

Exploring the Relationship between Parental Worry about their Children's Health and Usage of an Internet Intervention for Pediatric Encopresis

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Objective To investigate whether parental worry about their children's health predicts usage of a pediatric Internet intervention for encopresis. **Methods** Thirty-nine families with a child diagnosed with encopresis completed a national clinical trial of an Internet-based intervention for encopresis (www.ucanpooptoo.com). Parents rated worry about their children's health, encopresis severity, current parent treatment for depression, and parent comfort with the Internet. Usage indicators were collected while participants utilized the intervention. **Results** Regression analyses showed that parents who reported higher baseline levels of worry about their children's health showed greater subsequent intervention use ($\beta = .52, p = .002$), even after accounting for other plausible predictors. Exploratory analyses indicated that this effect may be stronger for families with younger children. **Conclusions** Characteristics of individuals using Internet-based treatment programs, such as parental worry about their children's health, can influence intervention usage, and should be considered by developers of Internet interventions.

The growth of the Internet has changed the way many people seek health-related information (Allen & Rainie, 2002). More than 80% of US adult Internet users have searched for health-related information (Fox, 2006), with parents being especially likely to use the Internet for this purpose (Allen & Rainie, 2002). Although most health Web sites provide information to the general public, the number of effective Internet interventions for behavioral and psychological health is growing rapidly (Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006; Marks, Cavanagh, & Gega, 2007; Ritterband, Gonder-Frederick, et al., 2003; Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). These online programs are typically interactive, highly structured, behaviorally based treatments that have been operationalized and transformed for delivery via the Internet (Ritterband, Gonder-Frederick, et al., 2003).

Despite growth in the number of Internet-based health interventions, little is known about whether certain user and program characteristics lead to greater use,

behavior change, and subsequent symptom improvement (Christensen, Griffiths, Groves, & Korten, 2006; Ritterband, 2006). There is some evidence that increased usage of an Internet intervention leads to greater behavior change (Christensen, Griffiths, & Korten, 2002; Tate, Jackvony, & Wing, 2003, 2006; Tate, Wing, & Winett, 2001; Wantland et al., 2004). Greater comfort with the Internet has also been found to be associated with greater engagement with online health resources (Weinert & Hill, 2005). However, a greater understanding of whether specific user characteristics predict intervention use is needed.

Determining which user characteristics predict treatment usage and treatment response can provide information in three key areas: (a) which types of interventions best suit and are most effective for which users, (b) how much support is needed within an intervention for various user types, and (c) which treatment components are most effective for intervention usage and success for which users. Within pediatric Internet interventions, learning which user characteristics predict usage (and ultimately

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behavior change and symptom improvement) will help developers create and ultimately optimize these Internet-based systems. In addition, data on predictors of usage will provide information for further development of a theoretical model for Internet interventions (Ritterband, 2006).

One user characteristic that might be considered to be an obvious predictor of treatment utilization is disease severity, meaning one might expect parents to seek and utilize treatment more often when their children are more symptomatic. Some researchers have found that "objective" indices of disease severity predict greater treatment utilization (Grant, Gil, Floyd, & Abrams, 2000). Others have found that only *perceptions* of disease severity by caretakers predict treatment utilization (Brown, Connelly, Rittle, & Clouse, 2006). While the relationship between disease severity and treatment utilization is complex and may be disease specific, it is, nonetheless, important to examine these user characteristics within Internet interventions.

It has long been recognized that some parent characteristics influence the utilization of traditional health services for children (Newacheck & Halfon, 1986; Riley et al., 1993; Starfield et al., 1985). With few exceptions (e.g., Abidin, 1982; Tessler & Mechanic, 1978), general parental mental health or personality constructs (e.g., trait depression and anxiety) have not been found to predict the use of health services for the children (Kelleher & Starfield, 1990; Ward & Pratt, 1996; Watson & Kemper, 1995). However, specific parental mental health and personality constructs, including maternal worry about their children's health, have been found to be associated with the use of children's health services (Brown et al., 2006; Feigelman, Duggan, & Bazell, 1990; Janicke, Finney & Riley, 2001; Spurrier et al., 2000). Further, maternal worry about their children's health has been found to predict usage even more strongly than mothers' ratings of their children's actual level of health. Greater parental worry about their children's health has been found to predict increased emergency room utilization (Feigelman et al., 1990), parental possession of medications for their children (Maiman, Becker, & Katlic, 1986), and school absences (Spurrier et al., 2000, although see Anthony, Gil, & Schanberg, 2003 for conflicting evidence).

