

# An Internet Intervention as Adjunctive Therapy for Pediatric Encopresis

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This study evaluated the benefits of enhanced toilet training delivered through the Internet for children with encopresis. Twenty-four children with encopresis were randomly assigned to the Internet intervention group (Web) or no Internet intervention group (No-Web). All participants continued to receive routine care from their primary care physician. The Web participants demonstrated greater improvements in terms of reduced fecal soiling, increased defecation in the toilet, and increased unprompted trips to the toilet ( $ps < .02$ ). Both groups demonstrated similar improvements in knowledge and toileting behaviors. Internet interventions may be an effective way of delivering sophisticated behavioral interventions to a large and dispersed population in a convenient format.

Pediatric encopresis is a relatively common problem that is typically resistant to primary care intervention. Incidence estimates range from 1.5% to 7.5% of school children ages 6 to 12 years (Doleys, 1983). Encopresis accounts for 3% of general pediatric clinic visits (Loening-Baucke, 1993) and 25% of all pediatric gastroenterology clinic visits (Levine, 1975). There are many different ways of treating encopresis, including medical management, which typically involves the administration of enemas and laxatives (Levine & Bakow, 1976; Loening-Baucke, 2002); biofeedback, in which electromyographic monitoring is used to examine muscle strength and control, as well as reversing paradoxical constriction of the external anal sphincter (Cox, Sutphen, Borowitz, & Ling, 1999; Loening-Baucke, 1990); behavioral interventions, focusing on improving defecation dynamics through instruction and modeling, reinforcement of routine toileting behaviors, and promoting a positive problem-solving approach among patient and parents (Cox, Sutphen, Borowitz, Dickens, & Singles, 1994; Loening-Baucke, 1990; Van der Plas et al., 1996); and a combinations of these methods (Cox et al., 1999; Stark, Owens-Stively, Spirito, Lewis, & Guevremont, 1990).

The outcomes associated with encopresis treatment programs vary considerably. In a recent review of the literature, McGrath, Mellon, and Murphy (2000) reported that medical intervention produced a 40% cure rate, which was defined as no accidents at postassessment. They further reported that for studies in which biofeedback was used with medical management (e.g., Cox et al., 1994; Loening-Baucke, 1990; Wald, Chandra, Gabel, & Chiponis, 1987), cure rates ranged from 55% to 79%. However, the addition of biofeedback does not necessarily enhance treatment outcome beyond that obtained with intensive medical management and behavioral intervention (Cox et al., 1999). Studies using positive reinforcement in combination with medical intervention reported cure rates ranging from 43% to 51% (Cox et al., 1994; Loening-Baucke, 1990; Van der Plas et al., 1996). The use of a group intervention combining medical treatment with behavioral techniques (enemas, education, bowel monitoring, goal setting, sitting regimen, reinforcement, and skill building) was found to produce an 89% cure rate in one study (Stark et al., 1990). In a replication of this study, 86% of the children had zero or one accident each week after treatment (Stark et al., 1997). In a review of randomized, controlled studies, Brooks et al. (2000) reported that standardized medical-behavioral treatments that combined enemas and/or laxatives with a toilet-sitting regimen, delivered by research clinicians, significantly reduced soiling in 16%–59% of children (Loening-Baucke, 1990; Van der Plas et al., 1996). The wide range of improvements across studies is likely due to variations in the definition of success as well as differences in treatment approach, study population, and study design.

Enhanced toilet training (ETT) incorporates behavioral treatment (reinforcement for spontaneous use of the toilet and clean pants, instructions and modeling on how to strain and how to retain stool, education on anatomy and physiology) with the regimen of medical management. It is enhanced because it additionally in-

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structs both parents and child on the physiology of overflow incontinence, training and modeling of appropriate defecation dynamics (effective straining with increasing intra-abdominal pressure while differentially relaxing the external anal sphincter), and exercises to enhance volitional control of the external anal sphincter muscle. A recent treatment outcome study demonstrated that ETT led to significantly greater symptom reduction compared with more intense medical management (Cox et al., 1999). Furthermore, patients receiving ETT needed significantly fewer treatment sessions than patients receiving intensive medical management alone (2.5 vs. 3.9 visits, respectively) and required lower doses of laxatives (1.0 vs. 4.7 tsp of senna or magnesium) each day (Cox et al., 1999). These effects were sustained at both 6- and 12-month follow-up (Borowitz, Cox, Sutphen, & Kovatchev, 2002).

Despite the significant benefits reported for ETT, there are several barriers to its routine use as a treatment for pediatric encopresis in clinical settings. To effectively administer ETT, professionals must have pertinent medical knowledge about such issues as defecation dynamics and the use of laxatives and enemas, as well as psychological knowledge, including expertise in behavioral management, developmental issues, and family dynamics. Few primary care physicians or psychologists have both skill sets.

