disability in the ICD-11 and DSM-5

development can serve as a predictor for development in other areas, such as cognitive and socio-emotional development. Additionally, lower achievements in motor development during early stages can predict disabilities later in life (Cameron et al., 2012; Duijff et al., 2012; Memisevic and Djordjevic, 2018; Pant et al., 2022; Suggate et al., 2017). Therefore, we decided to include an additional factor in the presented Functional Social Maturity Scale (FSMS), the Motor domain, which enables a more comprehensive understanding of adaptive behaviour in the context of disability.

A review of adaptive behaviour research by Price et al. (2018) points out a number of problems with conducting research on this issue. Firstly, most research on adaptive behaviour has been conducted within US clinical populations. This, in consequence, can lead to an Americanised approach to adaptive behaviour and the assumption that this culture determines which behaviour is adaptive and which one is not. In addition, researchers emphasise that even if the available studies were conducted outside the USA, they used scales that originated in the USA and were based on the behavioural standards of the Western world. Another problem of the reviewed studies concerned the specificity of the researched populations. It was noted that 84.4% of the studies included clinical groups (mainly individuals with autism spectrum disorder, or disorder of intellectual development – DID). The authors emphasise that it is essential to conduct research on adaptive behaviour in normative groups.

The aim of this paper is to introduce a new method, the FSMS (Sajewicz-Radtke and Radtke, 2023), developed to address the issues identified by Price et al. (2018). So far, in Poland, only one tool has been available for assessing adaptive behaviour: the Adaptive Behaviour Assessment System (ABAS-3) (Otrębski et al., 2019). However, ABAS-3 is an adaptation of an American questionnaire designed for independent completion by caregivers or teachers. Hence, there is a clear need to develop a measure that is not simply an adaptation of American methods but one that is tailored to Polish circumstances, specifically targeting the disability diagnostic process. In developing the method, we considered the guidelines from the latest ICD-11 classification of mental diseases and disorders (Salvador-Carulla et al., 2011; World Health Organization, 2022), while also drawing upon Poland’s tradition of studying adaptive behaviour, notably influenced by Doll’s theoretical framework (1936, 1953). We also covered the specifics of the support and educational system as well as the parental role of Polish parents (Wejnert and Djumabaeva, 2004).

METHODS

Participants and procedures

Non-clinical sample

The sample consisted of 1,657 individuals (801 males and 856 females), with an average age of $M = 11.56$ ($SD = 8.39$).

Variable	Statistic	Nursery	Pre-school	Primary school	Secondary school	Higher education	Alternative and homeschool education	Out-of-school individuals	Total
	<i>N</i>	130	397	447	184	166	57	276	1,657
Sex									
Male	<i>n</i> (%)	74 (57)	189 (48)	216 (48)	94 (51)	66 (40)	31 (54)	131 (47)	801 (48)
Female	<i>n</i> (%)	56 (43)	208 (52)	231 (52)	90 (49)	100 (60)	26 (46)	147 (53)	856 (52)
Age	<i>M</i> (<i>SD</i>)	1.82 (0.47)	4.72 (1.36)	10.78 (2.35)	17.31 (1.50)	22.25 (2.59)	2.41 (0.68)	18.87 (11.46)	11.56 (8.39)
Place of residence									
Up to 5,000 inhabitants	<i>n</i> (%)	38 (29)	84 (21)	94 (21)	34 (18)	25 (15)	34 (60)	65 (24)	374 (23)
From 5,000 to 100,000 inhabitants	<i>n</i> (%)	73 (56)	183 (46)	227 (51)	112 (61)	71 (43)	10 (18)	108 (39)	784 (47)
Over 100,000 inhabitants	<i>n</i> (%)	19 (25)	130 (33)	126 (28)	38 (21)	70 (42)	13 (23)	103 (37)	499 (30)
Mother’s education									
Primary	<i>n</i> (%)	3 (2)	21 (5)	17 (4)	5 (3)	6 (4)	7 (12)	8 (3)	67 (4)
Secondary	<i>n</i> (%)	69 (53)	179 (45)	195 (44)	82 (45)	85 (51)	28 (49)	110 (40)	748 (45)
Higher	<i>n</i> (%)	58 (45)	196 (49)	235 (53)	97 (53)	75 (45)	22 (39)	158 (57)	841 (51)
Missing data	<i>n</i> (%)	–	1 (<1)	–	–	–	–	–	1 (<1)
Father’s education									
Primary	<i>n</i> (%)	4 (3)	15 (4)	21 (5)	8 (4)	12 (7)	3 (5)	11 (4)	74 (4)
Secondary	<i>n</i> (%)	80 (62)	213 (54)	219 (49)	101 (55)	84 (51)	40 (70)	139 (50)	876 (53)
Higher	<i>n</i> (%)	46 (35)	169 (43)	206 (46)	75 (41)	70 (42)	14 (25)	126 (46)	706 (43)
Missing data	<i>n</i> (%)	–	–	1 (<1)	–	–	–	–	1 (<1)

Tab. 2. Characteristics of the non-clinical sample by educational institution type