It is possible that parental worry may be even more predictive of treatment usage in Internet-based interventions than in face-to-face interventions. One of the frequently cited advantages of Internet interventions is the additional control given to the user over the availability, timing, and pace of treatment (Griffiths et al., 2006). Worried parents may be more able to access and use

treatment information in an Internet intervention because more control rests with the user and they can avoid barriers associated with more traditional interventions (e.g., timing of appointments, expense, availability of care).

Given previous findings that parental worry had been predictive of traditional health care utilization (e.g., Feigelman et al., 1990), we hypothesized that greater parental worry about their children's health would predict greater usage of an Internet intervention for childhood encopresis. We believed that encopresis severity (as recorded by two indices) would also be predictive, but that parental worry about their children's health would predict intervention usage even after accounting for parent's ratings of encopresis severity. We further hypothesized that current parental treatment of depression would not predict program usage, but expected parent's comfort level using the Internet to be predictive of use. Finally, given that development theories posit that parent attitudes show more of an influence on child self-care behavior at earlier ages (Kopp, 1989), we expected that the families of younger children would show a stronger positive relationship between parental worry about their children's health and program usage than families of older children.

Method

Participants

Data for the current study were collected as part of a larger randomized clinical trial (Borowitz, Ritterband, Magee, Thorndike, & Cox, 2008). Specifically, between 2004 and 2006, 91 families with a child with encopresis between the ages of 6 and 12 were recruited to participate in a national clinical trial of an Internet intervention for pediatric encopresis (www.ucanpooptoo.com). All participants were being seen by a physician or clinical psychologist for treatment of encopresis, had experienced encopresis for >3 months, had more than one bowel accident in the previous 2 weeks, and had regular access to Internet and e-mail. Of the 91 families, 48 (53%) were randomly assigned to receive access to the Internet intervention (UCANPOOPTOO) while continuing to receive routine care as prescribed by their treating clinician (Treatment As Usual [TAU] + UCANPOOPTOO condition). The remaining 43 families (47%) continued to receive routine care as prescribed by their treating clinician (TAU condition). Thirty-nine of the 48 families (81%) assigned to the Internet intervention successfully completed a baseline assessment and thus made up the final sample for this study.

The final sample included 32 boys and 7 girls who on average were 8.28 years old ($SD = 1.92$). The sample of

children was 87.2% Caucasian, 5.1% Native Hawaiian or Other Pacific Islander, 2.6% Black/African American, 2.6% American Indian/Alaska Native, and 2.6% "Other." According to parents' reports, participants had experienced encopresis for an average of 43.37 months ($SD=32.33$) and had 10.24 bowel accidents in the previous 2 weeks ($SD=12.04$). Parents included 38 mothers and 1 father. Parents reported having an average of 15.10 years of education ($SD=2.30$). Finally, *t*-tests and chi-square tests showed no differences on any of demographic or disease variables between the final sample and either experimental participants who did not complete the baseline assessment, or the intervention sample in the larger clinical trial (all *p*'s > .10).

Program Information

The Internet intervention, UCANPOOPTOO, was designed to treat encopresis, which has incidence of 1.5–7.5% in school children aged 6–12 years (Doleys, 1983). The intervention adds to existing non-Internet treatments by reducing the impact of barriers to standard treatment such as clinician time, cost, and lack of comprehensive knowledge about encopresis. The program is designed for children and parents to use together and comprises three main components that are completed online: cores, modules, and follow-ups. The cores cover the three primary aspects of treatment: (a) anatomy, physiology, and pathophysiology of digestion; (b) education on clean-out and laxative treatments; and (c) behavioral treatment for encopresis. All users were instructed to go through the three cores during the first week they had access to the program. Cores provided detailed information through intensive tutorials using graphics and animation, each taking less than an hour to complete.

After completing all three cores, users were instructed to complete weekly online follow-up questions that assessed areas of continued need for intervention. Based on responses to follow-up questions, users were assigned particular modules. Modules covered an additional 22 topics, each taking 5–10 min to review. Modules provided information about a variety of issues, including fears of toilet use; social isolation; administering, adjusting,

and tapering laxatives; diet; hygiene; and preventing relapses. Participants could complete the same modules multiple times if needed or desired. The initial follow-up was administered 1 week after completing the three cores, and additional follow-up questions were completed 1 week after the completion of each previous follow-up (three follow-ups were encouraged as part of the study, but users could continue to complete more follow-ups if desired). To illustrate this process, consider the following example: If the user indicated, in the follow-up questions, that s/he was having difficulties adjusting the dose of laxative and having problems getting the child's school to cooperate with treatment, the Adjusting Laxative and Working With Schools Modules were assigned. All participants received an assessment after 4 weeks of the active treatment. For more information about the program, see Ritterband, Cox, et al. (2003).