Time and expense are additional barriers to the implementation of ETT. Costs to the family include doctor fees, transportation, and time away from both work and school. Psychosocial costs may also be high. Some families are embarrassed and reluctant to discuss the problem, making assessment and treatment management difficult.

This study evaluated an Internet-based version of ETT designed to overcome barriers associated with direct implementation by health care professionals alone. This mode of presentation has several advantages: (a) It includes comprehensive information

regarding medical and behavioral management of encopresis, thereby relieving health professionals of the need for specialized expertise in both areas; (b) It allows children and their parents private access to information at any time, thereby avoiding personal embarrassment and increasing treatment convenience as well as helping decrease costs; (c) It provides a wide range of treatment modules associated with encopresis, allowing patients to individualize their treatment by selecting the modules most relevant to them as well as to receive recommendations for modules on the basis of information they have entered through follow-up questionnaires; and (d) It takes advantage of a mode of communication—the computer—that is often highly appealing to children, potentially increasing adherence.

This multicentered study (University of Virginia and Vanderbilt University) examined the utility and effectiveness of an Internet-based version of ETT. All children in the study were encouraged to continue working with their treating physician. It was hypothesized that the children who received the Internet intervention would have greater success in reducing fecal accidents and normalizing bowel function than those who did not receive the intervention.

## Method

### Participants and Recruitment

Through posting of fliers and direct physician referral, 24 encopretic children were recruited from central Virginia ( $n = 12$ ) and middle Tennessee ( $n = 12$ ). There were 19 boys and 5 girls, with a mean age of 8.46 ( $SD = 1.81$ ) years (see Table 1). To be eligible for the study, children had to be between the ages of 6 and 12 years, soiling at least once a week, and have no medical diagnosis, other than constipation, that could explain their fecal incontinence. Participants did not need a computer or Internet access

Table 1  
*Descriptive Data at Baseline*

Variable	Web	No-Web	Significance test
Gender	12 (10 boys, 2 girls)	12 (9 boys, 3 girls)	$z = 0.49, p = .62$
Age, years			
<i>M</i>	8.57	8.34	$t = 0.30, p = .76$
<i>SD</i>	1.72	1.97	
Race	12 (11 White, 1 Black)	12 (10 White, 2 Black)	$z = 0.60, p = .55$
Stage of BM training	11 completed training (1 missing)	10 completed training (1 "in the midst"; "almost finished")	$z = 1.38, p = .17$
Length of current laxative regimen	21 months	18 months	$t = 0.12, p = .91$
	<i>M (SD)</i>	<i>M (SD)</i>	
Number of accidents per week	6.00 (6.30)	8.17 (7.31)	$t = 0.78, p = .45$
Number of BMs in toilet per week	3.25 (1.86)	6.00 (8.10)	$t = 1.05, p = .32$
Bathroom use w/o prompts	2.67 (2.19)	5.64 (7.71)	$t = 1.28, p = .21$
Bathroom use w/prompts	5.25 (8.40)	4.11 (5.01)	$t = 0.36, p = .72$
EKQ—Total	11.25 (3.25)	10.50 (4.64)	$t = 0.46, p = .65$
EKQ—Anatomy	1.50 (1.31)	1.42 (1.08)	$t = 0.17, p = .87$
EKQ—Pathophysiology	3.42 (1.24)	2.75 (1.82)	$t = 1.05, p = .31$
EKQ—Behavioral treatment	6.33 (2.31)	6.33 (2.57)	$t = 0.00, p = 1.00$
VECAT—Bowel Specific	27.33 (5.21)	24.50 (6.39)	$t = 1.19, p = .25$
VECAT—Generic	23.83 (3.35)	23.08 (5.14)	$t = 0.42, p = .68$

*Note.* BM = bowel movement; EKQ = Encopresis Knowledge Questionnaire; VECAT = Virginia Encopresis/Constipation Appreciation Test.

to be a part of this study, as these were provided. All families who contacted our research center and met criteria for this study were included.

The participants were assessed at baseline to determine how many accidents they were having prior to the intervention, the child's stage of toilet training, what treatment regimen they were currently following, and how long they had been on that regimen. On average, the children were having approximately one accident each day ( $M = 7.08$ ,  $SD = 6.76$ , accidents per week), and most parents indicated that their child had completed toilet training. Sixteen of the 24 children were taking some type of laxative, including Ex-Lax (Novartis), Milk of Magnesia (Phillips), Senokot (Purdue Frederick Company), or some other laxative, which had been administered for an average of 19.18 months. There were no significant differences on any of the dependent measures between groups at baseline (see Table 1).