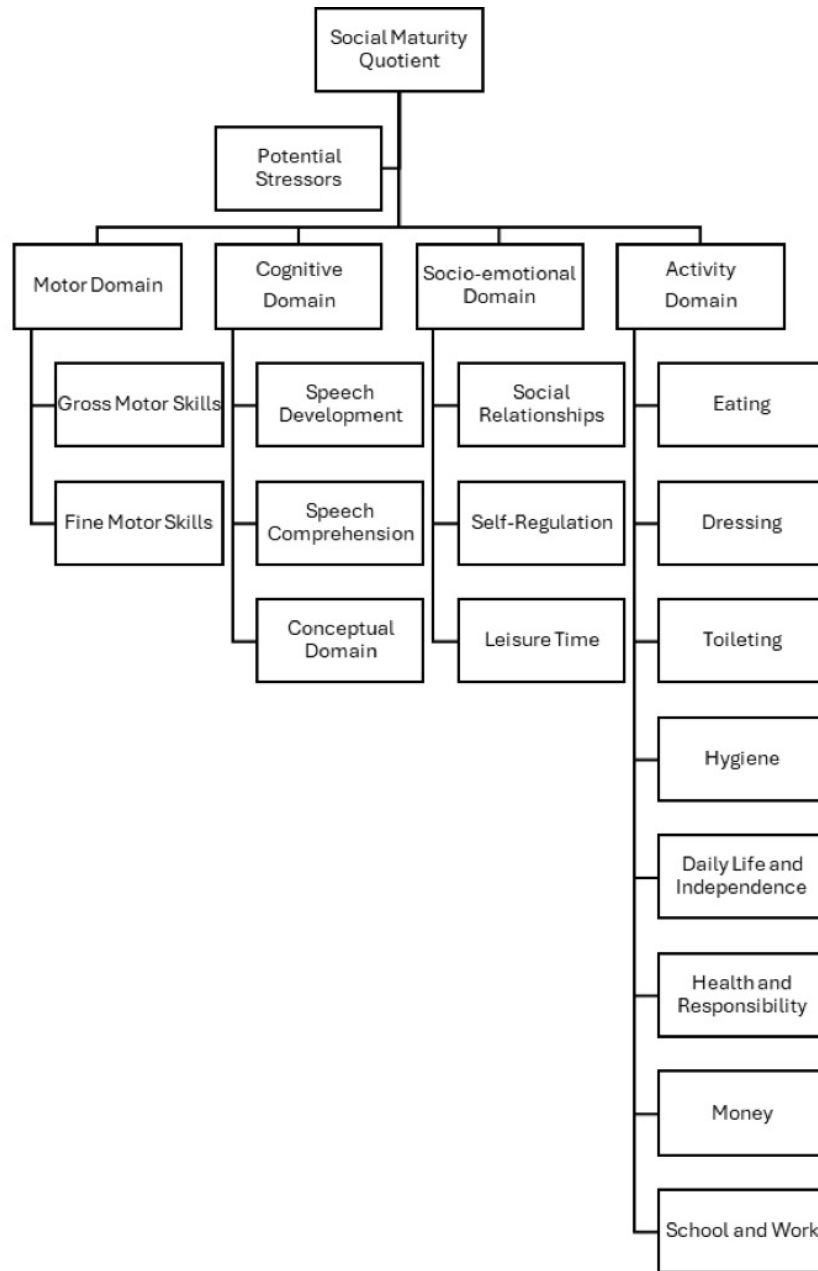


Fig. 1. Structure of the Functional Social Maturity Scale (FSMS)

The study's participants, due to their diverse age range, were educated at a variety of institutions. Moreover, the study cohort exhibited a broad spectrum of diversity in terms of their parents' educational levels. Data on the sample composition, categorised by the type of educational institution and encompassing the entire study cohort, is presented in Tab. 2.

Clinical sample

The sample consisted of 61 individuals (29 males, or 48%, and 32 females, or 52%) aged 5 to 21 years ($M = 13.20$, $SD = 4.64$) with a diagnosis of intellectual disability. Individuals in the clinical group were assessed at specialised

diagnostic centres by psychologists. Each subject was evaluated using both a standardised intellectual functioning test and a standardised adaptive behaviour test. Only those individuals who had been examined at least twice at the diagnostic centre and found to meet the criteria for a DID diagnosis on both occasions were included in the clinical group. Among the participants, 22 (36%) resided in areas with up to 5,000 inhabitants; 20 (33%) lived in towns with populations ranging from 5,000 to 100,000 inhabitants; and 19 (31%) resided in cities with over 100,000 inhabitants. The majority attended special schools (34 individuals, or 56%), 18 individuals (30%) primary schools, eight individuals (12%) pre-schools, and one individual (2%) secondary

