Behavioral therapy for functional constipation in childhood: health-related quality of life, emotional and behavior problems & parental child-rearing attitudes
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Chronic childhood constipation: A review of the literature and the introduction of a protocolized behavioral intervention program

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Abstract

Objective. To release a newly protocolized behavioral intervention program for children with chronic constipation aged 4–18 years with guidance from literature about underlying theories from which the treatment techniques follow.

Methods. Articles until July 2006 were identified through electronic searches in Medline, Psychinfo and Picarta. There was no limit placed on the time periods searched. Following keywords were used: constipation, encopresis, fecal incontinence, psychotherapy, emotions, randomized controlled trials, parent–child relations, parents, family, psychology, behavioral, behavioral problems, psychopathology, toilet, social, psychosocial, pain, retentive posturing, stool withholding, stool toileting refusal, shame, stress, anxiety. A filter was used to select literature referring to children 0–18 years old. Key constructs and content of sessions for a protocolized behavioral intervention program are derived from literature.

Results. Seventy-one articles on chronic childhood constipation are critically reviewed and categorized into sections on epidemiology, symptomatology, etiology and consequences, treatment and effectivity, and follow-up on chronic childhood constipation. This is followed by an extensive description of our protocolized behavioral intervention program.

Conclusion. This is the first article on childhood constipation presenting a full and transparent description of a behavioral intervention program embedded in literature. In addition, a theoretical framework is provided that can serve as a trial paradigm to evaluate intervention effectiveness.

Practice implications. This article can serve as an extensive guideline in routine practice to treat chronically constipated children. By releasing our protocolized behavioral intervention program and by offering a theoretical framework we expect to provide a good opportunity to evaluate clinical effectivity by both randomized controlled trials and qualitative research methods. Findings will contribute to the implementation of an effective treatment for chronic constipation in childhood.
Introduction

Constipation is a symptom rather than a disease and often constitutes a major problem for the child and his family. Unfortunately, no universal accepted definition for chronic constipation (1) is available. A group of pediatric gastroenterologists and pediatricians with an interest in gastrointestinal motility (2) reached agreement on defining childhood functional defecation disorders. Based on consensus, constipation was defined as the occurrence of two or more of the following six characteristics, during the last 8 weeks: (I) two or less bowel movements in the toilet per week; (II) one or more episodes of fecal incontinence per week; (III) history of retentive posturing or excessive volitional stool retention; (IV) history of painful or hard bowel movements; (V) presence of a large fecal mass in the rectum; (VI) history of large diameter stools that may obstruct the toilet. It was also decided to adopt the term fecal incontinence instead of the terms encopresis and soiling. With 84% of constipated children suffering from this complaint (3), the involuntary passing of fecal material in the underwear is one of the major features of childhood constipation.

It is important to distinguish between constipation with or without fecal incontinence and functional non-retentive fecal incontinence (FNRFI). It is indicated that different pathophysiological mechanisms are involved (2). Both entities can result in fecal incontinence, but in children with FNRFI, there are no signs of constipation. In many studies, constipated children with fecal incontinence and children with FNRFI are grouped into one sample because they share the complaint of fecal incontinence. It is known that about 80% of the children with fecal incontinence experience chronic constipation (3;4). In this article, mixed-up studies will not be discussed.

The pathophysiological mechanisms underlying childhood constipation are undoubtedly multifactorial, and are not well understood. In 90% of all patients, no specific organic cause can be found (5). Fearful reactions to defecation and stool-withholding behavior are common in children with constipation (6-11). Retained stools become progressively more difficult and painful to evacuate, leading to the development of fear and consequently persistent constipation (2;12). This vicious cycle can be described as learned behavior.

Based on clinical experience, constipated children are traditionally treated by pediatricians combining medical and behavioral approaches like a toilet sitting regimen and education (13;14). Laxative therapy usually consists of a series of enemas to disimpact the child, dietary suggestions and daily dosages of laxatives. The goal of treatment is to promote daily, soft painless stools preventing re-accumulation of feces (15). A bowel diary is used to quantify therapeutic progress and to enhance motivation. Based on findings from literature and our large clinical experience, we developed a protocolized behavioral intervention program for constipated children and their parents (16-18). In this article, we extensively describe the key construct and the content of this individual protocolized behavioral intervention program. It includes two age-related modules: a module for children aged 4–8 years and for children aged >8 years. The description of our protocolized behavioral intervention program will be embedded in a literature review. In addition, a theoretical framework is derived from literature on assumed etiology and consequences that can serve as a trial paradigm to evaluate intervention effectiveness.
Epidemiology

Constipation represents the main complaint in 3% of pediatric outpatient’s visits (5). This percentage increases to 25–45% in specific pediatric-gastrointestinal motility clinics (15;19). To date, the worldwide prevalence of constipation in children varies widely and is estimated to range between 0.7 and 29.6% (10;20;21). Latter prevalence studies are based on Rome II criteria, with duration of symptoms more than 3 months and a defecation frequency of less than three times per week. The large range is likely due to variations in sample size and different methods of data collection. Van den Berg et al. (22) found no evidence that constipation occurs less in non-Western societies. Higher rates are reported in girls than in boys, but a 1:1 ratio is also reported (22). A convincing explanation for this difference in gender ratio is absent.

Symptomatology

The majority of children with chronic constipation show reduced frequency of bowel movements in combination with fecal incontinence; passage of large stools that clog the toilet; hard stools; painful defecation; stool-withholding behavior; stool toileting refusal; and large stools in the rectum, palpable on abdominal or rectal examination (11;23-25). Rectoanal examination often reveals perianal feces (3). In a minority of cases, one finds anal fissures or hemorrhoids (23;25;26). Furthermore, these children often experience straining during defecation, abdominal pain, abdominal distension, anorexia, vomiting, poor appetite, urinary incontinence, urinary tract infection, and psychological problems (15). Mothers and children report the large role of pain (27). Between 68 and 86% of children with constipation experience pain before or during defecation (9;11). A high number of children give histories of painful defecation months or even years before the onset of fecal incontinence (11).

In constipated children, high percentages, 89–100%, are reported of stool-withholding behavior (9;11). Parents describe that their child holds his/her legs and buttocks stiffly together, rises on his toes and then rocks back and forth. In many cases, this behavior is misinterpreted by parents as an extreme effort to pass stool. The problem of stool withholding associated with constipation occurs only in 13% of healthy children (28).