### Procedure

Parents of encopretic children interested in participating in the study called the Center for Behavioral Medicine Research at the University of Virginia Health System. A brief screening questionnaire of general bowel habits was taken over the telephone. If the inclusion criteria were satisfied, the child's physician was contacted to verify that the physician approved the program content and would follow the child for routine care. Twenty-two different physicians provided approval to participate for the 24 participants in the study. All children in the study were encouraged to continue meeting with their physician. From a retrospective review of symptoms, participants were matched on the basis of fecal accident frequency, and then randomly assigned to either the Internet intervention (Web) or no Internet intervention (No-Web) group. A research assistant then went to the participant's home, obtained approved written informed consent, and administered a questionnaire protocol to the parents, including the Virginia Encopresis/Constipation Apperception Test (VECAT; Cox et al., in press), to assess toileting habits, and the pretreatment Child Information Form. The children received the Encopresis Knowledge Questionnaire (EKQ; a measure developed for this study). If the family was assigned to the Web group, a computer and printer were installed in the home and connected to the Internet, and the researcher introduced the parent and child to the Internet site and answered any questions about its use. The research assistant telephoned 2 days later, as well as several additional times throughout the family's involvement in the study (typically at 8 days and 15 days from initiation), to answer any questions concerning use of the Internet site. The No-Web families were also called at the same time intervals.

A posttreatment home visit was scheduled for all participants approximately 3 weeks following the initial home visit. At this time, the parents were administered the VECAT and the posttreatment Child Information Form concerning the child's bowel habits, and the child was again administered the EKQ. Participants received a \$25 gift certificate to a local toy store for completing the pretreatment assessment and another \$25 gift certificate for completing the posttreatment assessment. All procedures received prior approval from the Human Investigation Committee.

### Measures

**Demographics and bowel habits.** Information regarding family demographics and the child's bowel habits was assessed by parent report on the Child Information Form. In addition, questions regarding the child's bowel habits were included, such as number of bowel movements (BMs) in the toilet and use of toilet with and without parental prompts. This form was administered both pre- and postintervention. Questions regarding use of the Internet program were also included on this posttreatment form for the Web group.

**EKQ.** A questionnaire assessing children's knowledge regarding encopresis was developed for the purposes of this study. It consists of 26

questions, covering three main areas: anatomy (6 items), pathophysiology (6 items), and treatment (14 items). The questions were presented in matching, multiple choice, and true/false formats. Total scores are obtained by summing the number of correct responses, with a range from 0 to 26.

**VECAT.** The VECAT assesses bowel-specific problems related to the process of encopresis, such as avoidance of the toilet, nonresponsiveness to rectal distention cues, and fear of defecation pain. A generic subscale, included as a comparison measure, addresses problem behaviors not related to bowel issues. For example, compliance with parental instructions to sit on the toilet is a bowel-specific issue, whereas the parallel generic item is compliance to parental instructions to make the bed. The VECAT consists of 18 pairs of drawings (9 pairs of bowel-specific and 9 parallel generic events), and the child selects the picture in each pair that best describes him or herself. The VECAT has good internal consistency and test-retest reliability. It has been found to best differentiate encopretic children with bowel-specific and not generic problems (Cox et al., in press). An online version of this measure can be found on the U-CAN-POOP-TOO Internet site ([www.ucanpooptoo.com](http://www.ucanpooptoo.com))

### Internet Site

The U-CAN-POOP-TOO Internet site operationalizes ETT and was developed with the intention that the child and parent(s) would complete the various components of the site together. Because of developmental differences among patients, parents are encouraged to provide as much help and guidance as necessary. Younger children likely need more parental involvement, whereas older children are able to guide themselves through much of the site with little support. Thus, parental involvement makes this site useful to a wide age range of children.

The goal of the program is to provide the components of ETT in a child-focused, engaging manner. The program encompasses more than 200 Web pages and/or screens with numerous illustrations, interactive components, animated tutorials, and reinforcing quizzes. Professionals from several disciplines (clinical psychology, pediatric gastroenterology, nursing, and pediatrics) were involved in the creation and refinement of the content to ensure content accuracy and understandability. The presentation was designed to maximize simplicity and usability. Every page contains audio for the presented text, so the child is able to listen to the information while viewing the page. Some interactive components require the user to make decisions (i.e., What type of clean-out procedure will you use? What day and time will you start treatment?) as a way of involving the child and constructing contracts for behavior change. Summaries at the end of each section provide written instructions the user may print out. Because of large file sizes, the graphic-intensive components were put on the hard drives of the computers prior to being placed in the participant's home to eliminate long download times.

