

Challenging behavior in children and adolescents with Dravet syndrome: Exploring the lived experiences of parents



Amber Postma^{a,*}, Megan Milota^b, Marian J. Jongmans^{c,d}, Eva H. Brilstra^e, Janneke R. Zinkstok^{a,f,g}

^a Department of Psychiatry and Brain Center, University Medical Center Utrecht, The Netherlands

^b Julius Center, University Medical Center Utrecht, The Netherlands

^c Department of Pedagogical and Educational Sciences, Faculty of Social and Behavioral Sciences, Utrecht University, The Netherlands

^d Department of Neonatology, Wilhelmina Children's Hospital, University Medical Center Utrecht, The Netherlands

^e Department of Genetics, University Medical Center Utrecht, The Netherlands

^f Department of Psychiatry, Radboud University Medical Center, Nijmegen, The Netherlands

^g Karakter Child- and Adolescent Psychiatry Nijmegen, The Netherlands

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ABSTRACT

Background: Dravet syndrome (DS) is a monogenic syndrome associated with *SCN1A* mutations in the majority of patients and characterized by devastating epilepsy, that may be life-threatening. Aside from refractory seizures, core symptoms of DS include behavioral difficulties, developmental delay, cognitive impairment, and motor dysfunction. Previous DS research has mainly focused on epileptic seizures and pharmacological management and less on behavioral difficulties. This study aims to explore the lived experience of parents supporting a child with DS, with a focus on behavioral aspects.

Methods: We performed a qualitative study using focus groups and following the consolidated criteria for reporting qualitative research (COREQ) guidelines. We organized three focus groups with parents of children and adults with DS and used a pre-defined topic list of open questions, similar for each focus group to ensure comparability. The focus groups were video recorded, transcribed, and anonymized. Data were analyzed using an iterative coding process where codes were sorted into themes. Differences in coding among the researchers were discussed until a consensus was reached.

Results: In total, twenty parents (mothers only) participated in the study. The age of children with DS ranged between 3 to 22 years with a mean age of 11.8 years. A range of behavioral difficulties emerged from the thematic analysis. Overall, the most commonly mentioned behavioral difficulties were aggression, dangerous behavior, impulsivity, hyperactivity, routinized and compulsive habits. Our results showed different behavior per age group, with more externalizing behaviors such as aggression and impulsivity in children aged 3–13 years; and more internalizing behavior such as routinized and compulsive habits in adolescents and young adults (14–22 years). This results in a different kind of support these families need and should be acknowledged when in consult with a healthcare professional. Parents reported that challenging behavior was a source of stress and impacted negatively on their family's quality of life. Parents reported feeling alone in their search for solutions, and many explored options outside the traditional medical context.

Conclusion: Our results suggest that the challenging behavior associated with DS leads to a huge burden of care. Healthcare professionals working with DS patients may need to develop shared decision-making strategies that take into account challenging behavior.

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1. Introduction

Dravet syndrome (DS) is a devastating epilepsy syndrome, that may be life-threatening, that was first described in 1978 [1,2].

* Corresponding author at: University Medical Center Utrecht, Department of Psychiatry, Amber Postma, A01.126, PO Box 8419, 3500 VW Utrecht, The Netherlands.

E-mail address: a.postma-4@umcutrecht.nl (A. Postma).

Dravet syndrome consists of a wide phenotypic spectrum of seizures (e.g., febrile seizures, absences, status epilepticus) and is characterized as developmental and epileptic encephalopathy. The estimated incidence of DS caused by an *SCN1A* mutation is 1 in 20,900 births [3]. It is estimated that 10–20% of patients with DS die before 10 years of age most commonly due to sudden unexpected death in epilepsy (SUDEP) [4,5]. Many patients with DS experience major seizures weekly and minor seizures daily [6].

The refractoriness of these seizures typically requires medication and other sorts of therapies [7].

Aside from refractory seizures, the core symptoms of DS include behavioral difficulties, developmental delay, cognitive impairment, and motor dysfunction [4,8]. The prevalence of behavioral difficulties in DS ranges between 37% and 100% [6,8–10]. These behavioral difficulties may comprise hyperactivity, attention deficit, limited concentration, mood instability, short temper, oppositional behavior, perseveration, impulsive actions, and autistic-like features [8–10]. A recent systematic review describes an age-specific evolution of seizure-related manifestations and non-seizure-related manifestations such as attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) [11]. Previous studies reported behavioral difficulties to be the strongest predictor for health-related quality of life (HRQoL) in patients with DS [8–10]. In spite of the high prevalence, relatively little is known about how behavior develops from early childhood to adulthood.

Families caring for a child with DS experience a considerable impact on their physical health, mental health, social functioning, and financial resources [12,13]. In one study the negative impact on sleep and enduring fatigue are reported as the most critical for parents [13]. Existing literature on DS mainly focuses on the impact of refractory seizures on the caregiver's life and not the impact of other comorbidities in DS [12,13]. The additional impact of challenging behavior on patients with DS and their families has not been described before.