Approximately 80% of stool withholders also show stool toileting refusal (28). Stool toileting refusal is also an important and frequent accompanying symptom of constipation, and is likely the result of painful defecation due to hard and large stools (7;29). These children urinate on the toilet, but refuse to defecate there. During the toilet training process, approximately 20% of the children in a normal population go through a period of stool toileting refusal (28;30). Of those, only a fourth require intervention because stool toileting refusal persists above 4 years of age and/or because the child also displays stool-withholding behavior (28). Sometimes parents do not recognize stool toileting refusal as a problem, since their child asks for a diaper to defecate or their child soils his underwear at an acceptable time. However, an association has been shown between stool toileting refusal and toilet training at a later age and stool-withholding behavior (28), which can lead to severe constipation. Intervention of a pediatrician, like advising to return the child to diapers, may be necessary (9;28). Furthermore, counseling parents to avoid a negative attitude (verbal and non-verbal) towards feces and to praise their child when he/she defecates in his diaper, shortens the time of stool toileting refusal and results in the child being toilet trained earlier (31).
Etiology and consequences

Our behavioral intervention program is based on a vicious cycle which can be described as learned behavior. The production of large and/or hard stools results in fearful reactions related to defecation and stool withholding which may cause constipation, fecal incontinence, abnormalities in the rectum and/or bowel and a disturbed parent–child interaction. This all perpetuates the vicious circle and will finally lead to persistent constipation. Discussing etiology and consequences of functional constipation remains complicated, since causal processes are rarely explicitly investigated. In addition, constipation is multifactorial in origin, because anorectal function is a complex interplay between the colon, the rectum, the nervous system, the sphincter complex and the will of the child. Nevertheless, in next paragraphs, assumed physical and behavioral/psychological etiology and consequences will be organized and carefully discussed to provide a theoretical model that can serve as a trial paradigm to evaluate intervention effectiveness.

Etiology

Physical perspective

In more than 90% of all age groups, no obvious medical cause can be identified for childhood constipation (15;32). Several physical causes may elicit acute episodes of constipation: i.e. a change in diet (from human to cow milk) (33), a loss of appetite/dehydration due to an acute infection or use of drugs as methylphenidate. In addition, genetic predisposition may play a role, since constipation often dates back to the first months of life, and many patients have a positive family history of constipation (34-36). Constipation is occasionally caused by anatomical, endocrinological, metabolic or neurological factors. The most common condition in infancy that must be differentiated from idiopathic constipation is Hirschsprung’s disease (37).

Behavioral perspective

Physical abnormalities seem to only partially explain the persistence of constipation in childhood, suggesting other mechanisms are of greater importance. Clinicians and researchers assume stool-withholding behavior to be the major cause for development and/or persistence of constipation in childhood (2;6;7;9;11;12). It is suggested that stool-withholding behavior and defecation anxiety are preceded by painful defecation and hard bowel movements.

This hypothesis was confirmed in a prospective longitudinal study in 380 children aged between 17 and 19 months (7). Findings showed that hard and painful bowel movements occur usually before the onset of stool toileting refusal and thus are unlikely to be caused primarily by behavior. In accordance, Borowitz et al. (27) found that large and/or painful bowel movements were most commonly reported before the onset of constipation by 125 parents of constipated children. In addition, Benninga (38) indicated stool withholding is unlikely to be a primary behavioral mechanism, since constipation starts during early infancy in many children.

The role of parents in managing their child’s difficult behavior, i.e. defecation anxiety, is suggested to be an important factor in the development and/or persistence of constipation. Taubman (28) showed in a study to determine stool toileting refusal in healthy children an association between this behavior and a parental inability to set limits. A case–control study using the CBCL (39), a clean/up task, a temperament questionnaire and a semi-structured
behavioral screening revealed no differences between parents of healthy children with or without stool toileting refusal (29). However, a trend was found towards children with stool toileting refusal being rated by their parents as having a more difficult temperament. A study investigating stubbornness, showed constipated children aged 2–7 years were perceived by their parents to be significantly more stubborn, both in general and specifically regarding toileting behaviors than children without constipation (40). Especially parents of younger children (2–3 years old) perceived their child as more stubborn. This finding is in line with the fact that specific difficulties are normally associated with this developmental stage. The authors point at the influence of personality features of parents and parental styles on managing difficult (age appropriate) temperament of their child.

It has also been suggested that stool withholding develops or persists because of a lack of time for regular toileting (6), toilet phobia and a distaste for toilets other than the child's own. The latter is due to unhygienic toilets at school or bullying in the toilets. Lundblad and Hellstrom (41) showed in 385 Swedish school children aged 6–16 years that 80% never used toilets at school to defecate. Perceptions of sight and smell and feelings of insecurity hindered children from using the school toilets. Additionally, Barnes and Maddocks (42) showed that 40% of 87 primary school children in South Wales would never use the school toilet to defecate and that a significant proportion of children were bullied or teased at the toilets. Vernon et al. (43) assessed 394 children's experiences of school toilets in England and 157 children in Sweden. Children from both countries experienced school toilets unpleasant, dirty, smelly and frightening. In addition, bullying occurred there. Between 28 and 62% of children avoided using the school toilets. The authors point at the risk of constipation, urinary tract infections and incontinence because of the suppression of the “call to stool”.

Consequences

Physical consequences

Fecal incontinence

About 80% of the children with fecal incontinence experience chronic constipation (3;4). The involuntary leakage of feces may occur several times a day and in some severe cases, it may also occur at night due to severe fecal impaction of the rectum (23). After passing huge volumes of stool, overflow incontinence disappears in most cases. It is unknown, however, why children continue to have fecal incontinence after rectal clean out and adequate maintenance therapy. We hypothesize that “fecal accidents” might then be the result of stool withholding and denying or neglecting normal and appropriate physiological stimuli to go to the toilet. In addition, children who experienced constipation can (partly) lose the urge to defecate and consequently will be too late for the toilet.

Anorectal function disturbances

Long-term fecal retention resulting from stool withholding eventually might lead to accumulation of a large fecal mass and development of a dilated rectum. Altered compliance (elasticity) may result in decreased rectal tone and decreased rectal contractility with possible contribution to delayed evacuation of feces (44). Therefore, the primary reason the child is not able to defecate may no longer be merely withholding behavior but also impaired rectal function. Recently, Voskuil et al. (45) showed that the compliance of the rectum was higher in children
with functional constipation when compared with healthy children implying that the rectum is stretched and larger stool volumes are needed to trigger rectal sensation. While this parameter of rectal function is abnormal in the majority of children with severe constipation, the clinical relevance of rectal compliance has not yet been investigated. Furthermore, it is unclear whether constipated children clinically improve when this rectal abnormality is successfully treated.

