JIDR Journal of Intellectual Disability Research
Published on behalf of mencap and in association with IASSID

Journal of Intellectual Disability Research doi: 10.1111/jir.12930

VOLUME 66 PART 5 pp 483–498 MAY 2022

Behavioural phenomena in persons with an intellectual developmental disorder according to the level of emotional development

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Abstract

Background Challenging behaviours in people with an intellectual developmental disorder (IDD) are complex and often difficult to understand. The developmental perspective may provide additional insights into the specific behavioural patterns and underlying motives in different emotional reference ages.

Methods The behaviours of 185 adults with IDD who were admitted to psychiatry were systematically assessed with the Aberrant Behaviour Checklist (ABC) and the Modified Overt Aggression Scale (MOAS). The association of the different behaviours with various emotional reference age groups as assessed with the Scale of Emotional Development – Short (SED-S) was analysed to deduce behavioural patterns typical for a certain level of functioning.

Results Overall, the severity of challenging behaviours decreases in higher emotional reference age groups. Physical aggression was most prevalent in persons in the second phase of emotional development (7–18 months reference age). In SED-S-1 (reference age 0–6 months), the persons appeared to be *searching for physical comfort* and showed high scores in social withdrawal, stereotypies and aggression towards the self. Persons functioning in SED-S-2 (reference age 7–18 months) scored highest in irritability and physical aggression (*searching for security*), while those in SED-S-3 (19–36 months) exhibited the *searching for autonomy* type characterised by defiant and socially inappropriate behaviours. Persons with an emotional reference age of 4–7 years (SED-S-4) showed inappropriate speech, verbal self-regulation and depressive-like behavioural aspects (*searching for identity*).

Conclusions The behavioural phenomena exhibited in a certain emotional reference age may support the clinician to differentiate behavioural problems from psychopathological symptoms to yield the proper diagnosis.

Keywords behavioural phenotypes, challenging behaviour, emotional development, intellectual disability, mental health, Scale of Emotional Development – Short

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Background

Persons with an intellectual developmental disorder (IDD) frequently display challenging behaviours and suffer from additional mental health issues (Hemmings *et al.* 2013; Cooper *et al.* 2014). According to the Royal College of Psychiatrists (2007), behaviour can be described as challenging when it is of such an intensity, frequency or duration as to threaten the quality of life and/or the physical safety of the individual or others and is likely to lead to responses that are restrictive or aversive or that result in exclusion. In the ICD-10, challenging behaviour is coded with F7x.1 – intellectual disability with significant *impairment of behaviour* requiring attention or treatment (Dilling *et al.* 2015). These severe behavioural impairments take many forms but most commonly aggression and destructive behaviours, self-injury and stereotypy (Emerson & Einfeld 2011). For adults with IDD, challenging behaviour may often lead to increased long-term inpatient care, use of physical restraints and overuse of psychotropic medication and, consequently, social isolation (Robertson *et al.* 2004; Glover *et al.* 2014; Bowring *et al.* 2017). Several total population studies indicate considerable prevalence variation of challenging behaviour in adults with IDD from 4% to 22% (Emerson *et al.* 2001b; Jones *et al.* 2008; Cooper *et al.* 2014; Bowring *et al.* 2017), both separately and in combination with mental health issues (Cooper *et al.* 2014). Bowring et al. (2017) reported similar estimates for high-risk behaviours, including aggressive and destructive behaviours (8.3%), self-injurious tendencies (7.5%) and stereotyped behaviour (10.9%).

Already developed in childhood (Emerson & Einfeld 2011), these behaviours appear to increase in prevalence throughout adolescence, reaching a peak during the age range 15–34 years and then remaining relatively constant (Davies & Oliver 2013) or declining (Holden & Gitlesen 2006) in later adulthood. Challenging behaviours, when lacking effective therapeutic intervention and management, tend to become a chronic condition with high levels of relapse (Emerson *et al.* 2001a) and have a negative impact on overall quality of life in affected individuals.

The severity of IDD and the presence of autism spectrum disorders (ASD) have been recognised as the most important predictors of severe behavioural problems in people with IDD (McClintock *et al.* 2003; Sappok *et al.* 2013; Lloyd & Kennedy 2014). The prevalence of challenging behaviour increases with the severity of IDD (Poppes *et al.* 2010). Adults with ASD and IDD are four times more likely to exhibit problem behaviours than those with IDD only (McCarthy *et al.* 2010). Age (Emerson *et al.* 2001a; Tyrer *et al.* 2006), gender (Emerson *et al.* 2001b) and residential setting (Lowe *et al.* 2007) have also been identified as risk factors for challenging behaviours. Hastings et al. (2013) argued that challenging behaviour results from psycho-social and biological vulnerabilities. Respectively, challenging behaviour can occur in the context of low verbal abilities, psychological trauma, as a result of social impoverishment, and psychiatric or mood difficulties. From a biological perspective, behavioural problems have been associated with a decline in physical well-being (De Winter *et al.* 2011; Blickwedel *et al.* 2019), sensory over-stimulation or under-stimulation and a behavioural phenotype in the context of a genetic syndrome (Hastings *et al.* 2013). An emerging body of research indicates the crucial role of a level of emotional development (ED) in persons with an IDD: if not recognised or adequately taken into account, it can lead to misjudgement of an individual's behavioural repertoire, create permanent situations of excessive demands, cause or intensify social conflicts and tensions and thus arrest social integration and adaptation (Sappok *et al.* 2013, 2014).

As Hodapp & Zigler (1995) outlined in their seminal work, persons with developmental delays principally pass through the same developmental stages as their neurotypical counterparts; however, the course may be delayed or incomplete. Following the trajectories of typical development in infants, the acquisition of emotional competences and affect regulation is tightly bound with biological maturation of the social brain network (Sappok *et al.* 2019), but it also depends on environmental factors that determine the mutual interaction and learning processes (Johnson & Munakata 2005; Witherington & Crichton 2007). This comprehensive process comprises cognitive, social, sensorimotor functions and acquisition of emotional competencies, that is, affect regulation, which together determine the level of socio-emotional functioning (Sappok *et al.* 2019). Došen (2010) describes a phased course of ED (phases 1 to 5) covering reference ages from birth to

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12 years of age. The level of ED can be assessed with the Scale of Emotional Development – Short (SED-S; Sappok *et al.* 2016). Recent studies have indicated reliability and validity of the SED-S both in adults (Sappok *et al.* 2019) and in children (Sappok *et al.* 2019; Sterkenburg *et al.* 2021). Attributing specific emotional needs and motivations, as well as coping and regulating strategies to the level of ED may support the analysis and diagnostic allocation of observed behaviour patterns (Došen 2005).