In addition, little is known about parents' strategies for caring for a child with DS. A study by Nolan et al. described a few practical tips and practical coping mechanisms mentioned by parents, like conducting 'personal research' about DS. This study did not address coping with behavioral problems [14]. Actual literature on how parents experience behavioral difficulties of their child with DS does not exist [8–10]. A better understanding of these coping mechanisms regarding behavioral difficulties will give more insight into the impact of behavioral difficulties and the need for treatment or guidance. Due to the age-specific manifestations of DS, both the behavioral difficulties and the experiences of parents are likely to evolve over time [11].

In addition, parents may experience difficulties in healthcare provision due to the rarity of DS [15–17]. Dravet syndrome is a complex syndrome with many different manifestations. As a result, there may be a lack of expertise among healthcare professionals concerning manifestations like behavioral problems. This may hamper the search for the right care [15]. Therefore, more knowledge about the challenges that parents meet is much needed in order to manage the care of patients with DS [18].

In this qualitative study, we explored the 'lived experiences' of parents caring for a child with DS with respect to their child's behavior. The primary aims of this study were [1] to explore behavioral aspects of DS as experienced by parents caring for a child with DS and [2] potential differences in behavioral aspects between young children versus adolescents and young adults. Secondary aims were: (i) to explore the impact of DS and behavioral difficulties in DS on patients and their parents; (ii) to gain insight into the coping strategies of parents caring for a child with DS; and (iii) to explore whether parents feel able to address behavioral difficulties with healthcare professionals.

2. Method

2.1. Study design overview

We conducted a qualitative study using focus groups, following the consolidated criteria for reporting qualitative research (COREQ)

guidelines [19]. We were interested in the perspective of parents and asked parents caring for a child, adolescent or young adult about their experiences during focus groups. This approach was chosen to establish a collective perception of parents on behavioral difficulties and life impact as well as the personal opinions and experiences of these parents.

Ethical considerations

The study was approved by the Medical Research Ethical Committee Utrecht (METC 21-530). The coordinating researcher (AP) was responsible for explaining the research project to potential participants. All participants gave written informed consent and agreed with the video recording of the focus group.

2.2. Participants

Parents (biological or other) of children, adolescents, or young adults with DS were invited to participate. Potential participants were recruited through social media and the newsletter of the parent/patient organization 'Dravet syndrome Foundation Netherlands/Flanders' (Stichting Dravetsyndroom Nederland/Vlaanderen) [20]. Potential participants expressed interest by contacting the researchers themselves by e-mail. Inclusion criteria were: having a child with *SCN1A*-related DS and speaking Dutch. Parents of patients with DS of all ages were included. Three focus groups were formed based on the age of the child with DS, of which the first focus group [1] primarily included parents of younger children (aged from 4 to 10 years and one was 18 years); the second focus group [2] primarily consisted of parents of older children (aged from 15 to 22 years); the third focus group [3] included a mixed group of parents (children aged from 3 to 16 years). The aim of this approach was to establish groups in which participants could relate to each other as well as groups in which participants could learn from each other. All focus groups met online through Microsoft Teams. Each participant engaged in an online test meeting to resolve any malfunctioning prior to the focus group. The online format further allowed for safe and easy participation during the COVID-19 pandemic without traveling. Afterwards, the participant provided additional background information about the family composition and characteristics of their child with DS.

2.3. Data collection

Each focus group session was facilitated by a moderator (AP) familiar with the subject of the study and with the participants. The moderator (AP) is a psychiatrist in training. Other observing researchers were a psychiatrist (JZ), and an expert on qualitative research (MM). The focus groups were semi-structured in nature, with a pre-defined topic list of open-ended questions, similar for each focus group to ensure comparability. Beforehand, the participants received a document with information on the topics of the focus groups and the first three questions. The first focus group was held on 29 June 2021, the second on 15 July 2021 and the third on 25 November 2021. The focus groups were video recorded after verbal consent was obtained at the onset of the focus group. The recordings were then transcribed and anonymized, with the inclusion of non-linguistic observations (e.g., facial expressions, laughing, sighs, and gestures).

2.4. Data analysis

We used inductive thematic analysis to analyze the data according to Braun & Clarke [21] because it allows for providing a "thick description" of the dataset, which fits with our research objective of exploring 'lived experience'. Data were analyzed using

an iterative coding process where codes were sorted into themes. The primary researcher (AP) read the transcripts and generated codes. The code structure was discussed among the research team. All members (AP, JZ, MM) coded parts of the transcript. Differences in coding among the researchers were discussed until a consensus was reached.

3. Results

The characteristics of the parents and their children are displayed in Table 1. In total, twenty parents participated in the study (mothers only). The age of their children with DS ranged from 3 to 22 years with a mean age of 11.8 years (± 6.6). In the following sections, we will present [1] types of behavior described by parents; [2] changes in behavior with increasing age, as observed by parents; [3] the impact of challenging behavior on parents; [4] management strategies employed by parents; and [5] the place of behavioral problems in the medical management of DS. Each subsection includes a table with representative quotes from parents.

3.1. Type of behavior

The various categories of reported behavior per age group can be found in Table 2.