For a long time, pelvic floor dyssynergia, the abnormal or paradoxal contraction of the anal sphincter complex during a defecation attempt, has been suggested to play a major role in the pathophysiology in childhood constipation (32;46;47). Approximately 50% of children show this abnormal defecation pattern (32). However, biofeedback studies showed that improvement of pelvic floor dyssynergia does not result in better clinical outcome (32;47) and that rectal parameters remain disturbed despite clinical recovery (48).

**Psychological consequences**

**General behavioral problems**

The relationship between behavioral problems and functional constipation has been rarely investigated. Only one study by Nolan et al. (49) explored this relation by measuring behavioral problems after treating childhood constipation. This intervention study included 169 constipated children that were assigned to a treatment including behavior modification alone or behavior modification plus laxatives. Findings showed that the behavior modification plus laxatives treatment resulted in a larger remission rate with in addition a significant reduction in behavior problems measured by the Child Behavior Checklist (CBCL) (50). These results may indicate that behavioral problems in the majority of constipated children are caused by symptoms associated with constipation such as abdominal pain, painful defecation, fear and fecal incontinence.

A recent study by Rettew et al. (51) showed that interaction between child and parents was a significant predictor of psychopathology measured by the CBCL. Fecal incontinence in a child triggers a lot of parental stress because of dishonesty of the child about their fecal accidents (52) and the burden of cleaning clothes (6). The majority of the parents assume that fecal incontinence is caused by the child’s laziness, carelessness and stubbornness (24). Furthermore, parents are imposed by a heightened awareness of bowel function, prompting their incontinent child to toilet more frequently than parents of children without fecal incontinence (53). It is clear that these cognitions and perceptions of parents influence the parent–child interaction negatively, which may finally result in behavioral problems in the child.

Several studies assessed behavioral problems in constipated children using the CBCL (39;50). Loening-Baucke et al. (54) and Benninga and coworkers (38;55) measured behavioral problems in 173 constipated children. The mean T-scores for the sample as a whole is calculated and the 90th percentile (or >63) is used as cutoff for the so-called clinical range which discriminates between children with and without psychopathology. Approximately 40% of these children scored within the clinical range and the mean T-score showed no overall behavioral abnormalities were present. The authors concluded that the majority of constipated children could be characterized as only having mild behavioral problems, indicating that these children should primarily be treated in a pediatric setting and not in a psychiatric out-patient clinic. Nolan et al. (49) showed in a large intervention study with 169 constipated children, about the same proportions with 35% of children with constipation scoring above the 90th percentile.

The studies by Loening-Baucke et al. and Benninga et al. also aimed to outline behavior profiles for constipated children. However, no constipation-specific behavior problems could
be revealed. Constipated children could not be described as either typically internalizing or externalizing.

**Health-Related Quality of Life (HRQoL)**

A recent study by Youssef et al. (56) showed that constipated children (N = 224) had lower self-reported quality of life measured by the PedsQL (Pediatric Quality of Life Inventory) (57) than those with inflammatory bowel disease, gastroesophageal reflux disease and healthy children. Surprisingly, no difference was demonstrated in HRQoL obtained from child self-reports and parent proxy reports between constipated children with or without fecal incontinence. Years of abdominal pain and painful defecation reported by 89% of the constipated children, instead of fecal incontinence, may have been the factors leading to an impaired HRQoL. Interestingly, prolonged duration of symptoms correlated with lower parent reported scores.

**Treatments and effectiveness**

**Treatments**

**Medical–behavioral treatment**

The North American Society for Pediatric Gastroenterology and Nutrition (NASPGN) developed evidence-based guidelines for evaluating and treating pediatric constipation (14). Four important steps are discerned: (1) education, (2) disimpaction, and (3) maintenance therapy. The first step is targeted at altering negative attributions of the parents about the origin of the fecal incontinence. Many parents of constipated children think their child deliberately soils his/her pants. Therefore, parents are educated that the loss of feces in the underwear is involuntary and is the result of overflow incontinence and withholding behavior. The second step of disimpaction is needed to remove the hard and large amount of stool in the rectum. This step must not be omitted, because it can worsen overflow incontinence when oral laxatives as maintenance therapy are administered. Successful disimpaction can be achieved by either oral or rectal medication. The third step of maintenance therapy focuses on the prevention of re-accumulation of feces. Furthermore, dietary interventions, a behavioral approach (i.e. toilet sitting, bowel diary), laxative therapy and close follow-up by telephone and office visits are recommended. This may be necessary for many months. Long-term follow-up studies have demonstrated that children with constipation will not “just grow out of it” (36;58) and that relapse is common (36).

**Biofeedback**

In more than 50% of constipated children, the external anal sphincter and puborectalis muscle contract, rather than relax, during defecation (32). It is possible to normalize this abnormality by biofeedback training. Biofeedback is the use of monitoring instruments to detect and amplify selected physiologic processes in order to make previously unavailable physiological information accessible to the subject’s consciousness. By using biofeedback training, normalization of the abnormal or paradoxal contraction of the anal sphincter complex during a defecation attempt (i.e. pelvic floor dyssynergia) can be achieved. In 1980, experiences with the technique were for the first time presented in a publication (59).
Psychotherapy
Since behavioral problems in constipated children are usually mild and disappear after adequate treatment (38;54;55), these children can be primarily treated in a pediatric setting. Current guidelines indicate referral to a mental health service might be useful in patients with social withdrawal, a low self-esteem and depressive behavior due to their defecation disorder. In case of treatment resistance and family problems, referral is also preferred (14;15). A thorough analysis allows psychotherapy to more precisely determine (underlying) problem behavior, so this behavior can be seized. For example, individual therapy for the child, mediation therapy (teaching parents behavioral procedures) or family therapy can be offered.