Domain	ICD-11	Subscale	Subscale description	Number of items
Motor	-	1a. Gross Motor Skills	Assessing behaviours expected of several-month-old children, such as sitting independently (without support) all the way up to behaviours expected of adults, such as regular physical activities. These items assess the use of large muscle groups and the performance of tasks requiring balance, coordination, strength, and physical endurance. A low score indicates that the patient has not mastered important motor skills for his/her developmental stage. A person scoring low on this subscale has problems with motor coordination, control of large muscle groups, as well as moving around efficiently. E.g. <i>Sits independently without support for half a minute. / Participates systematically in physical activities requiring strength or physical condition (gym, running, swimming pool, etc.)</i>	18
		1b. Fine Motor Skills	Assessing behaviours that require eye-hand coordination, using precise hand and finger movements. These behaviours include those that are characteristic of infancy, such as transferring objects from hand to hand or putting objects into a container, as well as those seen in adolescence and adulthood, such as assembling furniture or do-it-yourself (DIY) tasks. A low score on this subscale indicates that the subject has difficulty with hand and arm movements, as well as with performing activities that require precision. This can include everyday activities (e.g. managing buttons) and those related to hobbies (e.g. colouring, DIY). E.g. <i>Transfers objects from hand to hand. / Can thread a needle and sew on a button or sew up a tear</i>	21
Cognitive	Conceptual	2a. Speech Development	Assessing speech development in the context of speech production and communication. The behaviours in this subscale range from simple gestures used to communicate to complex conversations and arguments. A low score in this subscale indicates impaired speech development. E.g. <i>Uses gestures that others can understand e.g. shaking head yes or no, raising hand or using another consistent way to show that wants or does not want something specific. / Is able to defend his/her opinion/position and provide arguments</i>	24
		2b. Speech Comprehension	Assessing the ability to receive and respond to verbal messages. The subscale includes behaviours such as responding to simple commands and understanding language at the level sufficient to conclude a contract. A low score on this subscale may indicate that the respondent lacks competence to receive speech. In this case, it is necessary to make sure that the subject's hearing is correct and there are no physiological obstacles in this area. If physiological hearing is normal, a low score on this subscale indicates that the subject has problems following oral instructions, keeping up with the course of a class or a conversation. E.g. <i>Understands simple questions/ commands, e.g. where is the nose, give me the doll/car, do you want to drink? / Understands the key terms necessary to conclude a contract (rent amount, cost of telephone subscription, periodicity of fees)</i>	14
		2c. Conceptual Domain	Assessing understanding of simple concepts, such as using basic devices, and abstract concepts, such as time or money. The subscale includes a range of behaviours, from simple actions like reaching for distant objects, to more complex ones that involve the use of modern technology. A low score on this subscale may indicate difficulties in daily social functioning, particularly in understanding basic concepts and terms. The subject may struggle with time concepts such as "yesterday", "tomorrow", "earlier", and "later", as well as understanding simple signs and gestures. These difficulties can lead to interpersonal conflicts and breaking rules. Additionally, the subject may experience challenges in reading simple instructions, writing down messages, or using money. E.g. <i>Recognises familiar people and objects from a distance. / Can find the services he/she needs on the Internet (e.g. calling a plumber or electrician, ordering food)</i>	26
Socio-emotional	Social	3a. Social Relationships	Assessing behaviours typical of infants, such as following directions with eyes, as well as behaviours typical of adults, such as building close, intimate relationships. A low score on this subscale may indicate difficulties in creating satisfactory social relationships. Individuals with low scores may have trouble conducting conversations, using polite language, and assessing, which type of behaviour is acceptable in company. They may thus be more prone to conflicts with peers, superiors, or teachers. Individuals with low scores may also experience problems finding a close friend. E.g. <i>Is interested in play and activities of other children and people, likes to watch them, reacts with animation. / Remains in a close relationship with the person he/she considers a partner</i>	30
		3b. Self-Regulation	Assessing behaviours that lead to self-regulation. These behaviours range from basic strategies, such as sucking on a pacifier or hugging a toy, to more complex ones that require internal motivation to overcome difficulties and achieve goals. A low score in this subscale may indicate the respondent's difficulties in understanding and regulating their own emotions. Such individuals may struggle with establishing attainable goals and accomplishing them. They may exhibit low levels of motivation towards tasks and have a tendency to disregard responsibilities and abandon projects. E.g. <i>Can remain calm for at least two minutes. / Thinks about professional future – wants to have a profession and a job</i>	19
		3c. Leisure Time	Assessing leisure time. It refers to behaviours typical of younger respondents, such as playing, and of adults, such as tourism. A low score on this subscale means that an individual may have difficulty managing their free time independently. They may be passive and expect others to organise their fun and entertainment. They may lack initiative in planning time outside of work. E.g. <i>Has a favourite game or activity and wants to be able to play it together with a guardian, parent or sibling. / Organises short leisure and tourist trips</i>	9

Tab. 3. Characteristics of domains and subscales of the Functional Social Maturity Scale (FSMS)

Domain	ICD-11	Subscale	Subscale description	Number of items
Activity	Practical	4a. Eating	Assessing both the ability to eat independently and the ability to prepare meals. The simplest items assess the ability to swallow and bite, while the most difficult ones assess the ability to plan and prepare meals independently. A low score on this subscale may indicate that individuals have not mastered the basic skills necessary to eat independently at an age-appropriate level. They may have difficulty eating with utensils or preparing simple or more complex meals. Such individuals may have problems satisfying the basic need for hunger. E.g. <i>When eating, bites and swallows efficiently. / Independently plans weekly grocery shopping and prepares meals based on it</i>	22
		4b. Dressing	Assessing the ability to get dressed independently, including preparing clothes, and selecting sizes. A low score on this subscale may indicate that an individual has not yet mastered the expected level of taking care of clothing for their developmental stage. They may require constant assistance not only with putting on separate items of clothing, but also with keeping them clean or choosing clothes suitable for weather or occasion. E.g. <i>Cooperates with dressing by stretching out arms and legs. / Does his/her own laundry</i>	19
		4c. Toileting	Assessing the ability to control bowel and bladder use, including behaviours typical of infants such as showing discomfort when wet or dirty, and coping with physiological needs in public places. A low score in this subscale may indicate that an individual has not yet mastered the ability to meet physiological needs at an age-appropriate level. This may suggest the need for assistance with monitoring defecation, using the toilet, or maintaining hygiene after a defecation. Such individuals may be less independent in meeting their needs in public places, including locating the toilet and understanding which toilet to use. E.g. <i>Shows signs of discomfort when dirty or after relieving himself/herself. / Distinguishes and obeys toilet markings in public places</i>	16
		4d. Hygiene	Assessing coping with hygienic tasks. Individual items refer to very basic skills, such as washing hands, and more complex ones, such as keeping clothes clean and performing daily hygiene tasks. A low score on this subscale may indicate that the person has not yet mastered hygiene-related skills at the level expected for his or her age. They may need constant supervision when performing hygienic practices. They may also have difficulty remembering necessary cleaning procedures, such as brushing their teeth or cutting their nails. E.g. <i>Knows to wash hands before eating, after using the toilet, etc. / Cuts nails independently and keeps them clean</i>	12
		4e. Daily Life and Independence	Assessing coping with everyday situations. The initial items assess basic skills that are typically developed during preschool years, while later items focus on tasks that are more relevant to adults, e.g. independent living. A low score on this subscale may indicate that an individual requires constant care from another person and is unable to fulfil their developmental tasks and responsibilities. They may have difficulty fulfilling basic duties, keeping order, or using public transport. E.g. <i>Can turn the TV on and off. / Exercises his/her civil rights (e.g. takes part in elections)</i>	26
		4f. Health and Responsibility	Assessing knowledge and skills in self-care. A low result in this subscale may indicate that an individual may engage in behaviours that are risky to their health (resulting from their ignorance). They may lack knowledge and skills regarding protection against dangerous behaviours. They may also have problems taking preventive measures or refuse treatment or medications. E.g. <i>Knows that hot (oven) and sharp objects (knife) are dangerous. / Has knowledge about sexuality, contraception, and sexually transmitted diseases</i>	13
		4g. Money	Assessing knowledge of the value and use of money. The initial items evaluate individuals' comprehension of the concept of money and price, while items designed for older participants focus on their understanding of borrowing and saving. A low score on this subscale may suggest a deficiency in grasping the concept of money or comprehending the correlation between the value of money and purchases. Individuals who encounter difficulties in understanding concepts such as credit, loans, savings, consumer rights, and making purchases may benefit from assistance with budgeting and expense management. E.g. <i>Knows approximately how much a roll, favourite bar, drink, ice cream, a trip to the cinema, a tram ticket, etc. costs. / Invests his/her savings</i>	14
		4h. School and Work	Assessing proficiency in skills required for education and employment. The evaluation spans from behaviours typical of toddlers, such as following instructions or seeking assistance, to more intricate tasks like job applications or working under time pressure. A low score on this subscale may indicate potential challenges for an individual in achieving independent and comprehensive engagement in academic or professional settings. They might encounter difficulties comprehending complex instructions and accepting feedback on their work. Additionally, they may struggle with meeting deadlines and demonstrate a casual approach towards fulfilling their responsibilities. E.g. <i>Selects and gives the appropriate object on command (give me the block when there are different toys on the table). / Is able to prepare a CV</i>	21