3.2. Behavior in children versus adolescents/young adults with DS

Fig. 1 illustrates the difference in behaviors between the two age groups (the group younger than 14 years, and the group of 14 years and older). The results display a pattern where in the case of younger children (aged 3–13 years), parents more often mentioned externalizing behavior, such as dangerous behavior, impulsivity, aggression, and hyperactivity. Children with eating difficulties were reported to have many behavioral problems around mealtimes. Parents of older children (aged 14–22 years) more often mentioned internalizing behavior like routinized habits, compulsive and repetitive habits, and the behavior is challenging compared to peers.

Table 1
Characteristics of participants and their child with DS.

Characteristics of parents <i>n</i> = 20	N(%)	Mean	Median (min–max)
Gender (female)	20 (100)		
Currently part-time employed	14 (70)		
Reduced working hours/ quit job	16 (80)		
Currently together with father of the child	17 (85)		
Characteristics of children, adolescents, and young adults with DS <i>n</i> = 20	N(%)	Mean(SD)	Median(min–max)
Gender (female)	12 (60)		
Age (years)		11.8 (6.6)	10.5 (3–22)
Age at diagnosis		3.2 (3.9)	2.0 (0.8–17)
Presently between 3–13 years	11 (55)	1.8 (0.9)	1.5 (0.8–3.5)
Presently between 14–22 years	9 (45)	5.0 (5.3)	3.0 (1.0–17)
Age of first noted behavioral difficulties		3.4 (3.4)	2.5 (0.0–13)
Mobility			
Walking independently	16 (80)		
Walking with aids	4 (20)		
Communication			
Very little communication	2 (10)		
With a few words or signs	7 (35)		
Speaks comprehensively in sentences and adequate communication	11 (55)		

3.3. The impact of challenging behavior on parents

As mentioned before, DS is a severe and complex syndrome. This may not only affect the patients themselves but also their families. Table 3 includes illustrative quotes about the impact of caring for a child with DS on families. Many parents reported feeling exhausted and admitted they needed help, as can be seen in quote 2A. Parents also discussed the ways in which parenting a child with DS influenced their own mental health (2A, 2B, 2C). In particular, they reported that refractory epilepsy and life-threatening situations were very stressful. Moreover, they reported feeling like they must be alert constantly because ‘anything can happen’. This was caused by the constant risk of seizures but also because of dangerous and disruptive behavior (2D, 2E).

The focus group data suggest that the impact of DS on patients and their families changes through the years. Parents mentioned that in the children’s younger years, the primary energy and time-consuming element of DS were trying to ‘survive’ the epileptic seizures (2A, 2F). As the children aged, parents reported a shift in attention (2G) to other challenges like behavioral difficulties, walking issues, and the child’s relationship with other family members. Parents reported concerns about the well-being of other children in the family. They reported that siblings of patients with DS also suffer because of the challenging behavior and were often on the receiving end of aggressive outbursts of the child with DS (2I). Parents felt powerless to prevent the DS child’s outbursts, which increases the emotional burden of this behavior. Parents also worried about how the constant focus on their child with DS would affect their other children (2H). Finally, parents also discussed feelings of guilt for not paying enough attention to their other children.

Eating problems constituted another prominent stressor for parents (2J, 2K). Parents describe eating disturbances including poor appetite, decreased tolerance for food variety, prolonged mealtimes, and picky eating. Mealtimes were described as extremely stressful and frustrating for both the child with DS and their families. In some cases, mealtime stress became so acute that the child with DS refused food entirely and had to be fed with a feeding tube instead.

Table 2
Illustration of sorts of behavior mentioned by these parents.