Sappok et al. (2013) indicated that the level of ED was a significant predictor for behavioural problems on the overall scale as well as on specific subscales for irritability, aggression to the self and verbal aggression. Böhm et al. (2019) identified cognitive-emotional developmental discrepancies; that is, the emotional reference age was lower than the cognitive reference age, which were clinically relevant with regard to the severity of behavioural impairments. Examining the importance of the level of ED for specific patterns of problem behaviour, a case–control study (N = 18) identified the repertoire of challenging behaviour according to the level of emotional functioning (Sappok *et al.* 2012). The analysis of the dominant behaviours in each phase of ED indicated specific behavioural clusters ('symptom cluster'). The adaptation phase (emotional reference ages 0–6 months) was characterised by prominent stereotypical, self-injurious and isolating behaviours. These would be typically observed if the physical needs of the persons are not met, for example, pain, starvation and lack of sleep. Persons with reference ages from 7 to 18 months (socialisation) exhibited increased levels of irritability, aggression towards others and destructive behaviour, which may be triggered in moments of insecure bonding to significant others. The behaviour of persons functioning in emotional reference ages of 1.5–3 years (individuation) was characterised by the presence of aggression, while hyperactivity and defiant behaviour became dominant. In this phase of ED, the problem behaviours may be caused by the persons need for autonomy. These clusters of behaviours according to the respective level of ED can be described as 'behavioural phenomena' referring to the observable actions of individuals or groups and to mental phenomena such as knowledge, attitudes, beliefs, motivations, perceptions, cognitions and emotions (National Institutes of Health 2019).

In this study, we aim to specify the behavioural phenomena that are typical for the level of ED in a larger sample of 185 adults with IDD. We therefore systematically analysed the relationship of several emotional reference age groups and conspicuous behaviours in people with IDD. The relationship between the emotional reference age assessed with the SED-S and defined behaviours on the *Aberrant Behaviour Checklist* (ABC) and *Modified Overt Aggression Scale* (MOAS) scale and subscale levels as well as on the ABC item level were determined to explore the underlying phenomena at the respective level of emotional functioning. Consequently, our analysis aims to enrich the clinical picture of IDD drawn by the DSM or ICD with respect to a more detailed analysis of the underlying developmental dynamics that shape the characteristic behavioural patterns in individuals with IDD. The depiction of the typical behavioural phenomena of each ED phase may assist to decode the observed behaviours, identify the underlying needs of a person, reduce the risk of overmedication and subsequently increase the quality of life of persons with IDD.

Methods

Setting and design

This retrospective study was conducted at the Center for Mental Health in Intellectual Developmental Disabilities at the Evangelisches Krankenhaus Königin Elisabeth Herzberge in Berlin, Germany. Study participants were recruited from among patients who were treated in the inpatient and outpatient clinic from March 2016 to June 2019. All participants with mild to profound IDD exhibiting challenging behaviours were assessed for the level of emotional functioning (SED-S) and the quality and severity of the challenging behaviours (ABC and MOAS). All participants had reached the age of 18 years at the time the study was conducted.

Ethics

All data were collected as part of the routine medical care according to the provisions of the Berlin State Hospital Act §25.1 (version 18.09.2011). The study was conducted according to the principles of the Declaration of Helsinki.

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Study sample

Overall, 185 persons were included in the study. The age of the participants ranged from 18 to 65 years [mean (M) = 36.50, standard deviation (SD) = 12.28] with 63.2% (n = 117) of them being male. Of the 185 participants included, the majority had a severe (42.2%) or moderate (31.9%) level of ID (cf. Table 1). The participants in the fifth phase were excluded from further analyses due to the small sample size (n = 3, 1.6%).

Diagnostic instruments

Scale of Emotional Development – Short

We employed the SED-S to assess the level of emotional functioning in eight different domains: *(1) Relating to his or her own Body*, *(2) Relating to Significant Others*, *(3) Dealing with Change – Object Permanence*, *(4) Differentiating Emotions*, *(5) Relating to Peers*, *(6) Engaging with the Material World*, *(7) Communicating with Others* and *(8) Regulating Affect*. The scale evaluation determined specific ED phases in a respective reference age from birth to the 12th year of life: *Adaptation* (0–6 months), *Socialisation* (7–18 months), *First Individuation* (19–36 months), *Identification* (4–7 years) and *Reality Awareness* (8–12 years). The SED-S was applied in a semi-structured interview conducted by a developmental psychology expert and a caregiver. The congruency between the level of ED and the chronological age of 160 typically developed children was high (Cohen's κ = 0.91). The inter-rater reliability was also high in 25 cases (Cohen's κ = 1.00), and the internal consistency was very high (Cronbach's α = 0.99) (Sappok *et al.* 2019). Cronbach's alpha for SED-S on domain level was excellent (α = 0.927).

Table 1 Description of the study sample

Characteristics	Number, *n* (%)
Level of IDD (DAS)	
Mild (ICD-10: F70)	31 (16.8)
Moderate (ICD-10: F71)	59 (31.9)
Severe (ICD-10: F72)	78 (42.2)
Profound (ICD-10: F73)	17 (9.2)
Level of emotional development (SED-S)	
Adaptation (SED-S-1)	25 (13.5)
Socialisation (SED-S-2)	48 (25.9)
Individuation (SED-S-3)	68 (36.8)
Identification (SED-S-4)	41 (22.2)
Reality awareness (SED-S-5)	3 (1.6)
Mental illnesses (ICD 10 F0.–F6. + F84)	
Organic delusional/affective disorders (F06.2–F06.3)	76 (41.1)
Schizophrenia or delusional disorders (F20–F29)	29 (15.7)
Affective disorders (F30–F39)	31 (16.8)
Neurotic, stress or somatoform disorder (F40–F48)	17 (9.2)
Personality disorder (F60–69)	8 (4.3)
Autism spectrum disorders (F84)	61 (33.0)

DAS, Disability Assessment Schedule; IDD, intellectual developmental disorder; SED-S, Scale of Emotional Development – Short.