Tab. 3. Characteristics of domains and subscales of the Functional Social Maturity Scale (FSMS) (cont.)

school. Within the studied group, most mothers of participants had completed secondary education (45 individuals, or 74%) or higher education (10, or 16%), while six mothers (10%) had primary education. A similar trend was observed in the fathers' education: secondary education – 48 (79%), higher education – eight (13%), and primary education – five (8%).

Measures

Functional Social Maturity Scale (FSMS) (Sajewicz-Radtke and Radtke, 2023)

The FSMS is a broad scale that assesses an individual's daily functioning using 16 subscales grouped into four main domains: Motor, Cognitive, Socio-Emotional, and Activity. Each domain consists of two to eight subscales, which are presented in detail in Fig. 1 and described in Tab. 3. The test takes the form of a detailed, structured interview with the parent/guardian or directly with the patient. Conducting a full interview takes about 60 minutes, though selected subscales may be used independently. In the diagnosis of young children, some scales are omitted (such as those related to money or schooling). The FSMS provides not only an overall functioning score, but also four separate scores for each domain and 16 detailed scores for each subscale. This approach reduces the risk of drawing conclusions regarding overall functioning (e.g. the practical domain) based on narrow behaviours of the respondent (e.g. eating and meal preparation).

Data analysis

To prepare the data for confirmatory factor analysis (CFA), individual scale item responses were aggregated into 69 parcels using the item parcelling method (Matsunaga, 2008). This procedure aimed to reduce the number of indicators, especially when the original model (with its initial item count) appeared overly complex relative to the number of observations. In our approach, we generated 4 to 6 parcels for each subtest, depending on the number of items within that specific subtest. Consequently, each parcel consisted of 2 to 6 items, with outcomes computed for each parcel as the arithmetic mean of the indicators assigned to it. The item sequence within each subtest was organised based on item difficulty, as determined by analyses employing the item response theory approach (Jurek et al., 2023). Items were arranged from the most difficult to the easiest, and this sequencing was maintained in the allocation of items to parcels. For example, item 1 was assigned to parcel 1, item 2 to parcel 2, item 3 to parcel 3, item 4 to parcel 1, item 5 to parcel 2, and so on. This procedure ensured that the parcels remained monotonic and aligned with the item order within their respective subtests while randomising the items.

Subsequently, a hierarchical CFA model with maximum likelihood estimation was used to represent the higher-order factor, Functional Social Maturity. This factor was divided into four second-order factors corresponding to distinct

functioning domains: Motor, Cognitive, Socio-Emotional, and Activity. Each domain was further represented by its respective first-order factors, as outlined in the theoretical model, which were then reflected in the observed indicators aggregated into bundles. Model fit was evaluated using commonly accepted criteria (comparative fit index, CFI > 0.95, root mean square error of approximation, RMSEA < 0.080) (see Brown, 2015).

Furthermore, we evaluated the measurement reliability of the four domains and the overall functional social maturity score using the split-half method. We calculated the correlation between the halves of even and odd items using the Spearman–Brown formula. Additionally, we used Cronbach's alpha formula as an indicator of the lower boundary of reliability. This section of the analysis used data from all participants, including both non-clinical and clinical samples ($N = 1,718$) to ensure greater variance in the results.

Next, we compared the distributions of functional social maturity scores (both across the four domains and the overall score) between the clinical group (individuals with a diagnosis of intellectual disability) and demographically matched individuals from the validation (non-clinical) group. To ensure the most accurate comparison between the two groups, we selected a corresponding individual from the non-clinical group for each individual in the clinical group, matching based on age, gender, and the educational levels of parents. In five cases from the clinical group, an exact demographic match was not found within the non-clinical group, so these observations were excluded from this part of the analysis.

RESULTS

Confirmatory factor analysis

Fig. 2 depicts the CFA coefficients for the internal section. It captures solely the relationships between latent variables within the functional social maturity model. For clarity, the measurement part of the model is omitted from the figure and can be found in Appendix A. The model demonstrated a strong fit to the data: $\chi^2(df) = 21,844 (2,257)$, CFI = 0.952, RMSEA (90% CI) = 0.072 (0.072; 0.073). Fig. 2 illustrated that the sixteen first-order factors, corresponding to the outcomes of the respective FSMS tests, have significant loadings onto the four second-order factors, with standardised loadings ranging from 0.90 to 0.99. Moreover, these four second-order factors display notably high loadings onto the highest-order factor. High factor loadings were also found at the level of the observed variables (parcels), ranging from 0.89 to 0.99 (see Appendix A for more information).