Behavior code	Quote	Present in age group	
		3–13	14–22
Aggression or anger	'I used to tell her that if she did something naughty, she had to sit on the bench in the hall. Her sister was sitting on the sofa and she walked over, hit her hard, and said to me 'I'll go sit on the bench then.' 'She has had a lot of medication and I recognize the aggressive behavior although not deliberate aggression. But yes, she throws her plate on the ground out of frustration and also other aggressive behavior: hitting, pinching or biting.'	++++	++
Anxiety	'He lives, in our opinion, with a lot of anxiety. He constantly seeks reassurance. And he asks a lot of questions. All the questions irritate those around him. And the need for constant reassurance irritates people too. And he is aware of this irritation.'		+
Concentration difficulties	'He is so quickly distracted that in school he is not able to learn or even listen.'	+	
Compulsive and repetitive habits	'He used to be more easygoing [...] But the rigidity has become predominant in the last 5 or 6 years. His compulsive behavior combined with the rigidity makes it very difficult.' 'He is like: 'Can I ask something?', 'Can I ask something?'. But it's not a discussion, and this repetitive behavior takes hours. [...] It drives me crazy, but I can't stop it either.'	+	++
Dangerous behavior	'It's not just the seizures, which come on so unexpectedly, and whether you can save her teeth. [...] I always say, you can never be more than an arm's length away so you can intervene in case she is about to do something dangerous. She always wants to run.' 'Yes, he's impulsive. When you turn around, he's walking around with a pair of scissors he just found, or he's sitting on top of the cat's scratching tower. He doesn't see danger anywhere.'	++++	++
Information processing	'The slow processing of information is very difficult. We often just say 'stop'. We must be very clear.'	+	+
Intense focus on details	'He'll say something like, 'oh last year when we saw Grandma and Grandpa he was wearing that red jacket.' His memory is really very good.'		+
Impulsivity	'The impulsivity is still there. I can't go to the supermarket with her because she fills the shopping cart and doesn't take no for an answer.' 'Just as the others mentioned, she's entirely uninhibited, which causes her to be reckless. She just doesn't see any danger, so safety is a really important factor for us. We've tried 100.000 times to teach her how to look before crossing the road. But if she sees something she likes across the road, she just crosses without looking.'	+++	+
Hyperactivity	'He gives 300% of his energy in an hour and then he gets really tired, and we just wait for the epileptic seizures to happen.' 'He gives himself a 100% all day and every day and in all different areas. He is mad, he is happy, he is sad, he is madder, and so it goes on and on, all day long.'	++	+
Limited reciprocity	'She has no perception of time. She mainly lives in her own world.'	+	+
Routinized habits including aversion to change and rigidity	'Change is problematic. In particular when he has his mind set on something. Nowadays, he's really into biking. When we go anywhere, we have to pass the shed where his bike is. It takes a lot of effort to get him to pass the bike.' 'In his care home, he eats much more varied than at home. When I try to feed him the same things at home, he says no. He just won't have it. He eats these foods there, not at home.'	++	+++
Self-harming behavior	'Her behavior changes when a seizure is coming. We observe a kind of increase of tension, also at night. She is restless, has difficulties sleeping, screams a lot, bangs her head. When the seizure has passed it is just like the tension has gone and then she is sweet again and we can interact with her.' 'Unfortunately, he started to self-harm. Whenever he had this tiny scab or wound, he would scratch and scratch and scratch, he just would not stop, until it would bleed. And then he panicked: he wouldn't tolerate a band-aid or anything, and this tiny thing would be a huge thing for all of us for weeks.'	+	+

Each + represents between 0 and 5 quotes.

3.4. Parents' coping strategies for behavioral challenges

Parents reported trying multiple strategies to improve challenging behavior, with varied success. These included, among others, building routine and structure into the daily rhythm, distracting the child to prevent tantrums, parenting courses, seeing a child and youth psychiatrist, deep pressure stimulation, using essential oils, cannabidiol (CBD) oil, vitamins, and supplements. In each of the focus group sessions, parents discussed the fact that distracting their child was the most effective intervention for challenging behavior (see Table 4) (3A, 3B). Parents also reported having to consistently regulate the emotions and behavior of their child. Due to intellectual disabilities, children with DS are often incapable of learning these skills themselves (3C,3D). Consequently, they rely on parents to regulate their thoughts and feelings, which is a very difficult task. When parents noticed that their child was getting angry, overwhelmed, or exhibiting repetitive behavior, they actively intervened to prevent an escalation.

Besides the search for solutions to improve behavioral difficulties, parents were also searching for explanations and patterns in their children's behavior. For example, parents found associations between behavioral difficulties and anti-seizure medication, tonic-clonic seizures, over-stimulation, and emotional situations (3E, 3F). Among the 42 comments made on causality were 21 comments about the perceived effects of anti-seizure medication on behavior. Moreover, 14 of the 20 focus group participants actively supported this association. Parents reported that they had many unanswered questions on the causality of problem behavior and a need for answers (3G).

Despite the serious nature of the focus groups and the emphasis on 'difficult behavior' in the discussions, there were also jokes and laughter among the participants. Many mothers used humor as a way of coping with difficult situations and with uncertainty. In addition, they were all very keen to share the positive qualities of their children (3H).