Effectivity
Research has not yielded a well-established treatment thus far for constipation with or without fecal incontinence. In two reviews, behavioral and medical treatments for constipation and fecal incontinence were extensively examined (60;61). Although both reviews point at the importance of addressing differential effectiveness across diagnostics subcategories (constipation with or without fecal incontinence vs. functional non-retentive fecal incontinence) mixed-up studies are used to assess intervention effects. In addition, the Cochrane review of Brazzelli and Griffiths (61) only selected randomized or quasi-randomized controlled trials. The RCT paradigm is valuable in evaluating psychotherapeutic interventions, but it also has well-recognized limitations. Williams and Garner (62) indicate several technical limitations such as differential attention, non-comparability of comparison groups, psychometric problems with outcome measures, inconsistency of treatment delivered, and contamination by other treatments in trials of long-term therapy. Of greatest importance to clinicians is that RCTs do not predict outcome at the level of the individual case. It is suggested by Margison et al. (63) to use more clinically responsive measurement methods to complement outcome studies. The authors describe other forms of testability and argue that both paradigms are necessary for psychotherapy to have robust evidence.

This review will discuss all intervention studies which exclusively included constipated children with or without fecal incontinence. We recognize case studies may be helpful in stimulating new clinical insights and illustrating nuances of treatment; however to limit this article’s scope, case studies will not be reviewed.

Laxative treatment
The current clinical recommendations for the management of childhood constipation consists of oral and sometimes rectal laxatives combined with behavioral approaches (14). To date, the specific contribution of laxative therapy has not been established independently from any behavioral component. In addition, there is little information concerning the maximum dose, duration or long-term side effects of any compound used in the treatment of childhood constipation. A Cochrane review evaluating the effect on stimulant laxatives for constipation and fecal incontinence in children did not find any suitable randomized-controlled trial in the existing literature (64). More recently, Voskuijl et al. (65) conducted a double blind, randomized, controlled, multicenter trial to compare the clinical efficacy and safety of PEG 3350 (Transipeg; polyethylene glycol with electrolytes) and lactulose in the treatment of functional childhood constipation. The study included 100 children who received either PEG 3350 or lactulose with in addition education, the advice of toilet training after each meal (5 min) and use of small gifts.
and praise of the pediatric gastroenterologist to enhance compliance. PEG 3350 was associated with a significantly higher success rate (56%) than lactulose (29%) after 8 weeks of treatment. Similar success rates for PEG 3350 compared with milk of magnesia were found by Loening-Baucke (66). Voskuijl et al. noted that comparison with other studies using PEG 3350 in the treatment of childhood constipation is difficult, as no criteria for success were mentioned in these studies. The variability of criteria for success is a notorious problem in the research area on childhood constipation and often hampers comparison of results.

**Medical–behavioral treatment**

It has almost been about 30 years that behavioral elements (i.e. education and toilet sitting) were combined with medical treatment to treat children with fecal incontinence (13). Medical–behavioral treatment for constipated children has only been evaluated by comparing it with medical–behavioral treatment plus biofeedback, oral laxatives or anorectal manometry (32;46;47;65;67;68). Cure rates of medical–behavioral treatment in these studies ranged between 50 and 60% immediately after treatment and at follow-ups. The low success rate of 5% in a biofeedback study of Loening-Baucke (68) is probably caused by the sample which was exclusively composed of children experiencing abnormal defecation dynamics. Probably, medical–behavioral treatment is less effective for children with this abnormal defecation pattern.

**Biofeedback**

Inconsistent data exist concerning the effect of biofeedback training in children with constipation (32;67-70). In constipated children with abnormal defecation dynamics, a combination of biofeedback training and medical–behavioral treatment was superior to medical–behavioral treatment alone (67-70). Successful treatment was related to an ability to relax the external anal sphincter and puborectalis muscle. Wald et al. (70) showed in a small RCT no difference in success rate for those children without pelvic floor dysynergia. In contrast to these positive data, van der Plas et al. (32) showed no relation between the improvement of pelvic floor dysynergia and clinical improvement in a large RCT including 192 constipated children. In contrast to an earlier study by the same group (68) in children with constipation with pelvic floor dysynergia, it was shown that 76% of these children improved pelvic floor dysynergia with biofeedback training but that only 48% of these children clinically recovered (71). A more recent study showed similar success rates comparing home biofeedback to biofeedback in the laboratory (72).

**Positive reinforcement**

The effectiveness of a medical treatment with in addition positive reinforcement in constipated children has been investigated in four studies (25;70;73;74). Three single-group studies (25;73;74) reported recovery rates of 43 and 75% at 2-year follow-up and 61% at 3-year follow-up, respectively. One between-group study showed medical–behavioral treatment with positive reinforcement (71% cured) to be superior to medical–behavioral treatment plus biofeedback (40% cured) (70).
Comprehensive behavioral (psycho)therapy

Merely one single-group study by Stark et al. (75) combined medical treatment with a comprehensive behavioral treatment protocol carried out by pediatric psychologists. The study included 52 constipated children who failed medical treatment. This protocolized behavioral group therapy comprised six sessions over a 7-week period with parents and children seen simultaneously in separate groups. Parents were taught how to gain their child’s compliance with enemas, toilet sitting and dietary fiber intake. Instructions in child management skills included differential attention, contingency management, implementation of rules, consequences, time-out, and contracting around toileting behaviors and diet. After treatment ending, 67% of constipated children showed one or less times per week fecal incontinence with an increase in bowel movements and minimal need of parent prompted toilet sitting. This study was a replication of a previous study by Stark et al. (76) with 18 constipated children. The protocolized behavioral group therapy resulted at the end of treatment and at 6 months follow-up in 89 and 78% of children having no fecal incontinence, respectively.

Long-term follow-up

A significant subgroup of children presenting to specialist pediatric clinics continues to have problems for several years. A large follow-up study of a cohort of 418 Dutch children with constipation showed that merely 60% of all children referred to a tertiary medical center for chronic constipation are treated successfully at 1 year of follow-up (36). At 5 year of follow-up, this percentage increases a little, to about 70%. At least one relapse was experienced by 50% of the children. Furthermore, it is presented that even beyond the age of 16 years 30% still experience symptoms of constipation. Although success criteria and population size and samples differ among studies, it is mostly indicated 30–50% remains symptomatic despite intensive medical treatment after 1–7 years follow-up (9;58;77-81). These findings reflect the necessity to develop and evaluate new treatments.