Reliability analyses

The study assessed reliability through the split-half method and Cronbach's alpha formula for the four domains and the overall FSMS score across seven distinct age groups. The average coefficients were then computed. Tab. 4 presents

Scale/Parcel	Factor loading	Error variance	Scale/Parcel	Factor loading	Error variance
Gross Motor Skills			Eating		
Parcel 1	0.94	0.12	Parcel 1	0.98	0.05
Parcel 2	0.96	0.08	Parcel 2	0.99	0.02
Parcel 3	0.97	0.06	Parcel 3	0.98	0.04
Parcel 4	0.95	0.09	Parcel 4	0.98	0.04
Fine Motor Skills			Dressing		
Parcel 1	0.99	0.03	Parcel 1	0.98	0.03
Parcel 2	0.98	0.03	Parcel 2	0.98	0.04
Parcel 3	0.99	0.03	Parcel 3	0.98	0.04
Parcel 4	0.98	0.04	Parcel 4	0.98	0.04
Speech Development			Toileting		
Parcel 1	0.98	0.04	Parcel 1	0.99	0.03
Parcel 2	0.98	0.03	Parcel 2	0.98	0.03
Parcel 3	0.99	0.02	Parcel 3	0.98	0.04
Parcel 4	0.98	0.03	Parcel 4	0.97	0.06
Parcel 5	0.97	0.07	Hygiene		
Speech Comprehension			Parcel 1	0.97	0.05
Parcel 1	0.97	0.05	Parcel 2	0.99	0.03
Parcel 2	0.95	0.10	Parcel 3	0.97	0.06
Parcel 3	0.95	0.10	Parcel 4	0.96	0.09
Parcel 4	0.93	0.13	Daily Life and Independence		
Conceptual Domain			Parcel 1	0.99	0.03
Parcel 1	0.98	0.04	Parcel 2	0.99	0.02
Parcel 2	0.99	0.02	Parcel 3	0.98	0.03
Parcel 3	0.99	0.02	Parcel 4	0.99	0.03
Parcel 4	0.99	0.03	Parcel 5	0.98	0.04
Parcel 5	0.98	0.03	Health and Responsibility		
Social Relationships			Parcel 1	0.98	0.05
Parcel 1	0.97	0.06	Parcel 2	0.98	0.03
Parcel 2	0.98	0.04	Parcel 3	0.98	0.03
Parcel 3	0.99	0.03	Parcel 4	0.97	0.06
Parcel 4	0.98	0.03	Money		
Parcel 5	0.98	0.04	Parcel 1	0.96	0.08
Parcel 6	0.96	0.09	Parcel 2	0.98	0.05
Self-Regulation			Parcel 3	0.99	0.02
Parcel 1	0.97	0.05	Parcel 4	0.98	0.04
Parcel 2	0.98	0.05	School and Work		
Parcel 3	0.97	0.06	Parcel 1	0.99	0.02
Parcel 4	0.97	0.05	Parcel 2	0.99	0.02
Leisure Time			Parcel 3	0.99	0.02
Parcel 1	0.89	0.21	Parcel 4	0.98	0.04
Parcel 2	0.96	0.07			
Parcel 3	0.91	0.17			
Parcel 4	0.91	0.17			

Appendix A. The measurement part of the functional social maturity model – results from the confirmatory factor analysis (CFA)

the results, indicating a high level of precision in measuring functional social maturity within each age group. The average reliability indices are excellent (all >0.90), which suggests that the FSMS scale has potential for use in educational and psychological diagnostics.

Correlations among the subscales and domains of the FSMS

Spearman correlations among the raw scores of the 16 FSMS subscales are notably high, ranging from 0.82 to 0.97.