Modified Overt Aggression Scale

The presence and severity of *verbal aggression*, *aggression against property*, *autoaggression* and *physical aggression* was assessed with MOAS on a five-level scale ('0' = *no aggression* to '4' = *maximum aggression*) (Knoedler 1989; Sorgi *et al.* 1991). For people with IDD, the inter-rater reliability (Oliver *et al.* 2007) was in the medium to high range (Cohen's κ = 0.65 and intraclass correlation r = 0.93). In the presented study, Cronbach's alpha for MOAS was α = 0.704.

Aberrant Behaviour Checklist

The types and severity of challenging behaviours were assessed with the ABC (Aman *et al.* 1985; Aman & Singh 1986; Aman *et al.* 1995), which consists of a total of 58 items with 4–16 items per subscale (*irritability*, *lethargy*, *stereotypy*, *hyperactivity* and *inappropriate speech*). A reference person indicates for each item whether a particular behaviour is either not at all a problem (0), the behaviour is a problem but slight in degree (1), the problem is moderately serious (2) or the problem is severe in degree (3). In a validation study (N = 270 people with IDD), the five-factorial structure of the instrument could be replicated (Zeilinger *et al.* 2011). In the presented study, Cronbach's alpha for the ABC items was α = 0.944.

Disability Assessment Schedule

To determine the participant's level of ID, the German version of the Disability Assessment Schedule (DAS) (Holmes *et al.* 1982) was conducted by a close caregiver upon a patient's admission to the

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hospital. The DAS consists of 16 items that assess skills and abilities in the areas of continence, self-help, communication and cultural techniques. The level of IDD was derived from the total score based on the sum of the items. The reliability and the convergent validity were evaluated as sufficient (Holmes *et al.* 1982; Meins & Süßmann 1993). The DAS is considered a valid and practicable instrument for assessing the degree of IDD (Holmes *et al.* 1982; Meins & Süßmann 1993); however, no direct conclusions can be drawn regarding the IQ.

Statistical analyses

The missing values of DAS ($n = 6$) were replaced by the respective grade of ID as derived from the medical files by an experienced clinician. The missing values of SED-S (one to two domains, $n = 12$) were replaced by values based on an average estimation of the remaining domain values and clinical information judged by an experienced psychologist. All the MOAS values were available. The missing values of the ABC (total 1.40%) were replaced by simple imputations.

(1) We computed a univariate linear regression analysis for the ABC and MOAS total and subscale scores with possible predictors (age, sex, degree of IDD, level of ED and ASD). All five predictors were tested separately for several response variables, that is, the ABC and MOAS total scores and the five (ABC) and four (MOAS) subscales. In total, 55 separate univariate regression analyses were run. The alpha error ($\alpha = 0.05$) was Bonferroni corrected. Consequently, we applied multiple regression analysis (inclusion method) for several scales or subscales with more than one result derived from the univariate regression analysis to allow a comparison of the relevance of the respective predictors.

For a comparison of the severity of the challenging behaviour in the different emotional reference ages, we calculated a single factor analysis of variance (Welch corrected) for each total and subscale score of the MOAS and the ABC. To analyse paired mean value comparisons, we applied the Tukey–Kramer and Games–Howell post hoc tests.

(2) In a second step, we examined the relationship between the level of emotional functioning and behavioural problems on ABC item level by means of a descriptive analysis. The frequency distributions of all ABC items were calculated for each SED-S phase by weighted means (cf. Table 4). Because a certain behaviour is not very specific if it occurs frequently in all four phases, those items that ranked in the upper quartile of all four phases were excluded (items 14, 36 and 57). The items ranking in the upper quartile were regarded as specific for a respective phase (cf. Table 5).

(3) Finally, based on the results of the scale, subscale and item analyses, we explored the behaviours typical for a certain emotional reference age (cf. Table 6).

Results

Relationship of challenging behaviours and emotional reference age

In the univariate regression analysis, the level of IDD and the level of ED were significant predictors (Bonferroni correction 0.0083) for five of the eleven (sub)scales [*autoaggression* (MOAS); *irritability*, *lethargy* and *stereotypy* and the *ABC total score*]. ASD was a significant predictor for the subscale *stereotypy* (cf. Table 2). In the multiple regression analysis, the level of IDD was a significant predictor for the *ABC total scale* ($P = 0.011$; $b = 8.16$) and the subscale *irritability* ($P = 0.027$; $b = 2.76$). The level of ED was found to have a significant predictive value for the subscales *lethargy* ($P = 0.04$; $b = -1.87$) and *stereotypy* ($P < 0.01$; $b = -1.63$) (cf. Table 3).

Aberrant Behaviour Checklist stratified according to the Scale of Emotional Development – Short scale

Figure 1 shows the average ABC total and subscale scores stratified according to the level of ED. For the ABC total score as well as the subscales *irritability*, *lethargy* and *hyperactivity*, the estimated mean values decreased with increasing emotional reference ages. Significant main effects could be demonstrated for the total scale of the ABC ($F_{3,178} = 6.70$, $P \leq 0.001$, $\omega^2 = 0.086$) and for all subscales. The greatest effect strengths were found for the subscales *stereotypy* ($F_{3,95.46} = 10.94$, $P \leq 0.001$, $\omega^2 = 0.151$) and *lethargy* ($F_{3,178} = 6.50$, $P \leq 0.001$, $\omega^2 = 0.083$). Furthermore, at least two of the SED-S groups differed on the subscales *irritability* ($F_{3,178} = 4.03$, $P = 0.008$, $\omega^2 = 0.048$) and *hyperactivity* ($F_{3,178} = 3.23$, $P = 0.024$, $\omega^2 = 0.035$). The smallest effect strength was seen in the subscale *inappropriate speech* ($F_{3,178} = 2.71$, $P = 0.047$, $\omega^2 = 0.027$).