To use the program, new users first register on the Internet site and choose a password. They are given a user-identification number to log on to their personalized version of the site. On subsequent visits, they log onto the site directly and are taken to their homepage, which provides information as to the user's current status in the program and what sections they need to complete.

The Internet site consists of three main sections: (a) Core Modules, (b) Modules, and (c) Follow-up (see Figure 1 for the Internet site flowchart diagram). Initially, all users complete the three core modules. These core modules cover anatomy, physiology, and pathophysiology of BMs, education on clean-out and laxative treatments, and behavioral treatment of encopresis. Each of these core modules provides detailed information using illustrations and animated tutorials. For example, in the anatomy/pathophysiology core, users are taken on a tour of the gastrointestinal track by Wahoo, an animated "guide," who demonstrates how the digestive system works. Wahoo explains typical system functioning and then reviews difficulties encopretic children often have and how the problems can manifest in the colon and rectum.

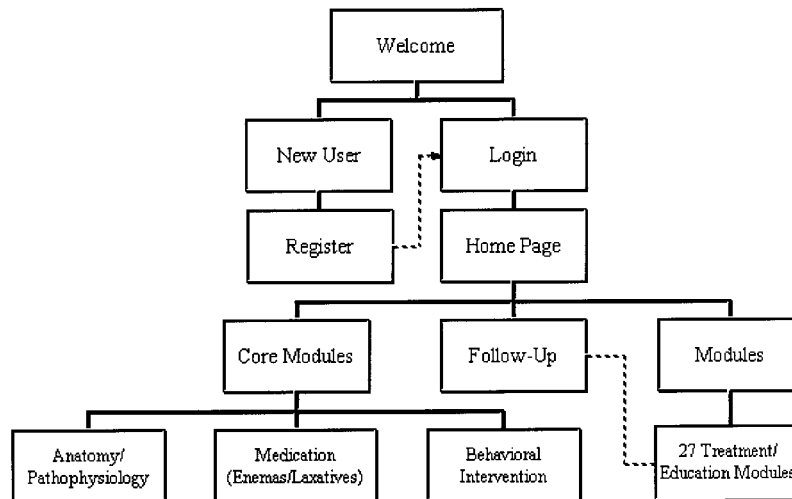


Figure 1. Flowchart of U-CAN-POOP-TOO Internet program.

The medication (enemas/laxative) core provides information on enemas and magnesium citrate as clean-out regimens, as well as on the use of various laxatives. An explanation of laxative treatment follows, and a recommendation regarding laxative dose is made based on an algorithm using the child's age. Because all of the children in this study were between the ages of 6 and 12, they were instructed to start with a basic regimen of one square of Ex-Lax (senna), twice a day.

The final core, behavioral intervention, focuses on proper defecation dynamics. It provides specific instructions to the child on how and how not to attempt to have a BM while sitting on the toilet. A detailed animated tutorial presents the information in a step-by-step format to instruct the child on how to sit on the toilet and feel comfortable, strain appropriately, and prevent paradoxical constriction of the external anal sphincter. Children also learn about the importance of practicing daily what they have learned and feeling good about their accomplishments.

At the end of each of the core modules, a question-and-answer game, titled "Show What You Know," is presented to reinforce retention of information. Also, at the end of the final core, a detailed, personalized instruction sheet is created for the user to print and follow. It includes the type and amount of clean-out and laxative to be used, how to administer them, the date on which the family stated they would begin treatment, instructions on proper defecation dynamics, and a diary to keep track of the toileting regimen.

The three core modules require a total of 60–90 min to complete. This can be done at one time or in multiple sessions. Once users have completed the core modules, they are instructed to return to the site in 1 week to complete a follow-up session. A second follow-up session is presented again in another week. At each follow-up, users are asked a series of questions (15 to 17 questions depending on the follow-up week) to determine treatment progress as well as to identify additional issues that may need to be addressed. On the basis of their responses, modules are listed on the personalized homepage, which users are instructed to complete. Alternatively, the users may go to a screen which lists all of the modules and select any which they believe may be helpful. The program includes 27 modules focusing on issues such as fears of toilet use; social isolation; administering, adjusting, and tapering laxatives; diet; hygiene; and preventing relapse (see Table 2 for a listing of the Internet site modules ordered by number of times accessed by participants). Each module requires 5 to 10 min to complete. After completing each core and any module, the user is asked five questions regarding usefulness and preference for the completed unit on a 0 (*not at all*) to 4 (*very well*) scale.