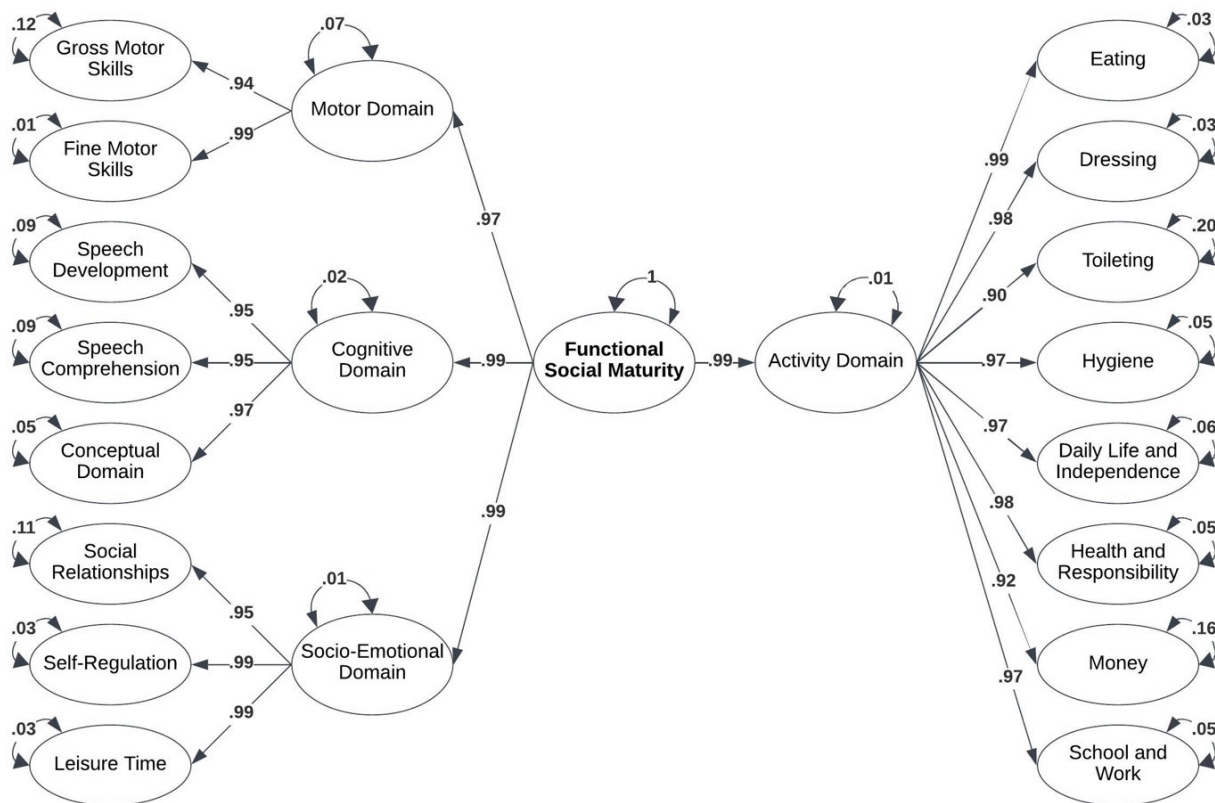


Fig. 2. Confirmatory factor analysis (CFA) coefficients for the functional social maturity model – the internal part of the model, encompassing only relationships between latent variables

This strong correlation primarily stems from the fact that raw scores tend to increase with the age of the participants, indicating that these scores reflect an individual’s functioning level relative to their peers. The correlation results for the two subscales that comprise the motor domain (Gross Motor Skills and Fine Motor Skills) with other scores do not stand out from the other subscales; positive correlations are consistently strong.

To accurately capture the true strength of the relationships within FSMS scores, it is essential to use standardised, age-normalised results. Such calculations are based on norm tables and are available only for the four main domains of the FSMS and the overall Social Maturity Quotient. Tab. 5 illustrates the Pearson correlations among these main domains and the overall Social Maturity Quotient. As can be seen, all domains significantly positively correlate with each other. The motor domain correlates most strongly with cognitive functioning and has a weaker correlation with the activity domain. The other correlations are also strong.

Comparison of FSMS score distributions in clinical and non-clinical samples

To compare the primary FSMS scores of a group of individuals diagnosed with intellectual disabilities (clinical sample,

$n = 56$) to demographically matched individuals from the validation group (non-clinical sample, $n = 56$) we calculated standard scores quotients for each individual, using normative tables (see Jurek et al., 2023). In the general population, these quotients follow a distribution with a mean of $M = 100$ and $SD = 15$, similar to the interpretation of IQ scores. Using the independent samples t -test, we compared the significance of differences between the mean scores in each group. The results of this analysis are presented in Tab. 6. The table also includes the percentage of individuals in each examined group who scored equal to or above 85 in each dimension, indicating a score no lower than one standard deviation below the average according to the general normalisation sample.

Tab. 6 shows that individuals diagnosed with intellectual disabilities achieved significantly lower scores across all dimensions of functional social maturity, providing empirical evidence for the validity of the FSMS scale. However, more intriguing from an application point of view, are the reports on the distribution of scores in both groups, which are visually depicted in Fig. 3 (panels from *a* to *e*).

In some dimensions, the percentage of individuals from the clinical sample scoring at or near the mean exceeds a quarter of the sample. This is evident for the Socio-Emotional Domain (32%, see Fig. 3, panel *c*) and the Activity Domain

Age group	Motor Domain		Cognitive Domain		Socio-Emotional Domain		Activity Domain		Functional Social Maturity	
	α	Split-half	α	Split-half	α	Split-half	α	Split-half	α	Split-half
01:00–01:11	0.86	0.96	0.92	0.98	0.90	0.96	0.91	0.99	0.96	0.99
02:00–03:11	0.90	0.93	0.93	0.98	0.96	0.99	0.97	0.98	0.98	0.99
04:00–06:11	0.93	0.98	0.95	0.98	0.97	0.99	0.98	0.99	0.99	0.99
07:00–09:11	0.95	0.98	0.97	0.98	0.98	0.99	0.99	0.99	0.99	0.99
10:00–12:11	0.95	0.98	0.97	0.99	0.96	0.98	0.98	0.99	0.99	0.99
13:00–16:11	0.84	0.92	0.96	0.98	0.90	0.93	0.97	0.98	0.98	0.99
17:00–30:00	0.85	0.93	0.97	0.99	0.93	0.94	0.98	0.99	0.99	0.99
Average	0.90	0.95	0.95	0.98	0.94	0.97	0.97	0.99	0.98	0.99

Tab. 4. Reliability estimates for fundamental dimensions of the FSMS using Cronbach's alpha and split-half method via the Spearman-Brown formula

FSMS Domain	Motor	Cognitive	Socio-Emotional	Activity
Motor	–			
Cognitive	0.63**	–		
Socio-Emotional	0.48**	0.63**	–	
Activity	0.13**	0.50**	0.60**	–
Overall Functional Social Maturity Quotient	0.48**	0.78**	0.83**	0.85**

** p -value < 0.01.

Tab. 5. Pearson correlations among the main domains of the FSMS (standard scores)

FSMS Score	Non-clinical sample ($n = 56$)			Clinical sample ($n = 56$)			t	d
	M	SD	Score ≥ 85 (%)	M	SD	Score ≥ 85 (%)		
Motor Domain FSMQ	80.68	23.07	38	58.59	21.79	12	5.21**	0.98
Cognitive Domain FSMQ	86.61	22.09	59	52.12	18.41	9	8.97**	1.70
Socio-Emotional Domain FSMQ	91.11	24.90	68	69.54	27.27	32	4.37**	0.83
Activity Domain FSMQ	103.00	21.62	82	65.25	25.19	27	8.51**	1.61
Overall Functional Social Maturity Quotient (FSMQ)	90.11	27.49	55	56.30	23.05	18	7.05**	1.33

M – mean; SD – standard deviation; t – t -value calculated from the Student's t -test; d – Cohen's d (a measure of effect size).
** p -value < 0.01.