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Table 2 Simple regression analyses (N = 185) for the prediction of challenging behaviour (scales of the MOAS and the ABC)

	Predictor		Age	Sex	Degree of IDD	Level of ED	ASD
Modified Overt Aggression Scale	MOAS total Gesamt	*r*	−0.07	−0.05	0.19	−0.17	−0.06
		P	0.375	0.503	0.01	0.020	0.978
	Aggression verbal	*r*	0.05	−0.09	−0.12	0.11	−0.10
		P	0.484	0.225	0.096	0.136	0.163
	Aggression objects	*r*	−0.07	−0.01	0.08	−0.07	0.04
		P	0.363	0.852	0.268	0.349	0.586
	Aggression self	*r*	−0.07	0.03	**0.25**	**−0.26**	0.10
		P	0.321	0.676	**0.000**	**0.000**	0.188
	Aggression others	*r*	−0.06	−0.07	0.19	−0.16	−0.06
		P	0.428	0.321	0.009	0.034	0.395
Aberrant Behaviour Checklist	ABC total	*r*	−0.14	−0.08	**0.33**	**−0.28**	−0.14
		P	0.051	0.304	**0.000**	**0.000**	0.051
	Irritability	*r*	−0.08	0.01	**0.26**	**−0.21**	−0.02
		P	0.306	0.886	**0.000**	**0.004**	0.792
	Lethargy	*r*	−0.09	−0.07	**0.26**	**−0.28**	0.09
		P	0.205	0.307	**0.000**	**0.000**	0.248
	Stereotypy	*r*	−0.19	−0.13	**0.27**	**−0.37**	0.17
		P	0.011	0.072	**0.000**	**0.000**	0.019
	Hyperactivity	*r*	−0.16	−0.10	**0.30**	−0.19	−0.06
		P	0.029	0.167	**0.000**	0.011	0.448
	Inappropriate speech	*r*	0.03	0.02	−0.04	0.13	−0.01
		P	0.641	0.743	0.575	0.076	0.858

α_{korr} = 0.0083, corrected according to Bonferroni. Significant predictors marked in bold.

ABC, Aberrant Behaviour Checklist; ASD, autism spectrum disorders; ED, emotional development; IDD, intellectual developmental disorder; MOAS, Modified Overt Aggression Scale.

The *post hoc* analysis of the overall ABC scale showed a significantly higher expression of the scale values of the first compared with the third (P = 0.015) and fourth ($P \leq$ 0.001) SED-S phases. For the subscales *lethargy* and *stereotypy*, significantly higher values were found in people in the first SED-S phase compared with the second (P = 0.021 or P = 0.018), third (P = 0.001 or P = 0.018) and fourth phases ($P \leq$ 0.001), whereby in the subscale *stereotypy*, people in the second and fourth (P = 0.010) as well as in the third and fourth phases (P = 0.002) also differed significantly. *Post hoc* analyses of the subscales *hyperactivity* and *irritability* showed a significant effect between the first and fourth SED-S phases (P = 0.013 and P = 0.005, respectively). For the *inappropriate speech* subscale, no significant group difference (significance level $\alpha \leq$ 0.05) was found despite a significant main effect (P = 0.047).

Table 3 Multiple regression analyses (N = 185) for the prediction of challenging behaviour (MOAS and ABC) for ED and IDD

Variable	Predictor	*b*	SE *b*	*β*	t	*P*	R^2
Aggression	ED	−0.95	0.59	−0.16	−1.60	0.111	0.068
self (MOAS)	IDD	0.96	0.68	0.14	1.40	0.162	
ABC total	ED	−2.95	2.75	−0.11	−1.07	0.286	0.104
	IDD	8.16	3.16	0.25	2.58	**0.011**	
Irritability	ED	−0.55	1.08	−0.05	−0.51	0.609	0.059
(ABC)	IDD	2.76	1.24	0.23	2.23	**0.027**	
Lethargy	ED	−1.87	0.91	−0.21	−2.07	**0.040**	0.077
(ABC)	IDD	1.15	1.04	0.11	1.10	0.273	
Stereotypy	ED	−1.63	0.44	−0.36	−3.72	**0.000**	0.128
(ABC)	IDD	0.06	0.50	0.01	0.13	0.901	

Bold marks for $P \leq$ 0.05.

ABC, Aberrant Behaviour Checklist; ED, emotional development; IDD, intellectual developmental disorder; MOAS, Modified Overt Aggression Scale.

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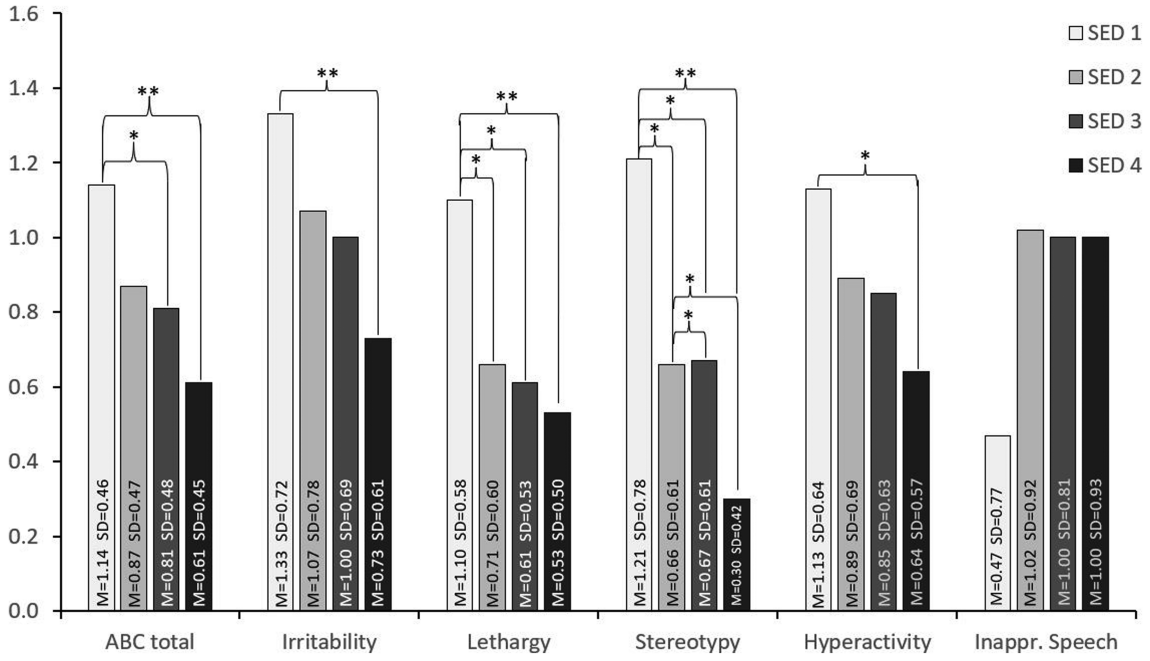

Figure 1. Mean values of the ABC scales (average scale values) stratified by SED level; */**$P \leq 0.05/0.01$; $n = 182$. ABC, Aberrant Behaviour Checklist; M, mean; SD, standard deviation; SED, Scale of Emotional Development.