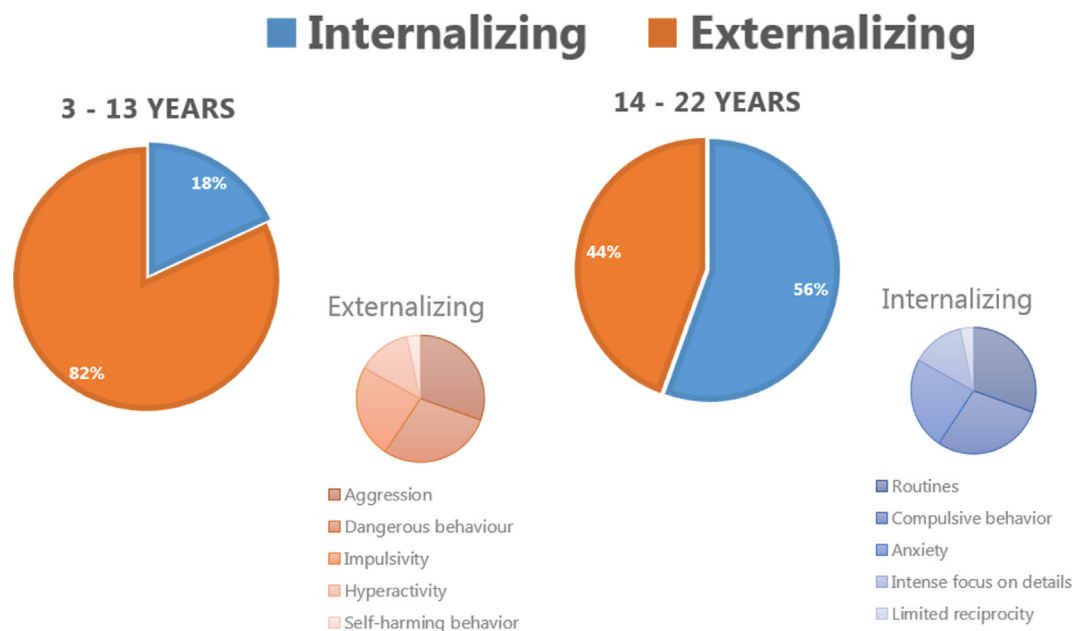


Fig. 1. Behavior in children vs adolescents/young adults with DS.

Table 3
Illustrative quotes for the impact of challenging behavior in DS.

Number	Quotes
2A	'Yes, but also that you can ask for help as a parent. The first two years we were just surviving. We were completely exhausted to be honest.'
2B	'You set her down and she runs away, and she won't come back. It's so exhausting, I always have to keep an eye on her.'
2C	'It takes up all your energy. If it isn't an epileptic seizure, it's something else. I find it so hard.'
2D	'I do enjoy the little things but I'm also always alert.'
2E	AP: 'Is that something you experience as difficult? That the children are unaware of danger? FG16: 'Yes, I've to be her shadow all the time.'
2F	'He's been going to school again for about a half year, and we feel like a normal family again and not just like we're surviving.'
2G	'The focus was the medical issues, and all other difficulties were secondary concerns. And currently the medical issues are under control. Although, Dravet is never really under control but maybe a little. And currently the behavior is the main concern.'
2H	'All the attention tends to go to her, but we try to control this. When there's something wrong with our other child, we catch ourselves thinking 'Oh no, not you as well!'
2I	'When my daughter was less than a year old, her brother pulled out her hair on a regular basis. That was awful to see as a mother, but I just couldn't prevent it.'
2J	'Yes, eating problems. These problems have had the biggest impact on us. Our daughter has a feeding tube for almost a year now also because she completely stopped eating and drinking and she kept that up for a very long time.'
2K	'In regard to eating, we have that under control at the moment because she gets her nutrition through a feeding tube. [...] The mealtimes used to be so stressful and frustrating for her. The plates literally flew through the room.'

3.5. Challenging behavior as part of treatment and management plans

DS is a complex syndrome with different kinds of seizure-related and non-seizure-related manifestations. Parents reported that they feel that the focus in current care seems to be primarily on seizure control. Several parents mentioned that they consider behavioral difficulties and eating problems to be just as significant as seizures. Parents reported that they struggle with how (4A,4B)

Table 4
Illustrative quotes on how to cope with behavioral difficulties.

Number	Quotes
3A	'She has these impressive temper tantrums. I can see it's going wrong; I can sense it coming. I can see that raging look in her eyes and then I think: 'I'll just quickly throw on another video!'
3B	'The dancing around your child, that's something I recognize too. So, because you can't reach her and punishment is not effective, I feel like I'm constantly steering her away from the negative things instead.'
3C	'I find his disregard for punishment very difficult. Sometimes I think the only thing that will reach him is if I hit him, but I don't want that either.'
3D	'She has a temper, wants everything right here and right now, not later, not tomorrow, not next week. She has no perception of time. This is so exhausting.'
3E	'Well, we've had 7 different anti-seizure medication but now we have a combination of three including Clobazam. But if we increase the dosage, the behavior gets terrible! She gets very aggressive.'
3F	'Her behavior changes when a seizure is coming. We observe a kind of increase of tension, also at night. She is restless, has difficulties sleeping, screams a lot, bangs her head. When the seizure has passed it is just like the tension has gone and then she is sweet again and we can interact with her.'
3G	'In my opinion is in our case the Levetiracetam the cause. But is it caused by the mutation in the gene? Or is it caused by medication? I have a lot more of these questions.'
3H	'He also gives a lot of love. He is a big hugger and is super sweet. These are his positive qualities.'

and where (4C) to ask for help with the challenging behavior (see Table 5). As a result, their search for solutions was often unfocused and multidirectional, and sometimes outside the realm of the traditional medical context. Parents in the focus groups reported feeling lost and alone in this search and often felt misunderstood by healthcare professionals (4D, 4E). Parents expressed the need to have a say in the decisions made regarding the treatment of their child (4F). In addition, parents reported that they experience difficulties discussing priorities in the treatment of DS with healthcare professionals (4D, 4E, 4G). Although they mentioned that behavior is not usually a treatment focus in DS (4D), parents also reported that awareness of behavioral difficulties in DS is growing. In their opinion, this is driven by efforts of schools

Table 5
Illustrative quotes on behavior in DS treatment.