Tab. 6. Comparison of FSMS scores between the clinical and non-clinical samples

(27%, see Fig. 3, panel d). This finding suggests that a considerable proportion of individuals with a diagnosis of intellectual disability demonstrate levels of social functioning in the socio-emotional and daily activity domains that are not significantly different from the average observed in the general population.

DISCUSSION

The robust fit of the CFA model revealed substantial relationships among multiple hierarchical factors within the functional social maturity model, confirming its structured nature across various levels. Moreover, with average reliability indices exceeding 0.90, our study consistently demonstrated high precision in measuring functional social maturity. This underscores the considerable potential of the FSMS scale in diagnosing adaptive behaviour as part of the intellectual disability diagnostic process. Notably, in specific domains, such as Socio-Emotional and Activity, over a quarter of the clinical sample scored close

to the population average, suggesting that a substantial proportion of individuals with intellectual disabilities exhibits social functioning comparable to that of the general population. In addition, research by Jordan et al. (2023) indicated that school-aged girls with fragile X syndrome and comparison groups were similar in terms of adaptive behaviour. This emphasizes the importance of assessing intellectual disabilities beyond intelligence alone, considering broader functional dimensions (Greenspan, 2012).

Furthermore, if one were to accept Greenspan's (2012) assumptions that adaptive behaviour is a sufficient variable for assessing the degree of intellectual disability, it would be beneficial to incorporate motor development into this construct. This is of particular importance in the early stages of development, where a comprehensive evaluation of all aspects of development enables more accurate prediction of its trajectory and better planning of support interventions (Rhemtulla and Tucker-Drob, 2011).

The high reliability indices of the presented tool (ranging from 0.90 to 0.98) may be attributed, among other factors, to

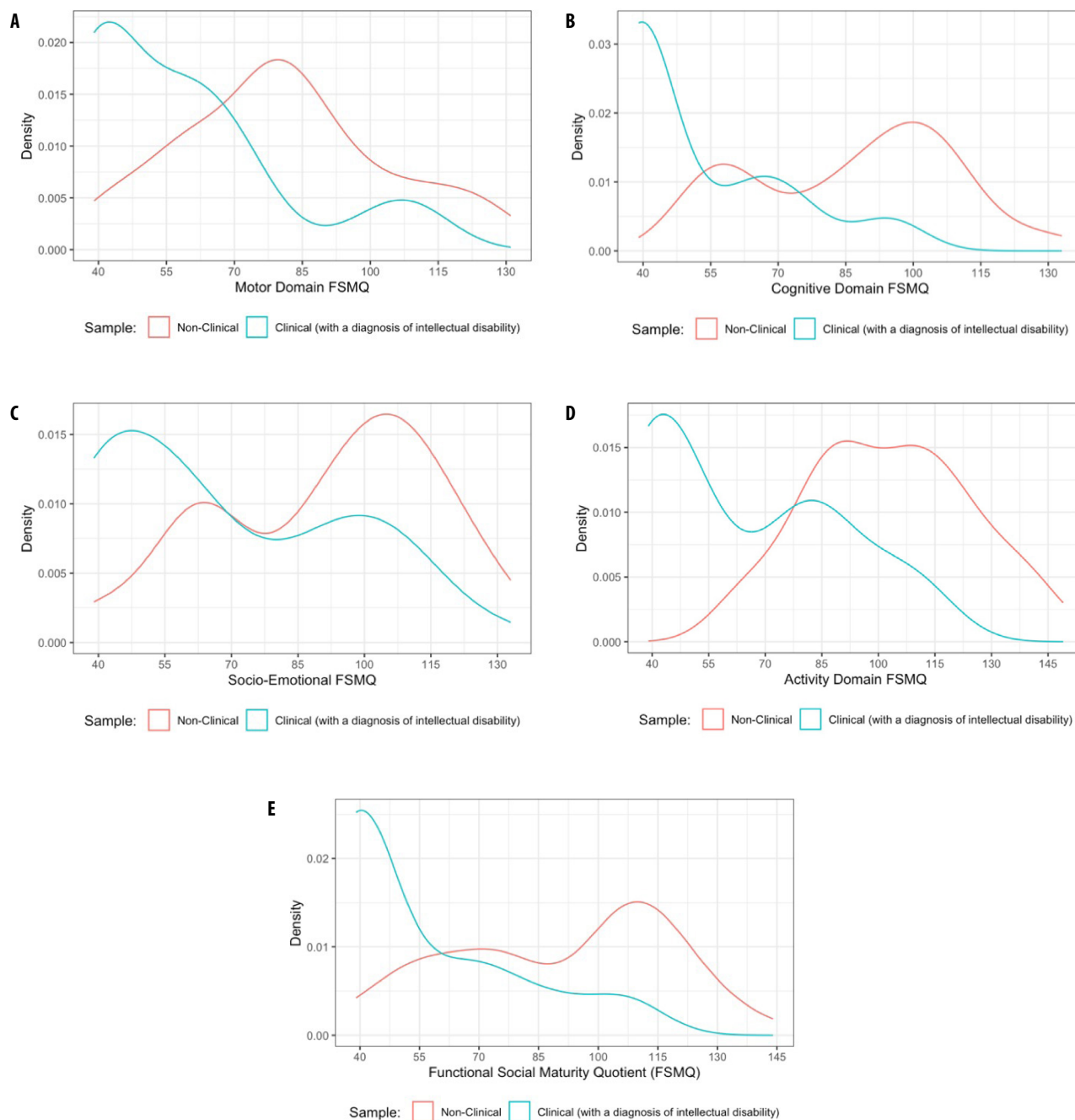


Fig. 3. Distribution of scores in the clinical and non-clinical groups across FSMS dimensions