Modified Overt Aggression Scale stratified according to the Scale of Emotional Development – Short scale

For the MOAS overall score, an increase in the mean values from SED-S-1 to SED-S-2 and a decrease from SED-S-2 to SED-S-3 can be observed. Similar results can be observed for the subscales *aggression against property*, *autoaggression* and *physical aggression*. On a descriptive level, an increase for the subscale *verbal aggression* from SED-S-1 to SED-S-3 followed by a decrease from SED-S-3 to SED-S-4 was seen.

To investigate whether the scale of aggressive behaviours related to the SED-S phase differed significantly, we conducted a single variance analysis for the MOAS. The results showed significant main effects for the total scale of MOAS ($P = 0.006$, $\omega^2 = 0.052$) and for the subscales *autoaggression* ($P = 0.004$, $\omega^2 = 0.057$), *physical aggression* ($P = 0.016$, $\omega^2 = 0.045$) and *aggression against property* ($P = 0.022$, $\omega^2 = 0.034$). The subscale *verbal aggression* showed no significant main effect ($P = 0.475$). The *post hoc* analysis of the MOAS overall scale values showed a significantly higher expression of aggressive behaviours among persons in SED-S-2 compared with persons in SED-S-4 ($P = 0.013$). The average expression on the *self-aggression* subscale was significantly lower for persons in SED-4 than for persons in SED-S-1 ($P = 0.041$) and SED-S-2 ($P = 0.008$). For the subscales *physical aggression* ($P = 0.025$) and *aggression against property* ($P = 0.045$), there were also significantly lower values for persons in SED-S-4 compared with those in (cf. Fig. 2).

Item analysis – ABC items depending on the SED-S phase

To identify the behaviours most frequently associated with a certain level of ED at the ABC item level, first the mean scores and then the 12 ABC items of the upper quartile (except the item is in the upper quartile in all SED-S phases), corresponding to the highest degree of challenging behaviour (Tables 4 and 5), were determined.

Behavioural phenomena according to the level of emotional functioning

Phenomena of challenging behaviour can be synoptically summarised by means of the individual item analysis of the ABCs, the mean values of the

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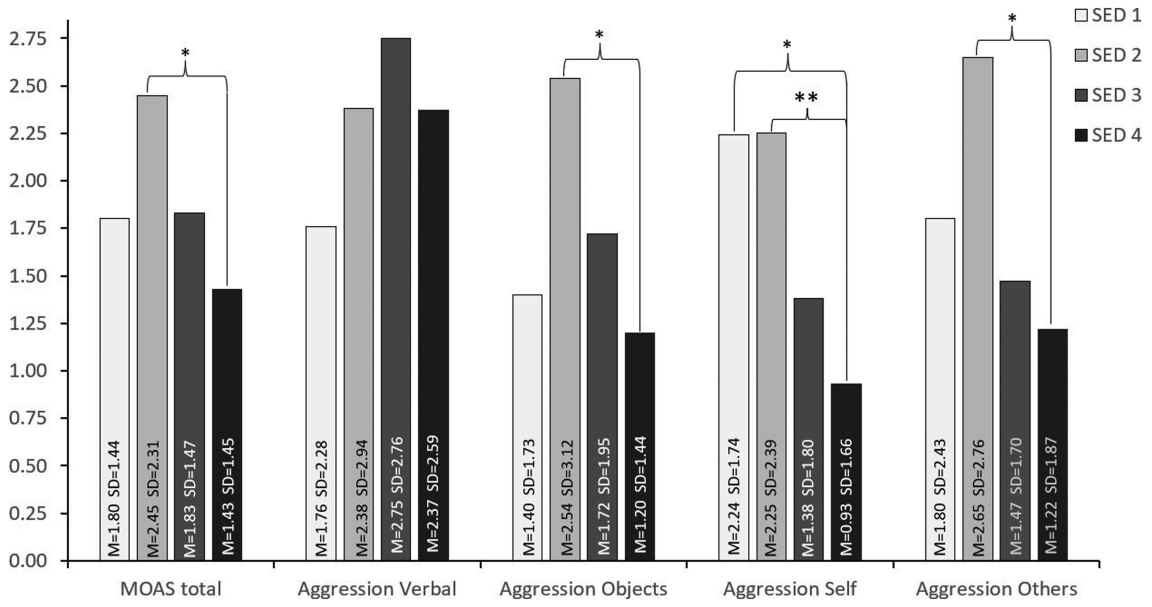

Figure 2. Mean values of the MOAS scales (unweighted) stratified by SED level; */**$P \leq 0.05/0.01$; $n = 182$. M, mean; MOAS, Modified Overt Aggression Scale; SD, standard deviation; SED, Scale of Emotional Development.

Table 4 List of ABC scores by means

	Mean			
ABC – item	**SED-1**	**SED-2**	**SED-3**	**SED-4**
1. Excessively active at home, school, work	**0.97**	0.59	0.65	0.60
2. Injures self on purpose	**1.63**	1.11	0.74	0.37
3. Listless, sluggish, inactive	**1.14**	0.91	0.85	0.89
4. Aggressive to others	0.92	**1.19**	1.10	0.96
5. Seeks isolation from others	**1.34**	0.94	0.75	0.73
6. Meaningless, recurring body movements	**1.47**	0.90	0.89	0.20
7. Boisterous (inappropriately noisy/rough)	**1.50**	1.27	1.09	0.76
8. Screams inappropriately	**1.36**	1.09	1.06	0.56
9. Talks excessively	0.31	0.79	0.74	**1.07**
10. Temper tantrums/outbursts	1.20	**1.46**	1.28	0.91
11. Stereotyped behaviour; abnormal, repetitive movements	**1.58**	0.98	0.96	0.47
12. Preoccupied, states into space	**0.84**	0.81	0.62	0.54
13. Impulsive (acts without thinking)	**1.42**	1.29	1.14	1.02
14. Irritable and whiny	**1.53**	1.29	1.31	1.10
15. Restless, unable to sit still	**1.33**	1.19	1.03	0.68
16. Withdrawn; prefers solitary activities	**1.72**	1.21	0.89	0.93
17. Odd, bizarre in behaviour	**1.33**	1.02	0.93	0.73
18. Disobedient, difficult to control	**1.26**	0.96	1.01	0.64
19. Yells at inappropriate times	**0.82**	0.57	0.54	0.34
20. Fixed facial expression; lacks emotional responsiveness	**0.72**	0.69	0.47	0.48
21. Disturbs others	1.12	1.23	**1.32**	0.98
22. Repetitive speech	0.55	1.27	1.26	**1.28**
23. Does nothing but sit and watch others	**0.88**	0.56	0.56	0.46