## Data Analysis

The two participant groups were compared on demographic variables using *t* tests and Mann–Whitney U nonparametric tests, when appropriate. The main outcome variables, including number of accidents, number of BMs in the toilet, and use of the bathroom with and without parental prompts, were first standardized by calculating the percentage difference from pre- to postassessment. The standardization was necessary because of the wide range of responses to outcome measures across participants (e.g., participants ranged from 1 to 25 accidents per week at preassessment and from 0 to 42 accidents per week at postassessment). Furthermore, the use of within-subject standardized differential scores tends to normalize the data, which made the use of *t* tests for group comparisons statistically appropriate. The EKQ and VECAT results were examined using the same procedure to have a unified representation of all dependent variables. Frequencies and descriptive statistics were computed for items measuring laxative use, treatment plan, and use of the Internet program.

## Results

### Behavior Change

Web parents reported that their children were having on average 6.00 ( $SD = 6.30$ ) accidents each week before the intervention and 0.50 ( $SD = 0.85$ ) accidents following the intervention, whereas the No-Web participants were reported as having 8.17 ( $SD = 7.31$ ) accidents at preassessment and 8.27 ( $SD = 13.83$ ) at postassessment. The cure rate, the proportion of children who had zero accidents at postassessment, was 70% for the Web group and 45% for the No-Web group. Success rates, as defined in two ways ( $\leq 1$  accidents per week and 2 accidents per week), were also computed. The Web group demonstrated 80% and 100% success, respectively, whereas the No-Web group had a 55% success rate with either definition.

In addition to examining group means, cure rates, and success rates, difference and percentage difference scores were calculated for each participant. By calculating the data in this way, comparisons could be made across all variables in the study. Overall, Web participants reported 93% improvement from pre- to postassessment, whereas No-Web participants reported a 31% improvement

Table 2  
*Modules of U-CAN-POOP-TOO*

Module name	Module description	No. of times module accessed	Usefulness of module (scale 0–4) <i>M (SD)</i>
Food Fight	This module provides information about diet and the role it plays in constipation and encopresis.	16	3.19 (1.05)
Working With Schools	This module provides information about how to best work with your school regarding your pooping problems.	9	3.44 (1.13)
Changing Behaviors	This module provides information about using incentives or rewards to help motivate you to sit on the toilet, practice exercises, and poop in the toilet.	8	3.75 (0.46)
Feeling Good About Self	This module examines why you should feel good about all the work you are doing to get better.	8	3.63 (0.52)
Preventing/Dealing with Relapse	This module provides information about what to do after you have finished treatment to make sure the problems do not return and, if they return, what you should do.	8	3.87 (0.35)
Taking Trips	This module provides information about how to reduce the risk of problems occurring when you go on trips.	8	4.00 (0.00)
Toilet Avoidance	This module provides information about how to become more comfortable sitting on other toilets.	8	3.38 (0.52)
Adjusting Laxatives	This module provides information about how to adjust the amount of laxative you are taking to make sure you are taking the amount you need.	7	4.00 (0.00)
Buns of Steel	This module provides information about how to strengthen your anus muscles so you do not have any more accidents.	7	3.86 (0.38)
Review Anatomy	This module is a review of the anatomy of the body and how the different parts of the body work to digest your food.	7	3.71 (0.49)
Giving/Getting Enemas	This module provides information about how to best give and get an enema.	5	3.80 (0.45)
Tapering Laxatives	This module provides information on how to help reduce and eventually eliminate taking laxatives after successful treatment.	5	3.80 (0.45)
24/48 Rule	This module presents two very important rules regarding enemas and laxatives you need to follow to make sure you stay cleaned out.	4	3.75 (0.50)
Good Hygiene	This module provides information on how to keep your bottom clean after having a poop.	4	3.25 (1.50)
Social Issues	This module provides information about how to deal with problems you may be having with other children.	4	3.25 (1.50)
Review Laxatives	This module is a review of the second part to being a Super Duper Potty Pooper in which you must be sure you stay “cleaned out” and help poops come out by taking laxatives.	3	4.00 (0.00)
Taking Time	This module provides information about how to take time to sit on the toilet, practice your exercises, and have a poop.	3	3.67 (0.58)
Laxatives and Health	This module examines some of the common worries people have about taking laxatives.	2	3.50 (0.71)
Fear of Monsters	This module provides information about how to overcome a fear of monsters in the toilet.	1	0 (0.00)
Fear of Pain	This module provides information about how to overcome a fear of having painful poops.	1	4.00 (0.00)
Fear of Pooping on the Toilet	This module provides information about how to overcome a fear of pooping on the toilet.	1	2.00 (0.00)
Review Clean Out	This module is a review of the first part to being a Super Duper Potty Pooper in which you must be sure you are “cleaned out.”	1	4.00 (0.00)
Review How To Poop	This module is a review of the third part of being a Super Duper Potty Pooper in which you must learn how to poop.	1	4.00 (0.00)
Regular Toilet Routines	This module provides information about why you need to go to the bathroom regularly.	1	4.00 (0.00)
Spoonful of Sugar	This module provides information about laxatives and ways to help make it an easier thing to take.	1	3.00 (0.00)
Fear of Falling In or Off the Toilet	This module provides information about how to overcome a fear of falling in or off the toilet.	0	
Fear of Toilet	This module provides information about how to overcome a fear of sitting on the toilet.	0	