Protocolized behavioral intervention program

Intervention: key constructs

Literature shows an involvement of behavioral components in development and/or persistence of chronic constipation in childhood. In addition, there is a need to evaluate in a controlled way effectiveness of a comprehensive behavioral treatment. Pediatric psychologists of our Psychosocial Department (16) developed a protocolized behavioral intervention program with two age-related modules (4–8 years; >8 years) for the treatment of chronic constipation in childhood. The program is based on literature, clinical experience and cognitive–behavioral theories.

Behavioral therapists use methods derived from experimental learning psychology. Techniques are based on experimentally established procedures and principles. It is assumed that human behavior is a consequence from its environment. Behavior reflects the learning history of human beings. Adaptive and maladaptive behaviors differ in terms of its impact on the environment, but are fundamentally identical. Consequently, behaviors can be learned and can be unlearned. Biological predisposing factors are taken into account when modifying behavior (82;83). Two types of experimental verified learning principles are crucial in behavioral therapy: classic conditioning and operant conditioning. The classic paradigm refers to a connection
between stimuli and is related to physiological reactions, the operant paradigm refers to a connection between acting and its consequences and is related to motor reactions (82;83).

Basic assumption of the behavioral intervention program to treat chronic childhood constipation is that fearful and phobic reactions related to defecation and fecal incontinence can be unlearned and that adequate defecation straining and toileting behavior can be (re)acquired by teaching parents behavioral procedures (17;18;84-86) and by behavioral play therapy with the child (17;18). Extensive methods from learning theory are applied and a learning process is started in the child and the parents. This learning process consists of five steps: Know; Dare; Can; Will; and Do. This approach was derived from a multidisciplinary behavioral treatment developed in a tertiary hospital in The Netherlands, to treat children with defecation disorders (17;18). The first step of psychoeducation is based on a cognitive–behavioral approach. It aims at altering negative or distorted thoughts of the parents about constipation and fecal incontinence into more positive and proactive ones. The other four steps are based on operant conditioning.

Analyzed from a behavioral perspective, stool withholding is a behavioral mechanism in which the child responds (Response) by consciously or unconsciously contracting his pelvic and gluteal muscles when he/she feels the urge to defecate (Stimulus). This leads to a vicious circle: physiologically because the rectum is increasingly distended, which results in disturbances of rectal compliance and consequently the urge to defecate will be delayed or even disappears; behaviorally because the child experiences repeatedly difficulties with defecation (Consequence), like pain because of large and hard stools which reinforces the stool-withholding behavior. The response to withhold stool was initially a “conscious” reaction on pain which later becomes a classic conditioned and automatic response (Stimulus ←→ Response).

Module for children 4–8 years old

The protocolized behavioral intervention program for children with constipation consists of 12 sessions during 22 weeks. The first 6 visits are weekly, visits 7–9 are every 2 weeks, visits 9–11 are every 3 weeks followed by visit 12 after another 4 weeks. A pediatric psychologist or behavioral therapist is accompanied by a co-therapist. The therapist mainly teaches the parent(s) behavioral procedures and monitors defecation frequency and episodes of fecal incontinence throughout a bowel diary filled out by the parents. The co-therapist is responsible for the behavioral play therapy. Every session starts with the child and parents together to discuss the practiced exercises performed at home and the rewarding schemes. This is done to monitor the learning process at home and to improve the parent–child interaction. By targeting the parent–child interaction, it is expected constipation related behavioral problems will be reduced in the child (51). Then the therapist will have an individual conversation with the parents, while the co-therapist plays with the child. To facilitate parent–child interaction, the play therapy with the child takes place in the same room.

Usage of laxatives is essential to facilitate the learning process. Rectal disimpaction takes place before starting the treatment. New impaction is prevented by giving oral laxatives for at least 3 months. During the behavioral treatment if medication needs adjustment, a pediatrician can always be consulted by the therapist. As long as the child is withholding defecation, medication is aimed at emptying the bowel.

Table 1 gives a detailed description of all the sessions for the two age modules.
Step 1. Know: psychoeducation.
Psychoeducation is crucial for parents to change their behavior towards the constipation and even more important, towards the child with fecal incontinence. A positive nonaccusatory approach to the child is necessary to carry out therapeutic procedures at home. It is expected from parents to reinforce appropriate toileting behavior and to ignore the inappropriate behavior of pant soiling and stool-withholding behavior. Before applying the behavioral intervention program, it is of major importance to tackle negative perceptions of parents. If parents still assume the fecal incontinence is their child’s fault and that he/she is doing it on purpose to tease parents, the treatment becomes very difficult and may be even impossible.

Step 2. Dare: anxiety reduction.
The next step is extinction of defecation anxiety and avoidance. Throughout the entire therapy, a large amount of attention is given to this element. For child and parents defecation and related themes are covered with negativity. Almost every constipated child experiences pain during defecation, urges to defecate trigger stress in the child and struggles with parent are common. Playing with dolls producing stools, clay modeling, reading children’s books and talking about defecation and related themes reduces negativity and helps the parent and child to relax (during defecation). By the gradual exposure to these fear-evoking stimuli, avoidance and fearful behavior will be eliminated. Stimuli are presented in a hierarchical fashion that is too weak to elicit avoidance or defensive behavior. Motor games targeted at the lower part of the body are aimed at teaching the child to use that part of the body and that sensations in that area can also be pleasant. This learning process by means of play therapy aimed at desensitization is primarily a task of the co-therapist. Both therapists function as models demonstrating that the subject is discussible and can even be funny. Another method in the program to reduce anxiety in the child is to prevent medical invasive treatments, such as administering enemas. If possible, oral laxatives are preferred.