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Table 4. *(Continued)*

ABC – item	Mean			
	SED-1	SED-2	SED-3	SED-4
24. Uncooperative	**1.44**	0.77	0.91	0.61
25. Depressed mood	0.93	**0.95**	0.90	0.90
26. Resists any form of physical contact	**1.00**	0.40	0.40	0.37
27. Moves or rolls head back and forth repetitively	**0.72**	0.21	0.15	0.07
28. Does not pay attention to instructions	**1.68**	1.02	0.96	0.71
29. Demands must be met immediately	**1.85**	1.04	1.25	0.95
30. Isolates himself or herself from other children or adults	**1.04**	0.94	0.72	0.56
31. Disrupts group activities	**1.20**	1.01	1.06	0.80
32. Sits or stands in one position for a long time	**1.30**	1.04	0.54	0.42
33. Talk to self loudly	0.33	0.67	**0.99**	0.90
34. Cries over minor annoyances and hurts	**0.56**	0.47	0.41	0.49
35. Repetitive hand, body or head movements	**1.84**	0.92	0.99	0.46
36. Mood changes quickly	**1.60**	1.56	1.56	1.30
37. Unresponsive to structured activities (does not react)	**0.81**	0.54	0.64	0.22
38. Does not stay in seat (during lesson, training session, meals etc.)	**0.76**	0.69	0.57	0.38
39. Will not sit still for any length of time	**0.52**	0.21	0.29	0.12
40. Is difficult to reach, contact or get through to	**1.52**	0.73	1.01	0.71
41. Cries and screams inappropriately	**1.10**	0.71	0.84	0.39
42. Prefers to be alone	**1.52**	0.94	0.81	0.83
43. No try to communicate (words or gestures)	**1.00**	0.19	0.34	0.05
44. Easily distractible	1.18	1.09	1.11	**1.20**
45. Waves or shakes the extremities repeatedly	**0.44**	0.29	0.40	0.12
46. Repeats a word or phrase over and over	0.71	**1.35**	1.00	0.73
47. Stamps feet or bangs objects or slams doors	1.24	**1.25**	1.01	0.70
48. Constantly runs or jumps around the room	**0.84**	0.48	0.28	0.15
49. Rocks body back and forth repeatedly	**1.08**	0.27	0.39	0.07
50. Deliberately hurts himself or herself	**1.68**	0.88	0.73	0.36
51. Pays no attention when spoken to	**1.00**	0.67	0.64	0.32
52. Does physical violence to self	**1.64**	0.92	0.68	0.34
53. Inactive, never moves spontaneously	0.38	**0.42**	0.19	0.27
54. Tends to be excessively active	**0.88**	0.77	0.56	0.54
55. Responds negatively to affection	**0.88**	0.23	0.26	0.36
56. Deliberately ignores directions	**1.04**	0.94	0.97	0.71
57. Has temper outbursts or tantrums when does not get own way	**1.88**	1.52	1.53	1.22
58. Shows few social reactions to others	**1.61**	0.85	0.68	0.63

SED-S phases with the highest mean in bold numbers.
ABC, Aberrant Behaviour Checklist; SED-S, Scale of Emotional Development – Short.

ABC subscales per SED-S phase and the average expression of the non-weighted MOAS subscales per SED-S phase (Sappok *et al.* 2012, 2019) (cf. Table 6).

Searching for physical comfort (Scale of Emotional Development – Short-1)

The SED-S phase 1 focuses on challenging behaviour in the sense of stereotypic (item 35), impatient (item 29) and self-harming behaviours (items 52, 50 and 2) as well as symptoms of social isolation (items 16, 40 and 42) or withdrawal (items 58 and 28). The ABC total scores and all subscales except *inappropriate speech* are significantly increased compared with the higher levels of emotional functioning. In the MOAS, *aggression towards the self* predominates (M 2.24).

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Table 5 The 12 Aberrant Behaviour Checklist items of the upper quartile of each SED-S phase

SED-1	Mean	SED-2	Mean	SED-3	Mean	SED-4	Mean
29. Demands must be met immediately	1.85	10. Temper tantrums/outbursts	1.46	21. Disturbs others	1.32	22. Repetitive speech	1.28
35. Repetitive hand, body or head movements	1.84	46. Repeats a word or phrase over and over	1.35	10. Temper tantrums/outbursts	1.28	44. Easily distractible	1.20
16. Withdrawn; prefers solitary activities	1.72	13. Impulsive (acts without thinking)	1.29	22. Repetitive speech	1.26	9. Talks excessively	1.07
50. Deliberately hurts himself or herself	1.68	22. Repetitive speech	1.27	29. Demands must be met immediately	1.25	13. Impulsive (acts without thinking)	1.02
28. Does not pay attention to instructions	1.68	7. Boisterous (inappropriately noisy and rough)	1.27	13. Impulsive (acts without thinking)	1.14	21. Disturbs others	0.98
52. Does physical violence to self	1.64	47. Stamps feet or bangs objects or slams doors	1.25	44. Easily distractible	1.11	4. Aggressive to other children or adults (verbally or physically)	0.96
2. Injures self on purpose	1.63	21. Disturbs others	1.23	4. Aggressive to other children or adults (verbally or physically)	1.10	29. Demands must be met immediately	0.95
58. Shows few social reactions to others	1.61	16. Withdrawn; prefers solitary activities	1.21	7. Boisterous (inappropriately noisy and rough)	1.09	16. Withdrawn; prefers solitary activities	0.93
11. Stereotyped behaviour; abnormal, repetitive movements	1.58	15. Restless, unable to sit still	1.19	31. Disrupts group activities	1.06	10. Temper tantrums/outbursts	0.91
40. Is difficult to reach, contact or get through to	1.52	4. Aggressive to other children or adults (verbally or physically)	1.19	8. Screams inappropriately	1.06	25. Depressed mood	0.90
42. Prefers to be alone	1.52	2. Injures self on purpose	1.11	15. Restless, unable to sit still	1.03	33. Talk to self loudly	0.90
7. Boisterous (inappropriately noisy and rough)	1.50	44. Easily distractible	1.09	40. Is difficult to reach, contact or get through to	1.01	3. Listless, sluggish, inactive	0.89

Items within the upper quartile in all SED-S phases (items 14, 36 and 57) were excluded.
SED-S, Scale of Emotional Development – Short.