rate,  $t(19) = 2.29$ ,  $p = .018$ . Children in the Web group also significantly increased their number of BMs in the toilet by 152% compared with the No-Web group, who decreased slightly by  $-16\%$  from pre- to postassessment,  $t(15) = 3.41$ ,  $p = .001$ .

The Web participants also significantly increased their number of trips to the toilet without parental prompts by 109% compared with the No-Web participants, who decreased their trips by  $-37\%$ ,  $t(15) = 1.97$ ,  $p = .021$ . Similarly, the Web participants increased their number of trips to the toilet with parental prompts by 47%, whereas the No-Web participants decreased by  $-45\%$ ; however, this was not significant,  $t(14) = 1.03$ ,  $p = .109$ . See Figure 2 for a visual comparison of each of these variables.

### Knowledge Acquisition

It was also hypothesized that the Web group, compared with the No-Web group, would be superior in terms of greater knowledge acquisition concerning bowel function. However, both groups improved from pre- to posttreatment on the EKQ total score (Web by 34% and No-Web by 36%) as well as on each of the subscales (on the Anatomy, Pathophysiology, and Behavioral Treatment subscales, the Web group improved 5%, 30%, and 42%, and the No-Web group improved 31%, 46%, and 20%, respectively).

A similar pattern was found using the VECAT. Scores on the Bowel Specific subscale decreased across all participants, indicat-

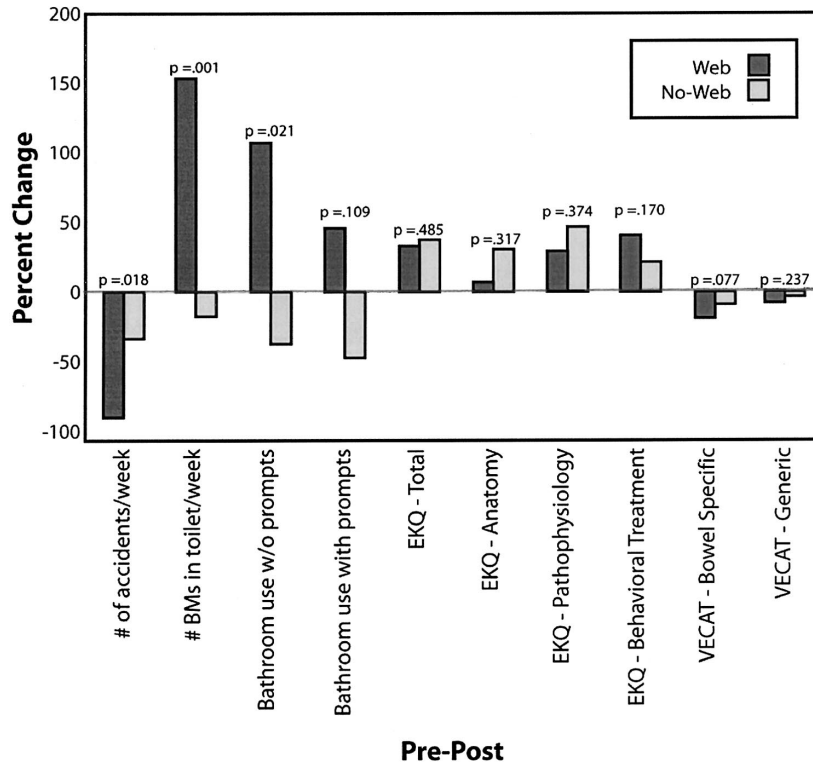


Figure 2. Percentage change on dependent variables from pre- to postassessment for children who received (Web) and did not receive (No-Web) the intervention. BM = bowel movement; EKQ = Encopresis Knowledge Questionnaire; VECAT = Virginia Encopresis/Constipation Apperception Test.

ing a reported reduction in bowel-related problems. The Web group decreased by  $-19\%$  on the Bowel Specific and  $-6\%$  on the Generic subscales of the VECAT from pre- to postassessment. The No-Web group decreased by  $-7\%$  on the Bowel Specific and  $-2\%$  on the Generic subscales. No significant differences were found between the two groups in changes on either measure. The percentage score differences for these measures are also shown in Figure 2, providing a comparison of groups across all variables.