Table 1. Protocolized behavioral intervention program for chronic constipation in childhood with two age-related modules: children 4–8 and 8–18 years [16]

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<th>Session</th>
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<td>Children 4–8 years</td>
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| 2       | Content          | With parents and therapist + co-therapist: Introduction of the five steps of the program. | With child: 
Psychosocial and explanation of physiological mechanisms childhood constipation. |
<p>|         |                  | Diagnostic interview about his/her motivation for this particular treatment, how he/she experiences fecal incontinence, reactions from social environment, sexual abuse, etc. | |</p>
<table>
<thead>
<tr>
<th>Session</th>
<th>Content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Children 4–8 years</strong></td>
</tr>
<tr>
<td></td>
<td>Homework</td>
<td>Explanation behavioral learning principles.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motivation of parent by emphasizing their importance since they are contingency managers/co-therapists during therapy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explanation bowel diary.</td>
</tr>
<tr>
<td>3</td>
<td>Content</td>
<td>With child and parent: Reading children’s book about animals and their bowel habits (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child and parent: Clay modeling of animals’ stools before the child is asked to model his/her own stool (therapist + co-therapist).</td>
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<tr>
<td></td>
<td></td>
<td>With child: Compilation of homework booklet (co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With parent: Evaluation of bowel diary and adjustment of laxatives. If necessary consult pediatrician (therapist).</td>
</tr>
<tr>
<td></td>
<td>Homework</td>
<td>Parents have to fill out a bowel diary to record defecation frequency and episodes of fecal incontinence.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Child has to draw own stools in booklet (if child does not produce any, it can draw stools of his/her parents or pets).</td>
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<tr>
<td>4</td>
<td>Content</td>
<td>With child and parent: Short evaluation of homework and bowel diary (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child and parent: Play with doll producing stools. Administration of enemas to doll (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child and parent: Modeling and teaching motor games: (1) place hand and knees on the ground and stretch your back like a cat; (2) pull up buttocks while laying on your back (therapist + co-therapist).</td>
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<tr>
<td></td>
<td></td>
<td>With child and parent: Explaining new homework (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child: Drawing of these exercises in homework booklet (co-therapist).</td>
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<tr>
<td>Session</td>
<td>Content</td>
<td>Description</td>
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<tr>
<td>35</td>
<td>homework</td>
<td></td>
</tr>
<tr>
<td><strong>Children 4–8 years</strong></td>
<td></td>
<td>With child: Reading children’s book about defecation and anxiety (co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With parent: Evaluation of homework and bowel diary and adjustment of laxatives. If necessary consult pediatrician (therapist).</td>
</tr>
<tr>
<td><strong>Children 8–18 years</strong></td>
<td></td>
<td>Teaching adequate straining technique on a chair (use balloon or hand of the child to blow, so the abdomen of the child will move out while pushing out his/her breath).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explanation proper toileting position, advice a footrest.</td>
</tr>
<tr>
<td>Homework</td>
<td>Parents have to fill out a bowel diary to record defecation frequency and episodes of fecal incontinence. Child has to practice motor games once a day. Parents have to reward their child by giving one sticker in homework booklet directly after practicing.</td>
<td>Practicing toilet training: The child has to practice with help of parents straining exercise on the toilet three times a day (15 min after a meal is preferred). Parents have to reward their child with one token immediately after toilet training. When the child happens to produce a bowel movement during toilet training or throughout the day it is rewarded with an additional token. It is crucial parents do not force their child to produce a bowel movement. The child has to fill out toilet training forms with token registration and a bowel diary to record defecation frequency and episodes of fecal incontinence. The child has to compose a reward list (with help from parents).</td>
</tr>
<tr>
<td>5</td>
<td>Content</td>
<td>With child and parent: Short evaluation of homework and bowel diary. Give attention to earned rewards (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child and parent: Explanation of physiology of the gut and how food is digested using a doll. Brown paint is used for the doll to produce bowel movement on the potty (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child and parent: Explanation that straining is necessary to propel out stool using the doll (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child and parent: Teaching adequate straining technique on a chair (use balloon or hand of the child to blow, so the abdomen of the child will move out while pushing out his/her breath) (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluation of homework and bowel diary and adjustment of laxatives. If necessary consult pediatrician.</td>
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<tr>
<td></td>
<td></td>
<td>Discussion with parent and child how many tokens the child needs before he/she can exchange these for a reward from the reward list.</td>
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<tr>
<td></td>
<td></td>
<td>Rehearsal of learning principles.</td>
</tr>
<tr>
<td>Session</td>
<td>Content homework</td>
<td>Description</td>
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<td>---------</td>
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<tr>
<td>2</td>
<td>With child and parent: Short evaluation of homework and bowel diary. Give attention to earned rewards (therapist + co-therapist).</td>
<td>Evaluation of homework and bowel diary and adjustment of laxatives. If necessary consult pediatrician.</td>
</tr>
<tr>
<td></td>
<td>With child and parent: Rehearsal of straining technique (therapist + co-therapist).</td>
<td>Give attention to earned rewards.</td>
</tr>
<tr>
<td></td>
<td>With child and parent: Explaining new homework (therapist + co-therapist).</td>
<td>Continuation of toilet training: Discussion of motivation, progress and difficulties.</td>
</tr>
<tr>
<td></td>
<td>With child: Clay modeling of stools with brown and soft food, i.e. gingerbread (co-therapist).</td>
<td>From the records of the bowel diary optimal moments can now be derived for toilet training three times a day (aimed at enlarging the possibility the child actually produces a bowel movement during the exercise).</td>
</tr>
<tr>
<td>Session</td>
<td>Content</td>
<td>Description</td>
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<tr>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>With child: Play with toys (co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With parent: From the records of the bowel diary, an optimal moment can now be derived for toilet training once a day (aimed at enlarging the possibility the child actually produces a bowel movement during the exercise) (therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With parent: Clarification rational of reward list (therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With parent: Evaluation of homework and bowel diary and adjustment of laxatives. If necessary, consult pediatrician (therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With parent: Hand-written information about explained toilet training and reinforcement (therapist).</td>
</tr>
<tr>
<td>Homework</td>
<td></td>
<td>Rehearsal of learning principles. Timing of rewards of major importance. Changes of reward scheme are sometimes needed, since frequency of toilet training can be reduced if the child regularly produces spontaneous bowel movements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The child has to fill out toilet training forms with token registration and a bowel diary to record defecation frequency and episodes of fecal incontinence.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuation of toilet training: Parents reward their child with one token for each toilet training and when the child happens to produce a bowel movement during toilet training or throughout the day it is rewarded with an additional token.</td>
</tr>
<tr>
<td>7</td>
<td>Content</td>
<td>With child and parent: Short evaluation of homework and bowel diary. Give attention to earned rewards (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child (when older than 6 years) and parent: Discuss how many stickers the child needs before he/she can exchange these for a reward from the reward list (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child and parent: Explaining new homework (therapist + co-therapist).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>With child: Play with toys (co-therapist).</td>
</tr>
</tbody>
</table>

### Chronic Childhood Constipation: A Review of the Literature and the Introduction of a Protocolized Behavioral Intervention Program