the adaptation of test items to the specific functioning needs of children, youth, and adults in Poland. The adaptation process of measures that examine adaptive behaviours may result in the exclusion of culture-specific aspects and the inclusion of behaviours that are not prevalent in the daily life of a particular community but are important from a construct perspective. This limitation is not due to methodological errors on the part of those who are responsible for the adaptation but rather stems from the limitations of the adaptation procedure itself. For instance, it may not be possible to include a significant scale that does not fit into the design of

the given measure. From a practical standpoint, it appears that complex diagnostic procedures, such as the assessment of adaptive behaviour and, consequently, intellectual disability, should be conducted through interviews rather than questionnaires (Finlay and Lyons, 2001). Research shows that face-to-face interviews motivate subjects to provide more elaborate statements, which increases the precision of measurements when collecting sensitive data. Additionally, this procedure helps avoid omitting questions that may be difficult or inconvenient for respondents to answer. (Richman et al., 1999). The presented measure maintains the structure

of adaptive behaviour presented in the ICD-11 (World Health Organization, 2022): conceptual (Cognitive Domain), social (Socio-Emotional Domain), and practical (Activity Domain), with the addition of the Motor domain, as mentioned above. We decided, however, to divide each domain into detailed indicators (see Fig. 1 and Tab. 3). This procedure increases measurement precision and allows for more accurate planning of interventions. The tool's structure also enables a more detailed assessment of the effectiveness of programs that support people with disabilities.

Given the ongoing discussions and lack of consensus on the definition of adaptive behaviour (Greenspan, 2012; Price et al., 2018) and the construct of intellectual disability itself (Harris and Greenspan, 2016), it seems reasonable to conduct further research on the profiles of daily functioning for individuals with and without DID, as well as their family members (Łada-Maško et al., 2024). Research conducted by Sajewicz-Radtke et al. (2022) suggests that individuals with intellectual and developmental disabilities exhibit a range of IQ profiles, indicating potential heterogeneity in adaptive behaviour profiles as well. Investigating the developmental trajectory of these behaviours in relation to the level of disability would enable better planning of education and potential careers for individuals with DID. Research conducted by Dykens et al. (2006) shows an age-related developmental wall of adaptive behaviours during the middle childhood years for children with Down syndrome. It would be interesting to determine whether an age-related developmental wall of adaptive behaviours during the middle childhood years constitutes a universal limitation for other groups of people with DID.

LIMITATIONS OF THE STUDY AND FUTURE DIRECTIONS

Despite the high value of the conducted research, the results must be interpreted in the context of several limitations. The first one is the small sample size in the clinical group, which restricts the generalisability of the conclusions. However, the significant results obtained even at the small group level may be an important indication for further research and practical implications. Secondly, further investigations are necessary to explore potential gender differences. Additionally, in our research, we did not compare participants with different levels of intellectual disability, whereas according to presented theoretical background and previous research, adaptive behaviours should be considered within the context of varying levels of intellectual disability (as determined by IQ score). Another limitation of this study can be attributed to the fact that most research on adaptive behaviours is conducted in the USA clinical populations or uses scales created in the USA. We did not, however, compare the results obtained in the FSMS with other scales, such as the ABAS-3 (Otrębski et al., 2019). We acknowledge the lack of analyses regarding convergent and divergent validity. Future studies should aim to establish the convergent validity of the FSMS by correlating it with

established measures of similar constructs and divergent validity by ensuring it does not correlate with measures of dissimilar constructs. Moreover, the criterion validity of the FSMS needs to be examined in more detail. Future research should include correlation and regression analyses to determine the strength and direction of relationships between the FSMS and established criterion measures.

In future research, it would be valuable to examine adaptive behaviours in different disability groups using the FSMS. Longitudinal studies are needed to show the dynamics of changes in the adaptive behaviours of individuals over the course of chronic diseases. Additionally, it would be advisable to include the caregiver burden factor and assess the family system in the context of adaptive behaviours.

IMPLICATIONS

The FSMS can be used in educational and clinical settings to assess the level of adaptive behaviours in individuals who struggle with adapting and independent functioning in specific contexts, such as school, home, or work. It is important to note that the tool complements the process of diagnosing the degree of intellectual disability.

The FSMS can be helpful in identifying areas that require training and qualifying individuals for specific support programs. Additionally, the results obtained from the FSMS may prove useful in planning and monitoring therapeutic interventions. However, the primary purpose of the FSMS is to assess an individual's level of independence in the process of certification of psychological fitness. The FSMS results allow for determining recommendations in the process of certification or individual educational and therapeutic programs. The results of certification procedures are associated with the possibility of obtaining specific financial aid from the state as well as subsidising support interventions. Additionally, the obtained results allow for the identification of both the strengths of the examined individuals (understood as normative development of specific skills) and the areas requiring support and therapy. The results of individual domains or subscales can also serve as a guide for further diagnostics in specific areas.

The FSMS can provide individuals with disabilities insight into their level of functioning. We can use the results to involve participants in a deeper understanding of their situation and enhance their engagement in self-empowerment, as well as in discussions with the support team, including social workers, teachers, or therapists. This will enable them to establish more effective therapeutic objectives and monitor progress. The FSMS results can also serve as a starting point for conversations with parents who may need to adjust their parenting approach, whether they are being overly protective or excessively demanding. This will help them understand their child's capabilities, highlighting strengths and areas requiring additional support.

Ethics approval statement

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Board for Research Projects at the Faculty of Social Sciences, University of Gdańsk, Poland (Decision No. 13/2022).

Methodological disclosure

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study.

Conflict of interest

The authors declare no conflict of interest.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Author contribution

Original concept of study; critical review of manuscript: USR, ABEM, BMR. Collection, recording and/or compilation of data: USR, PJ, MO. Analysis and interpretation of data; writing of manuscript; final approval of manuscript: USR, ABEM, PJ, MO, BMR.

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