### Internet Experience

The Internet site was accessed an average of 14 times by each Web participant during the 3 weeks of treatment. During the follow-up home visit, the Web participants were asked about their experience using the Internet site. Questions were rated on a 0 (*not at all*) to 4 (*very well*) Likert scale. Parents indicated that they found the Internet program easy to use ( $M = 3.55$ ,  $SD = 0.69$ ), the Internet material understandable ( $M = 3.64$ ,  $SD = 0.67$ ), and that their child found it very enjoyable ( $M = 3.45$ ,  $SD = 0.93$ ). They also reported that their child seemed to understand the material ( $M = 3.09$ ,  $SD = .70$ ) and was able to follow through with the treatment recommendations ( $M = 3.18$ ,  $SD = 1.17$ ). The parents were also encouraged to provide some descriptive information as to what they believed was the most helpful and least helpful aspect of the Internet program (see Table 3).

Participants were asked similar preference questions regarding individual cores and modules while using the Internet site. For the core modules, all mean ratings were extremely high, ranging

from 3.28 to 4.00 (see Table 4). Some participants viewed a core more than once, explaining why the cores were accessed more than 12 times (the total number of participants). One of the most important data points to note is the average rating of the usefulness of the third core. Every participant rated this core, which focused on the behavioral aspect of treatment (the foundation of ETT), the highest possible score of 4.

Table 2, which provides information on the modules, also highlights information on the number of times each module was accessed as well as the mean rating users made on the usefulness of the module. Only two modules were not accessed at all during this study: Fear of Toilet and Fear of Falling In or Off the Toilet. However, the other three fear modules were viewed, and a large amount of overlap is contained in these five modules. The remaining modules were viewed between 1 and 9 times. The module on diet, Food Fight, was viewed more often than any other module (16 times), and it was rated  $M = 3.19$  ( $SD = 1.05$ ). Only one module, Fear of Pooping on the Toilet was rated less than a 3 on usefulness; however, this module was only rated by one user.

### Discussion

Children who were provided the Internet version of ETT improved significantly more than those who did not receive this intervention. The number of accidents was reduced from approximately one accident a day to just one accident every 2 weeks, whereas the number of accidents for the No-Web group remained high, with more than one accident a day. In addition, the Web

Table 3  
*Responses to Questions about the Most and Least Helpful Aspects of U-CAN-POOP-TOO*

Question	Response
What was the most helpful part of the Internet program; that is, what have you used from the U-CAN-POOP-TOO Web site that has helped the most?	<p>“... the most helpful was [the] step-by-step program to get [child] regulated . . .”</p> <p>“... understand[ing] why his body does what it needs to do everyday—and what happens when he doesn’t have a BM.”</p> <p>“... the importance of regular BMs and health consequences . . . the information was tremendously useful.”</p> <p>“... developing a feeling [that] he can control his own body.”</p> <p>“... realizing that he is not the only child with this problem . . . that was reassuring . . .”</p>
What was the least helpful part of the Internet program; that is, what was not useful from the U-CAN-POOP-TOO Web site?	<p>“... difficulty with connections . . .”</p> <p>“... modules regarding fear of toilet and ‘monsters’ . . .”</p> <p>“... art work of the body did not print out . . .”</p> <p>“... Miralax should have been included [as a choice of laxative].”</p> <p>“... nutrition portion was too limited . . .”</p>

Note. BM = bowel movement.

group increased in the number of BMs they had in the toilet each week, whereas the No-Web group actually decreased in the number of BMs they had in the toilet during the same period. Children in the Web group increased their use of the bathroom with and without parental prompts, whereas the No-Web group decreased their use. These data support our hypothesis that use of the Internet intervention would produce fewer fecal accidents and increase the number of BMs in the toilet.

Although it is somewhat difficult to compare findings across studies because of variations in study populations, treatment parameters, and definitions of success, the findings from this study appear to be similar to those using face-to-face, behavioral interventions in combination with medical management. The cure rate of our Internet-based ETT (70%) is on the higher end of the large range (16%–89%) of medical–behavioral treatments that may include biofeedback, reinforcement, or more extensive behavioral techniques. Our No-Web group, who received unspecified routine medical care, had a similar cure rate (45%) to that of the average cure rate of medical interventions (40%) reported by McGrath et al. (2000). Additionally, the rate of significant improvement ( $\leq 1$  accident per week) for our Web and No-Web groups (80% vs. 55%) is similar to what was reported with our face-to-face ETT and intensive medical management groups (85% vs. 45%; Cox et al., 1999). It should be kept in mind when considering the success of the Internet intervention as compared with other successful intervention that this treatment is readily available, at the patients’ convenience and pace.