Number	Quote
4A	'I find attention for behavior in the treatment of DS more difficult to discuss because it is not something you can measure'
4B	'Yes, but also that you can ask for help as a parent. The first two years we were just surviving. We were completely exhausted actually.'
4C	'At a certain point as parent, you would like to move on and where are you going to find that, other than the neurologist? In these conversations we mostly talk about seizure and how is it going but who'll help you with the behavior difficulties?'
4D	'Because he has such extreme seizures, the doctors are saying: 'He'll need a lot of medication. The most important thing, at this point, is to control the seizures. The behavior you just have to accept.'
4E	'The most important thing right now is the seizure control. The neurologist doesn't want to take any risks. But I, as a mother, would like to take these risks if it would mean that the behavior would improve.'
4F	'Yes, we can discuss it with the neurologist, but I've noticed that we don't agree. I witness the challenging behavior and for the neurologist it isn't visible and also less troublesome. So yes, it's a subject we discuss but we want to make different choices. I would like to explore other options and take more risks.'
4G	'The main focus is on the medical aspects; we notice this too. So much focus that the behavioral difficulties just get pushed aside. We get so little help or affirmation, no one offers help.'
4H	'I think that mainly the schools and daycares are the ones paying more attention to this behavior. Not the doctors. I think the doctors are specializing more and more in their expertise areas and don't notice much else.'

and/or daycare facilities where the staff is very willing to help with managing challenging behavior (4H).

4. Discussion

This qualitative study provides an overview of the lived experiences of parents caring for a child, adolescent, or young adult with DS, with a specific focus on behavioral aspects of DS. The most commonly mentioned behavioral difficulties by parents are aggression, dangerous behavior, impulsivity, hyperactivity, routinized and compulsive habits. Our results show different behaviors per age group with parents reporting externalizing behaviors such as aggression and impulsivity in young children with DS, and internalizing behaviors such as routinized and compulsive habits in adolescents and young adults with DS. Parents of a younger child with DS may face different challenges than those parenting an adolescent or young adult. Whereas a parent of a younger child may have concerns about dangerous behavior, hyperactivity, and aggression, a parent of an adolescent or young adult may experience frustration with the compulsive and routinized habits. These results suggest that challenging behavior associated with DS changes with age. Accordingly, the support needs of parents may also change with age. Currently, parents must interpret the thoughts and emotions of their child via behavior alone. It is challenging to interpret the meaning of unpredictable and changing behavior and impossible to verify if the interpretation is correct. This results for parents in a continuous search for new solutions and clarifications. The support needs of parents may be best addressed by a tailored and age-specific assessment of needs by healthcare professionals that is repeated every so many years throughout the development of the child with DS. To the best of our knowledge, this is the first qualitative study investigating the behavioral aspects of DS.

Previous quantitative studies investigating behavior in DS reported symptoms of hyperactivity and inattention [9,10,22–24],

with hyperactivity being the most characteristic behavioral aspect of DS [10,22–24]. In addition, previous quantitative studies reported poor danger awareness, aggressive behavior, opposing and provocative behavior, autistic features, and self-harming behaviors [9,11,22–26]. Consistent with these previous findings, dangerous behavior and impulsivity were among the most frequently mentioned behaviors by parents of patients with DS in our study. In addition, our results suggest that routinized and compulsive habits are recognizable symptoms in children and adolescents with DS. This is consistent with a body of literature reporting autistic features in DS [22,23,25,26]. Sullivan et al. described a prevalence of autism spectrum disorder (ASD) of 40% in children and 62% in adults with DS [11]. Likewise, in our study routinized and compulsive habits both were more common with increasing age. In addition, behavioral difficulties combined with eating problems were stressed repeatedly, which has not often been reported before [27].

From our data, it was clear that caring for a child with DS is often quite stressful and has an enormous impact on the patient and their families. The burden of care and associated stress may result in mental health issues in parents caring for a child with DS. Several studies identified that illness in a child affects the social functioning, physical and mental health, and professional life of the parents [12,13]. These data suggest that in the care management of a child with DS, the child's health is important but also the mental health of the primary caregivers. In addition, our results also shed further light on existing studies about the impact of having a sibling with DS [12–14]. Many parents reported feelings of guilt towards siblings of a child with DS because they spent so much time caring for and managing the child with DS that they felt almost neglectful of their other children. It is noted that we did not include siblings in our study, therefore we do not know the actual impact on siblings of a child with DS. Dravet syndrome affects not only the child but the whole family and this may warrant attention from healthcare professionals.

From the parents' experiences, it was clear that they apply a wide range of management strategies for their child, varying with age. The variety of solutions parents reported reflects their persistent desire and efforts to improve the situation and have some form of control.