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Table 6 Synopsis of the behavioural phenomena in the different emotional reference ages according to the ABC and Modified Overt Aggression Scale scales and subscales and the ABC item analysis

	SED-S-1 *n* = 25	**SED-S-2** *n* = 48	**SED-S-3** *n* = 68	**SED-S-4** *n* = 41
Emotional reference age	0–6 months	7–18 months	1.5–3 years	4–7 years
Behavioural phenomena	Searching for physical comfort	Searching for security	Searching for autonomy	Searching for identity
Characteristics	**1** Stereotypy	**1** Aggression (objects, others, self)	**1** Aggression (verbal)	**1** Inappropriate speech
	2 Aggression (self)	**2** Irritability	**2** Impulsivity	**2** Verbal self-regulation
	3 Social withdrawal	**3** Temper tantrums	**3** Defiant and socially inappropriate behaviour	**3** Sadness
	4 Irritability	**4** Impulsivity	**4** Inappropriate vocalisations	**4** Reduced motivation
	5 Hyperactivity	**5** Repetitive speech	**5** Irritability	**5** Aggression (verbal)
	6 Isolation	**6** Hyperactivity	**6** Hyperactivity	**6** Mood swings
	7 Impatience	**7** Withdrawal	**7** Angry impatience	**7** Easily distractible

ABC, Aberrant Behaviour Checklist; SED-S, Scale of Emotional Development – Short.

Searching for security (Scale of Emotional Development – Short-2)

In this SED-S phase, the challenging behaviour is particularly evident in a high level of externalising psychomotor activity and aggressiveness. At the ABC item level, temper tantrums (items 7, 10 and 47), impulsivity (items 13 and 21) and verbal repetitions (items 46 and 22) are frequent but also withdrawal symptoms appear (item 16). Accordingly, the MOAS shows high values for *aggression towards others* (M 2.65) and *objects* (M 2.54), and the *aggression towards the self* is still high (M 2.25) with significant differences compared with SED-4 on overall and subscale levels. At the ABC subscale level, *stereotypy* was lower than in SED-1 but higher than in SED-4. The highest ABC subscale values were found for *irritability* (M 1.07), followed by *inappropriate speech* (M 1.02), *hyperactivity* (M 0.89) and *lethargy* (M 0.71).

Searching for autonomy (Scale of Emotional Development – Short-3)

The third SED-S phase is characterised by a high degree of impulsivity (items 29 and 13) as well as furious (item 10), defiant and socially inappropriate behaviour (items 21 and 31). In addition, inappropriate vocalisations (items 22, 7 and 8) are frequent. At the ABC subscale level, *irritability* and *inappropriate speech* (M 1.0) are most prevalent followed by *hyperactivity* (M 0.85), *stereotypy* (M 0.67) and *lethargy* (M 0.61), with significantly higher levels of stereotypic behaviours compared with SED-4. Concerning the MOAS subscale, *verbal aggression* predominated (M 2.75).

Searching for identity (Scale of Emotional Development – Short-4)

The ABC subscale with the highest levels is *inappropriate speech* (M *1.0*), and *verbal aggression* dominates in the MOAS (M 2.37; SD 2.89). At the item level, the ABC is characterised by conspicuous speech behaviour in the sense of verbal self-regulation (items 22, 9 and 33); persons seem easily distractible (item 44). In addition, there are depressive symptoms, such as mood swings (items 13 and 29), sadness (item 25) and reduced motivation (items 16 and 3).

Discussion

Challenging behaviours in people with IDD are complex and often difficult to understand. Based on the bio-psycho-social model, problem behaviours can be assessed in a structured way to provide insights into the underlying physical and mental illnesses and environmental factors (Royal College of Psychiatrists 2007; Došen 2010; Hastings *et al.* 2013; Sappok *et al.* 2019). In persons with IDD, the developmental perspective provides additional insights into the motives for a certain behaviour

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(Gardner *et al.* 2006; Sappok *et al.* 2012; National Institute for Health and Care Excellence Guidelines 2015; Canadian Consensus Guidelines 2018). Moreover, the identification of a specific behavioural pattern that is typically occurring in a certain emotional reference age group may be supportive to differentiate behavioural problems from psychopathological symptoms. In this study, therefore, we investigated the behavioural phenomena that are typical for a certain emotional reference age group in a larger sample of adults with IDD. Our results show that (1) ED is a strong predictor of challenging behaviour in individuals with IDD, (2) each emotional reference age group is characterised by distinct behavioural patterns and (3) these could be synoptically described as unique characteristic behavioural phenomena according to the respective level of ED, that is, searching for physical comfort, searching for security, searching for autonomy and searching for an identity subtype.

When analysing several predictors, such as age, sex, degree of IDD, level of ED and ASD, only lower levels of ED and more severe forms of IDD significantly predicted challenging behaviours. These results were particularly affirmative for self-aggression (MOAS), irritability, lethargy and stereotypy (ABC) as well as the ABC total score. These results confirm previously reported findings (McClintock *et al.* 2003; Lloyd & Kennedy 2014; Sappok *et al.* 2014; Dworschak *et al.* 2016). Interestingly, a relationship between ASD and challenging behaviour was only found for the variable *stereotypy*. These findings contradict previously reported results (McCarthy *et al.* 2010). Probably due to the large number of variables and high correlations in between these, ASD was no predictor for challenging behaviour in the current study. Furthermore, the estimated mean values of the ABC total score and its subscales decreased with increasing emotional reference ages. However, the estimated mean value of *inappropriate speech* remained consistently elevated from SED-S-2 phase onwards. This might be associated with the low verbal abilities of persons with an emotional reference age of 0–6 months. SED-S-2 and SED-S-3 demonstrated strikingly similar profiles on the ABC subscale level, with high scores for irritability and hyperactivity. These results are in line with previous studies showing that persons with more severe forms of IDD more often exhibit problems in affect regulation and hyperactivity, while with increasing socio-emotional competences, the ability to adapt and to verbally communicate a certain problem becomes increasingly successful (Baillargeon 2004; Böhm *et al.* 2019).