- **Session:**
  - **Content:**
  - **Description:**
    - Children 4–8 years
    - Children 8–18 years
    - With child: Play with toys (co-therapist).
    - With parent: From the records of the bowel diary, an optimal moment can now be derived for toilet training once a day (aimed at enlarging the possibility the child actually produces a bowel movement during the exercise) (therapist).
    - With parent: Clarification rational of reward list (therapist).
    - With parent: Evaluation of homework and bowel diary and adjustment of laxatives. If necessary, consult pediatrician (therapist).
    - With parent: Hand-written information about explained toilet training and reinforcement (therapist).
    - **Rehearsal of learning principles. Timing of rewards of major importance. Changes of reward scheme are sometimes needed, since frequency of toilet training can be reduced if the child regularly produces spontaneous bowel movements.**
    - The child has to fill out toilet training forms with token registration and a bowel diary to record defecation frequency and episodes of fecal incontinence.
    - Continuation of toilet training: Parents reward their child with one token for each toilet training and when the child happens to produce a bowel movement during toilet training or throughout the day it is rewarded with an additional token.
    - **Identical to session 6.**
<table>
<thead>
<tr>
<th>Session</th>
<th>Content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children 4–8 years</td>
<td></td>
<td>With parent: From the records of the bowel diary optimal moments can be derived for toilet training two or three times a day (therapist). With parent: Evaluation of homework and bowel diary and adjustment of laxatives. If necessary consult pediatrician (therapist).</td>
</tr>
<tr>
<td>Homework</td>
<td>Parents reward their child with one sticker in the homework booklet for each toilet training and when the child happens to produce a bowel movement during toilet training or throughout the day it is rewarded with an additional sticker. From now on the child may exchange stickers to obtain rewards from the list. Start with relatively small rewards.</td>
<td></td>
</tr>
<tr>
<td>Children 8–18 years</td>
<td></td>
<td>With parent: From the records of the bowel diary optimal moments can be derived for toilet training two or three times a day (therapist). With parent: Evaluation of homework and bowel diary and adjustment of laxatives. If necessary consult pediatrician (therapist).</td>
</tr>
<tr>
<td>8–11</td>
<td>Content</td>
<td>With child and parent: Short evaluation of homework and bowel diary. Give attention to earned rewards (therapist + co-therapist). With child and parent: Explanation to continue homework (therapist + co-therapist). With child: Play with toys (co-therapist). With parent: Continuation toilet training. Discuss progress and difficulties. Repeat behavioral learning principles (therapist). With parent: Changes of reward scheme are sometimes needed, since frequency of toilet training can be reduced if the child regularly produces spontaneous bowel movements (therapist). With parent: Evaluation of homework and bowel diary and adjustment of laxatives. If necessary consult pediatrician (therapist).</td>
</tr>
<tr>
<td>Homework</td>
<td>Parents have to fill out a bowel diary to record defecation frequency and episodes of fecal incontinence. Parents continue rewarding child with one sticker in the homework booklet for each toilet training and when the child happens to produce a bowel movement during toilet training or throughout the day it is rewarded with an additional sticker. The child may exchange stickers to obtain rewards from the list.</td>
<td>Identical to session 6.</td>
</tr>
</tbody>
</table>
Laxatives take an important place in this step. In most cases, constipated children are not able to produce a bowel movement without the help of medication. By monitoring a bowel diary filled out by the parents, medication can be adjusted by the therapist. If necessary, a pediatrician can be consulted.

The child is also taught appropriate defecation straining. Sometimes children have “forgotten” how to strain, because for a long time defecation frequency was very low. During therapy, they are taught a straining technique making them able to expel stool. They learn to relax legs and feet, to take in a deep breathe and hold it while sitting up straight, and then to push down with the held breath. The child receives “hand feedback” by placing one hand on the abdomen just below the navel to feel the abdomen move out when the breath is pushed down. By placing feet on a footrest, the anorectal angle is flattened, which further facilitates fecal expulsion. Even when children lost the feeling of urge, the child can learn to use the lower part of the body to evacuate feces voluntarily. At home, the child practices this exercise with help of his parents until he/she can do it on his own.

Although, not documented in the program description in Table 1, it may in some cases be necessary to arrest stool toileting refusal before introducing the straining exercise which has to be practiced at the toilet. In small steps, the child is taught to defeate in the toilet instead of in his diaper by rewarding him for each new step and abandon the rewards for the previous step.

Anxiety and aversion related to defecation, toileting and cleaning procedures results in many constipated children in reluctance. Motivation to let the child carry out assignments can be created by stepwise reinforcement. Consequently, the child will exhibit increasingly appropriate behavior. Setting achievable goals enlarges motivation and feelings of competence of child and parents and prevents struggles. When the child practices an exercise at home, parents reward
their child with a sticker. When enough stickers are earned by the child, they can be exchanged for social or material rewards, i.e. helping to prepare dinner, inviting friends for sleeping, buying a (small) toy, staying up late, etc. Adequate timing and quality of reinforcement carried out by parents is crucial in contingency management. Just until a child masters a part of the target behavior, a next small step can be taken.

Differential attention like teaching parents to ignore or to neutrally react on the inappropriate behavior of stool-withholding behavior and pant soiling is also a powerful technique in shaping adequate toileting behavior. A lot of parents are inclined to react on their child when they observe stool withholding or when they see or smell the fecal incontinence. This reinforces the undesirable behavior and parents are advised to leave this reaction pattern. Parents must stop mainly punishing the child for inappropriate behavior. This can even lead to behavior in which the child excessively withholds stool (87).

Step 5. Do: establishing toilet routine.
After passing former steps, adequate defecation straining and toileting behavior is shaped and defecation anxiety/avoidance is systematically desensitized. The last step consists of toileting routine. When the urge to defecate occurs, it must become a habit for the child to use the toilet to evacuate sufficient feces instead of withholding it. A subset of children lost (partly) the urge to defecate because of decreased rectal compliance following severe chronic constipation.
Scheduled toileting and carry out the straining exercise routinely is necessary for these children. This requires a lot of discipline from the parent and the child, but is the only solution.

Module for children 8–18 years old
Children aged 8–18 years follow the same step as the younger children, except for anxiety reduction procedures by means of play therapy. In older children, the mechanisms by which symptoms are perpetuated become much more complex and are assumed to play a larger role than pain which was at a younger age the primary reason for persistent constipation (53). Consequently, no co-therapist is involved in the module for older children. Instead of this, children are taught to take responsibility for their bowel habits. Children of older ages are able to monitor their behavior and bad habits and are conscious of it, so they can contribute a lot to their behavioral change. Psychoeducation will not only be targeted at the parents but also at the child. Motivation from the child is a crucial factor to succeed.