Parents reported feeling alone in their search for how to best manage their child's behavior. Their experience was that healthcare appointments were often centered around seizure management with little space for other concerns (e.g., behavior). The way that the current healthcare for children with DS in the Netherlands is organized may not meet all the needs of these parents. This may explain our finding that many parents reported seeking out remedies outside the mainstream healthcare system. DS has many different manifestations, each with its own severity and impact, which may vary over time and between patients. Indeed, our results suggest that challenging behavior associated with DS changes with age. Accordingly, the support needs of parents may also change over time. This may be best addressed by a tailored and age-specific assessment of needs that is repeated every so many years throughout the development of the child with DS, carried out by a multidisciplinary expert team. In addition, parents expressed that they would like to play an active role in shaping their child's medical management, e.g., in decisions about seizure medication that may also impact behavior. This may be best addressed by incorporating a shared decision-making process, during which healthcare professionals actively engage parents in weighing up various treatment options. Shared decision-making is best viewed as a collaboration in all aspects of clinical care, with clinicians needing to fully engage with the patient's experience of illness and participation in treatment [28]. In the context of rare diseases associated with intellectual disability, such as DS, the

shared-decision making process may involve the caregivers instead of patients. Shared-decision making in the context of rare diseases has gained recent attention [15,17] and may lead parents to feel more empowered.

4.1. Strengths and limitations

As far as the strengths of our study are a concern, organizing the focus groups online increased feasibility and made it possible for busy and burdened parents to participate. In advance, we were concerned that an online focus group would not allow for lively discussions. However, we found that participants felt free to speak up, and the 'hand raising' option in the online video conferencing app we used was helpful in this respect. The participants responded to the questions of the moderator but also commented on each other and asked each other questions. No malfunctioning of the video conferencing app occurred during the focus group meetings. A further strength of our study is the focus on parental experiences of behavioral aspects of DS. To our knowledge, this is the first comprehensive exploration of behavioral difficulties in DS from a parental perspective.

This study has, nonetheless, several limitations. First, although some fathers initially expressed interest, the participants were all mothers. Therefore, this study cannot compare similarities and differences in experiences and coping strategies or life impact based on gender. In addition, Nabbout et al. indeed described a perceived higher impact on mothers than on fathers [12]. A second limitation is potential recruitment bias. All participants contacted the research team after reading an email or advertisement via social media. It is likely that parents who experience difficulties with their child's behavior were more likely to participate in the study. Therefore, our results might reflect the severe end of the behavioral DS phenotype rather than the whole spectrum. A third limitation is that the topic of the focus group was 'behavioral difficulties', i.e., the presence of aberrant behavior. Therefore, examples of 'normal behavior' and behavior perceived as positive may have been mentioned less by parents. It is noted that the behavior described in this study is based on the observations and interpretations of parents. Finally, the results suggest that challenging behavior associated with DS changes with age. However, we cannot rule out the possibility that other factors contribute to this pattern. The older age group had been diagnosed at an older age, probably because the diagnostic process has improved over the last years [2]. An earlier study showed that older patients were more likely to have been diagnosed at a later age and to have used medication that is contraindicated in Dravet syndrome for a longer period of time, which is associated with a worse cognitive outcome. This may have influenced the pattern of behavioral problems [29]. Unfortunately, data on epilepsy, treatment, and other comorbidities were not available in the current study, therefore we were unable to take these factors into account.

5. Conclusion

Our results display an overview of behavioral aspects observed among patients with DS and their subsequent impact on patients and families. Although seizure management remains crucial, our results suggest that challenging behaviors associated with DS lead to a huge burden of care in the home environment. Healthcare professionals working with DS patients may need to develop shared decision strategies that consider both seizure management and challenging behavior. We would advise that parents actively discuss challenging behavior with healthcare professionals and express the impact of such behavior on the quality of life of the child and the families. In case of challenging behavior, healthcare

professionals with expertise in this area should be part of the multidisciplinary treatment team, in order to provide proper care for these behavioral difficulties. We would recommend that healthcare professionals also consider the mental health of the caregivers of the child they are treating. In cases where the burden becomes too high, we would suggest that caregivers search for help in their social network, in the healthcare system, or with peers who might experience the same difficulties. Regarding future studies, we would recommend that these investigate the behavioral phenotype of DS in detail in a broad spectrum of DS patients of various ages. This will provide insight into the behavioral and psychiatric phenotype and will guide treatment and management strategies.