The children who used the Internet-based ETT were expected to be more knowledgeable than the comparison group regarding anatomy, pathophysiology, and treatment of pediatric encopresis. However, total scores on the Knowledge subscales increased for both groups from pre- to postintervention. This illustrates that the children’s physicians may have been effective in explaining the causes and treatment of encopresis to the children. Similarly, the Bowel Specific subscale scores decreased for both groups on the VECAT, indicating fewer perceived bowel-related problems at postassessment. This illustrates the No-Web group was not a no-treatment group, as additionally reflected in the fact that it had a 45% cure rate.

Numerous assessments were made both during and following the use of the program regarding the participant’s ease of use, enjoyment, understanding, ability to follow through with recommendations, and preference for the program. Individual modules of the program were assessed by the participants, with almost unanimous approval. Some constructive feedback was obtained to further improve the content, performance, and presentation of the material.

On the basis of the results of this study, this Internet intervention was an effective element to the successful treatment of pediatric encopresis in these children. Not only did the program help to significantly reduce the number of accidents the children were having, but it was also delivered in a format the children enjoyed. This system addresses many of the barriers health care professionals face when attempting to treat encopresis. Information that

Table 4  
*Parent Mean (and Standard Deviation) Ratings for Different Elements of U-CAN-POOP-TOO*

Question (no. of times core was accessed)	Core 1 (19)	Core 2 (18)	Core 3 (13)
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
1. How useful was this module? (0–4)	3.84 (0.38)	3.94 (0.24)	4.00 (0.00)
2. How well did you understand the material? (0–4)	3.89 (0.32)	3.89 (0.32)	3.92 (0.28)
3. How well did your child understand the material? (0–4)	3.53 (0.61)	3.28 (1.07)	3.54 (1.13)
4. How much did you enjoy using the module? (0–4)	3.68 (0.48)	3.67 (0.49)	3.69 (0.48)
5. How much did your child enjoy using the module? (0–4)	3.63 (0.76)	3.61 (0.98)	3.46 (1.13)

Note. Core 1 = anatomy and pathophysiology; Core 2 = medication (enemas/laxatives); Core 3 = behavioral intervention.

neither a physician nor a psychologist can typically provide alone was presented in a comprehensive and engaging way. The children seemed to appreciate the program not only for its content but also because it demonstrated that they were not alone with this problem. They were able to obtain the information at their own pace and in their own time, which likely facilitated the significant progress that they made. It also provided an avenue for them to discuss a problem they were often unwilling to examine.

Although the Internet intervention was found to be effective and addresses many barriers to treating encopresis, there are limitations of this study. Fully documenting the nature of care provided by the family physicians would have facilitated comparisons between the Web and No-Web groups as well as better comparison between these findings with published results of other studies. Also, recording 2 weeks of diary data both pre- and postintervention would have provided a clearer means to identifying changes. In addition, it may have been useful to compare treatment outcome of families familiar and not familiar with the Internet, to determine whether Internet familiarity is a limiting factor.

It should also be noted that a hybrid treatment intervention approach, one in which large file sizes are placed on the hard drive (or provided on CD-ROM), was used to reduce download times of graphic intensive files. Although the program shell was accessed on the Web and all data transfer was completed via the Internet, access of the entire program, including the large files, on the Internet would likely necessitate longer download periods when using a phone modem. However, we do not believe these wait times are prohibitive.

This is one of the first studies to empirically evaluate the use of an Internet program to help treat a medical condition. The use of this type of technology to provide information and treatments has both limitations and significant potential (Ritterband et al., in press). There are potential legal issues, such as those involving the provision of treatment to individuals in states where the clinician and/or developer is not licensed to provide services. There is also a significant cost in terms of creating and maintaining such a treatment program that must be effectively addressed with a realistic business plan. However, it has the ability to provide critical information to those who might be unable or unwilling to seek out care they need. It helps bridge the skills of different professionals, who, independently, may not have all the information or tools necessary to successfully treat the problem. With the Internet, information can be obtained whenever professionals, parents, and/or children wish, lag time is practically eliminated, and treatments can be presented in vast detail through the use of not only the written word but also audio and visuals, such as pictures, movies, and animated graphics, to enhance understanding of the disorder. Parents and children may feel empowered by this information, and, while being able to digest the information at their own pace, better use it to enhance treatment efficacy. The cost involved with obtaining access to this information on the Internet is already minimal and continues to decline every day. Finally, this mode of treatment delivery may be much more appealing to children, increasing their willingness to participate and follow treatment recommendations. Future studies need to address the specific financial and psychosocial costs and benefits of this type of approach. In addition, the effectiveness of this form of intervention

with other patient populations as an adjunctive component to other care providers (i.e., psychologists) should be investigated.

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