During treatment, the child has to fill out his own bowel diary, training schemes and rewarding lists which will be reviewed every session with the therapist. Of course, parents are indispensable; they are a “rewarding instance” for their child to reinforce appropriate behavior by giving the child tokens when he/she carries out his straining exercise and when he/she produces a bowel movement. The child exchanges these tokens for social or material rewards, i.e. staying up late, deciding what to eat for diner, enlarging time spend on the computer, etc. Principally, sessions take place with parents and child together making it possible to deal with possible existing interaction problems.

Resistance and co-morbidity
Difficult temperament, behavior problems and parent–child interaction problems are considered to be related with the onset or maintenance of constipation in children. Psychodynamically, it is stated that intrapsychic and/or relational conflicts give rise to the symptom formation of fecal incontinence (formerly defined as encopresis). During the anal stage of development, a child is establishing autonomy and independence. However, at the same stage, the child is also asked by
the parents for the first time in his life to conduct socially accepted behavior, i.e. using the toilet. Erikson (88) pointed at the fundamental meaning of bowel and bladder control as a first step to autonomic functioning. Bemporad et al. (89) and Bellman (90) also referred to the typically underlying hostile mother–child psychodynamics that could accompany fecal incontinence. Anthony (1957) spoke of “the battle of the bowels”, with the child and its mother being locked into a chronic, unyielding struggle for power and control typically seen in the second year of life, during the anal stage of psychosexual development. Unfortunately, most psychoanalytical publications do not differ between retentive and non-retentive encopresis/fecal incontinence. In addition, these studies have a qualitative character and describe case histories.

Sexual abuse is also often associated with constipation and fecal incontinence in children. This relation was only recently investigated by Mellon et al. (91) in a retrospective analysis of three comparison groups of 4–12 year olds: 466 children documented and treated for sexual abuse, 429 psychiatrically referred children with externalizing problems and 641 normative children recruited from the community were studied. Findings showed the fecal incontinence rate in the abused group differed significantly from that of the normative group, but not from the psychiatric group. These findings do not support the predictive utility of fecal incontinence as an indicator of sexual abuse in children. The authors conclude fecal incontinence seems to represent one of many stress-induced dysregulated behaviors.

Although empirical evidence showing the prevalence and impact for most co-morbid factors is lacking, we believe the behavioral program in addition to laxative treatment can be beneficial in the pediatric setting. Co-morbidity may cause constipated children and their parents to fail conventional medical treatment.

Co-morbidity and resistance may hamper a standard delivery of the presented protocolized program. Competent and experienced therapists must then be able to deviate appropriately from technical protocolized recommendations and to integrate other therapeutic styles, i.e. psychodynamic, systemic, etc. (63). If possible, it is strategically preferred to keep the constipation as a primary treatment goal, since for most parents, this corresponds with their needs. Furthermore, one can expect generalization to other problem behaviors (92). Another option is to interrupt the protocolized program temporarily to address “obstacles” hindering the learning process. Ideally, these obstacles should already be addressed through the anamnesis before starting the protocolized program. During treatment, the role of parents is that of a co-therapist/contingency manager who has to implement behavior management techniques at home, hence attention is required when severe parent–child interaction problems or limited abilities in child-rearing practices of parents are present. If parents are considered to be competent co-therapists for their child, it should be no problem to even treat children with developmental disorders such as PDD-NOS, ADHD or learning disabilities with the behavioral program. Depending on the disorder, behaviors in these children can be challenging, which may impede the learning process. To establish adequate defecation straining and toileting behavior, extending the length of the protocol may then be necessary.

Managing resistance in adolescents requires a distinct approach. Bosch and Hoytema (93) provided a fascinating description about adolescents with retentive fecal incontinence matching our clinical observations. Reticence, passivity, an externalizing attitude and a lack of autonomy were features also commonly seen in the constipated adolescents participating in our protocolized behavioral intervention program. As a consequence of these characteristics, the therapeutic elements as described in the protocol for children 8–18 years old are targeted at enlarging the...
self-efficacy of the adolescent. An active and directive attitude from the therapist is essential in treating constipated adolescents. In addition, as already mentioned, other therapeutic styles may be required to overcome resistance and denial in adolescents.

Discussion and conclusion

Discussion

This literature review showed psychological and physical problems associated with constipation impose a large burden for the child and its parents, especially when complaints persist as children grow older. It is disappointing that research has not yielded a well-established treatment thus far for constipation. It seems crucial in the research field on functional defecation disorders in childhood to address differential effectiveness across diagnostic subcategories (constipation with or without fecal incontinence vs. functional non-retentive fecal incontinence). Literature shows physical abnormalities only partially explain the persistence of constipation in childhood. Stool-withholding behavior and defecation anxiety seem of great importance in the development and maintenance of chronic childhood constipation. In addition, co-morbid factors, i.e. behavioral problems, difficult temperament and parent–child interaction problems, are considered to be related with the onset or maintenance of constipation in children. This indicates a behavioral intervention program in addition to laxative treatment seems to be beneficial for constipated children and their parents in the pediatric setting. Referral to a mental health service might be useful for those constipated children who exhibit social withdrawal, a low self-esteem and depressive behavior due to the defecation disorder. In case of treatment resistance and family problems, referral is also preferred.

Conclusion

This is the first article presenting a full and transparent description of a behavioral intervention program for childhood constipation embedded in literature. In addition, a theoretical framework is derived from the reviewed literature that can serve as a trial paradigm to evaluate intervention effectiveness. This new program is based on clinical experience and an extensive review of the literature. In this article, key constructs and content of the sessions of a protocolized behavioral intervention program for children aged 4–8 years and children aged 8–18 years are extensively described (Table 1).

Practice implications

This article will hopefully serve as an extensive guideline in routine practice to treat chronically constipated children. The literature review presents underlying theories from which the treatment techniques follow. By releasing our protocolized behavioral intervention program and offering a theoretical framework, we expect to provide a good opportunity to evaluate clinical efficacy by both randomized controlled trials and qualitative research methods. Findings will contribute to the implementation of an effective treatment for chronic constipation in childhood.
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Chronic childhood constipation: A review of the literature and the introduction of a protocolized behavioral intervention program