Declaration of Competing Interest

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

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References

- [1] Dravet C. Dravet syndrome history. *Dev Med Child Neurol* 2011;53(2):1–6.
- [2] Wheless JW, Fulton SP, Mudigoudar BD. Dravet Syndrome: A Review of Current Management. *Pediatr Neurol* 2020;107:28–40.
- [3] Wu YW, Sullivan J, McDaniel SS, Meisler MH, Walsh EM, Li SX, et al. Incidence of dravet syndrome in a US population. *Pediatrics* 2015;136(5):1310–5.
- [4] Anwar A, Saleem S, Patel UK, Arumaithurai K, Malik P. Dravet Syndrome: An Overview. *Cureus* 2019;11(6):1–11.
- [5] Shmuelly S, Sisodiya SM, Gunning WB, Sander JW, Thijs RD. Mortality in Dravet syndrome: A review. *Epilepsy Behav* 2016;64(A):69–74.
- [6] de Lange IM, Gunning B, Sonsma ACM, van Gemert L, van Kempen M, Verbeek NE, et al. Outcomes and comorbidities of SCN1A-related seizure disorders. *Epilepsy Behav* 2019;90:252–9.
- [7] Wallace A, Wirrell E, Kenney-Jung DL. Pharmacotherapy for Dravet Syndrome. *Pediatr Drugs* 2016;18:197–208.
- [8] Jansson JS, Hallböök T, Reilly C. Intellectual functioning and behavior in Dravet syndrome: A systematic review. *Epilepsy Behav* 2020;108:1–11.
- [9] Sinoo C, de Lange IML, Westers P, Gunning WB, Jongmans MJ, Brilstra EH. Behavior problems and health-related quality of life in Dravet syndrome. *Epilepsy Behav* 2019;90:217–27.
- [10] Brunklaus A, Dorris L, Zuberi SM. Comorbidities and predictors of health-related quality of life in Dravet syndrome. *Epilepsia* 2011;52(8):1476–82.
- [11] Sullivan J, Deighton AM, Vila MC, Szabo BM, Maru B, Gofshsteyn JS, et al. The clinical, economic, and humanistic burden of Dravet syndrome – A systematic literature review. *Epilepsy Behav* 2022;130:1–13.
- [12] Nabbout R, Dirani M, Teng T, Bianic F, Martin M, Holland R, et al. Impact of childhood Dravet syndrome on care givers of patients with DS, a major impact on mothers. *Epilepsy Behav* 2020;108:1–8.
- [13] Jensen MP, Liljenquist KS, Bocell F, Gammaitoni AR, Aron CR, Galer BS, et al. Life impact of caregiving for severe childhood epilepsy: Results of expert panels and caregiver focus groups. *Epilepsy Behav* 2017;74:135–43.
- [14] Nolan K, Camfield CS, Camfield PR. Coping with a child with dravet syndrome: Insights from families. *J Child Neurol* 2008;23(6):690–4.
- [15] Perestelo-Pérez L, Rivero-Santana A, Abt-Sacks A, Toledo-Chavarrí A, Brito N, Álvarez-Pérez Y, et al. Patient empowerment and involvement in research. In: *Advances in Experimental Medicine and Biology*; 2017. p. 249–64.
- [16] Juandó-Prats C, James E, Bilder DA, McNair L, Kenneally N, Helfer J, et al. DRIVET ENGAGE. Parent caregivers of children with Dravet syndrome: Perspectives, needs, and opportunities for clinical research. *Epilepsy Behav* 2021.
- [17] Babac A, Von Friedrichs V, Litzkendorf S, Zeidler J, Damm K, Graf Von Der Schulenburg JM. Integrating patient perspectives in medical decision-making: A qualitative interview study examining potentials within the rare disease information exchange process in practice. *BMC Med Inf Decis Making* 2019;19(1):1–17.
- [18] Lipkin M. Shared decision making. *JAMA Intern Med* 2013;173(13):1204–5.
- [19] Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007;19(6):349–57.
- [20] Stichting Dravetsyndroom Nederland/Vlaanderen [Internet]; 2014. Available from: <https://www.dravetsyndroom.eu/>.

- [21] Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3(2):77–101.
- [22] Villeneuve N, Laguitton V, Viellard M, Lépine A, Chabrol B, Dravet C, et al. Cognitive and adaptive evaluation of 21 consecutive patients with Dravet syndrome. *Epilepsy Behav* 2014;31:143–8.
- [23] Nabbout R, Chemaly N, Chipaux M, Barcia G, Bouis C, Dubouch C, et al. Encephalopathy in children with Dravet syndrome is not a pure consequence of epilepsy. *Orphanet J Rare Dis* 2013;8(1):176.
- [24] Ragona F, Brazzo D, De GI, Morbi M, Freri E, Teutonico F, et al. Dravet syndrome: Early clinical manifestations and cognitive outcome in 37 Italian patients. *Brain Dev* 2010;32(1):71–7.
- [25] Berkvens JJL, Veugen I, Veendrick-Meekes MJB, Snoeijen-Schouwenaars FM, Schelhaas HJ, Willemsen MH, et al. Autism and behavior in adult patients with Dravet syndrome (DS). *Epilepsy Behav* 2015;47:11–6.
- [26] Lagae L, Brambilla I, Mingorance A, Gibson E, Battersby A. Quality of life and comorbidities associated with Dravet syndrome severity: a multinational cohort survey. *Dev Med Child Neurol* 2018;60(1):63–72.
- [27] Knupp KG, Scarbro S, Wilkening G, Juarez-Colunga E, Kempe A, Dempsey A. Parental Perception of Comorbidities in Children With Dravet Syndrome. *Pediatr Neurol* 2017;2017(76):60–5.
- [28] Tonelli MR, Sullivan MD. Person-centred shared decision making. *J Eval Clin Pract* 2019;25(6).
- [29] de Lange IM, Gunning B, Sonsma ACM, van Gemert L, van Kempen M, Verbeek NE, et al. Influence of contraindicated medication use on cognitive outcome in Dravet syndrome and age at first afebrile seizure as a clinical predictor in SCN1A-related seizure phenotypes. *Epilepsia* 2018;59(6):1154–65.