Furthermore, the MOAS overall score increased within an emotional reference age group of 7–18 months (SED-S-2). In this developmental phase, a body schema of its own emerges, as the body is increasingly utilised in a targeted way. Aggression, as the most extreme act of challenging behaviour in SED-S-2, is often a sign of fear, for example, separation anxiety (Asendorpf *et al.* 1996; Bowlby 2010). With the onset of an understanding of rules (SED-S-3) and the beginning ability to regulate affects more and more successfully (SED-S-4), physical aggressive behaviours decrease (Holodynski & Upmann 2003).

The analysis of the MOAS and ABC scales at the item level allowed us to synoptically derive seven characteristics for challenging behaviour for each SED-S phase. Evidence of the clustering of challenging behaviour in a specific developmental age group has been already reported in a small matched-control sample of 18 individuals, and despite minor methodological differences, there is clear agreement with previous findings on item level (SED-S-1 6/12, SED-S-2 8/12 and SED-S-3 8/12) (Sappok *et al.* 2012). The current study expands the previously reported findings in a larger sample set and extends it with an exemplification of behavioural phenomena in SED-S-4.

In SED-S-1 (reference age 0–6 months), persons have no schema of one's own body, basic physical needs predominate (staying warm, feeling full and being free of pain) and just like affects, must be satisfied immediately by caregivers. If not, individual's behaviour appears to show them to be *searching for physical comfort*. The behaviour is characterised by simple motor actions (stereotypy, self-aggression and hyperactivity) and seems to be detached from the environment (social withdrawal and isolation). The high values for *irritability and hyperactivity* reflect the low ability to regulate stress autonomously.

With a reference age of 7 to 18 months, persons in the SED-S-2 phase can use their body in a targeted way and explore the environment through messy play. They are also building a basis of trust and social

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bonds. Without the presence of the caregiver, there is a lack of security. Stress caused by loudness or other unexpected, frightening experiences may lead to challenging behaviour, which can be characterised by high levels of aggression towards the self, others and objects. Aggressive behaviour is merged with a high degree of irritability, impulsivity, temper and verbal repetitions. Together, these constitute the *searching for security* behavioural phenomena. In this phase, the bond with the caregiver is formed, and permanent contact is necessary to help regulate affect and protect from irritation (Ainsworth *et al.* 1978; Goldsmith *et al.* 1987; Cole *et al.* 2004). The association of physical aggression towards the self and others with impulse-control and conduct problems was also described by Rojahn et al. (2004). This behavioural pattern has been already described in the pilot study (Sappok *et al.* 2012). In addition, withdrawal has been identified as a novel aspect that may be caused by the larger sample size.

The problem behaviours observed in SED-S-3 (reference ages 19–36 months) could be phenomenologically conceived as *searching for autonomy*. In this development phase, the persons discover their own will and gradually detach themselves from the emotional unity with the caregiver. There is a reliable ability to communicate at a certain distance and the competence to choose between alternatives as well as a first understanding of social rules. Nevertheless, their frustration tolerance is low; lack of attention quickly leads to envy and outrage. The behavioural specifics in this reference age group comprise defiant and socially inappropriate behaviour (e.g. *disturbs others*, *difficult to reach* and *disrupts group activities*) and inappropriate vocal utterance, such as *inappropriately screaming* or *repetitive speech*. The search for attention and the testing of one's own limits play a major role, which is sometimes misunderstood as provocative behaviour (Matson *et al.* 2011).

Lastly, the current study has scrutinised the behavioural phenomena of individuals in the SED-S-4 phase (reference ages 4 to 7 years). The development of a theory of mind and, consequently, the ability to empathise are the central resources of this emotional developmental phase; basic feelings can be named. The peer group and the associated desire to belong become more important; a stable emotional bond is possible. Experiencing exclusion or the fear of failure can trigger stress. The behavioural peculiarities of this phase encompass *inappropriate speech* and *verbal self-regulation* together with depressive-like behavioural aspects. The behavioural phenomena can be viewed in terms of *searching for identity*. The individuals in the reference age group possess an increasingly realistic view of the world and an improved affect regulation and also develop empathy and a need to belong to a group. This includes discovering one's own sexual identity (Slaby & Frey 1975; Maccoby 1990).

As this study was conducted in a clinical trial population, the participants' level of psychiatric comorbidities is high. It should be noted that people with IDD generally are highly vulnerable for psychiatric disorders (Sheehan *et al.* 2018; Mazza *et al.* 2020). However, these comorbidities may have influenced the results. The DAS only allows an assessment of the severity of ID; no standardised IQ analysis was applied. This may limit the exact assignment to a certain level of cognitive functioning. The psychometric properties of the SED-S have not yet been fully assessed, so the validity of the emotional reference ages may be limited in this respect. The level of ED is influenced by numerous environmental and systemic factors and may differ within a person depending on the point of time and the environment. There are more aspects important for the development of challenging behaviours as described in the introduction section; for example, verbal abilities, the living situation, the social environment, the role of caregiver and the presence of trauma should be considered in future studies. Due to the small number of cases, a characterisation of challenging behavioural phenomena in SED-S-5 has not yet been possible. Finally, the analysis needs to be replicated in a second independent group.

Being aware that challenging behaviour is caused by various biological and psychological aspects, the developmental perspective may add a further dimension to the understanding of this complex phenomenon. The behavioural phenomena that are specific for a certain emotional reference age may support the clinician to differentiate behavioural problems from psychopathological symptoms. Moreover, the described problem behaviours typical for a certain level of ED may support the affected persons and caregivers to understand difficult situations, identify misunderstandings and recognise

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underlying needs. Through larger study populations and the inclusion of additional scales, these synopses should be further validated and elaborated to align treatment and support accordingly.

Acknowledgements

We thank our patient families for their supportive understanding, our clinical colleagues for their diligent support in the survey and our patients for enriching us every day and helping us to better understand their situation and underlying needs. Open access funding enabled and organized by Projekt DEAL.

Source of funding

No external funding was received for the research reported in the paper.

Conflict of interest

Tanja Sappok receives royalties from different book publishers, among others Hogrefe and Kohlhammer.

For the other authors, no conflicts of interest have been declared.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy and ethical restrictions.

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Accepted 7 March 2022

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