Measures

Parental Worry About Their Children's Health

Parents completed a 16-item modified version of the Child Health Questionnaire (Landgraf, Abetz, & Ware, 1996), a widely-used measure of children's physical and psychosocial health with good validity and reliability (Landgraf et al., 1996; Raat, Botterweck, Landgraf, Hoogeveen, & Essink-Bot, 2005). The modified version excludes questions about demographic information and has shown good reliability (National Institute of Child Health and Human Development Study of Early Child Care and Youth Development, n.d.). Four items assessing parental worry about their children's health were analyzed for the current study. Items were chosen that either directly assessed parental worries about their children's health or asked for general perceptions of their children's health that were expected to be largely influenced by worry (see Table I for a list of items, item intercorrelations, and descriptive statistics).

Cronbach's alpha was .82 for the four items, indicating good reliability for the index. Additionally, the item intercorrelations were larger in magnitude than the correlations of the overall index with the number of parent-rated bowel accidents in the last 2 weeks ($r=.07$, $p=.67$, 95% confidence interval [CI] = $-.26$ to $.38$) or parents' ratings

Table I. Inter-correlations and Descriptive Statistics of Items Assessing Parental Worry about their Child's Health

Item	Intercorrelations				Descriptive statistics	
	1	2	3	4	<i>M</i>	<i>SD</i>
1. "I worry about my child's health more than other people worry about their children's health"	–				2.47	1.39
2. "During the past 4 weeks, how much emotional worry or concern did your child's physical health cause you?"	.51	–			2.59	1.39
3. "In general, would you say your child's health is [Excellent, very good, good, fair, poor]"	.53	.51	–		2.03	.78
4. "My child seems to be less healthy than other children I know."	.70	.54	.82	–	1.97	1.11

Note. All correlations are significant at $p=.001$. All items were answered on five-point scales.

of interference due to encopresis for their children ($r = .20$, $p = .22$, 95% CI = $-.12$ to $.49$). Therefore, this four-question "worry index" seems to capture consistent variance above and beyond the measures of the severity of encopresis.

Two measures of encopresis severity were used in this study.

Number of bowel accidents—Parents retrospectively reported the number of bowel accidents their children experienced during the 2 weeks preceding the baseline assessment.

Interference due to encopresis for child—As a second measure of encopresis severity, a mean score was calculated utilizing five items in which parents were asked to rate the interference caused by encopresis (i.e., "During the past 2 weeks, to what extent do you think soiling accidents have interfered with your child's _____ [e.g., school performance]"). These items were administered as part of a general preassessment questionnaire created for the study, which covered a range of questions including demographic information, bowel habits, and interference due to encopresis for the child. Items were selected that estimated the extent to which encopresis interfered with school, social, and family functioning, due to the centrality of these domains to a child's emotional functioning (e.g., Ford, Goodman, & Meltzer, 2004). Cronbach's alpha was .92 for these five items.

Parent Treatment for Depression

Parents' report of whether they were currently receiving treatment for depression was used as a potential predictor of Internet intervention usage. This variable was included to offer a more stringent test of the incremental validity of parental worry about their children's health in predicting usage above and beyond other predictors. A more extensive assessment of depression, treatment history, or other current and past parent psychopathology was not included in this study in order to reduce participant burden. Eleven of 39 (28%) parents reported that they were currently being treated for depression.

Parent Comfort With the Internet

Parents reported their comfort with the Internet using a 5-point scale ranging from 1 = *not comfortable at all* to 5 = *I'm an expert*. The mean comfort level was 3.90 ($SD = 0.72$), falling between *comfortable* and *very comfortable*.

Program Usage

Program usage was operationalized using three behavioral indices of usage: (a) the number of completed cores

(out of three assigned), (b) completed supplemental modules, and (c) completed follow-ups (out of three recommended, although participants could complete more than three). The completion of cores and modules was recorded by the participants' click of the final link at the end of each treatment component. Completion of follow-up questions was determined by participants answering and submitting each item. Participants completed an average of 2.26 cores ($SD = 1.25$, range 0–3), 9.18 modules ($SD = 11.65$, range = 0–36), and 2.59 follow-ups ($SD = 2.55$, range = 0–8). To examine program usage as a single construct, these three indices of usage were converted to a common metric. Individual variable z -scores were computed for each family by comparing each family's score to the overall group mean on each variable (and dividing by the group standard deviation to produce the z -score). The individual variable z -scores were then averaged to create the overall z -score composite score. Cronbach's alpha was .82 for the three individual variable z -scores.

Procedure

Families were referred to the trial of the Internet intervention for pediatric encopresis by their treating clinician. These providers were made aware of the trial through advertising in scientific publications, conferences, professional newsletters, and word of mouth. Study personnel contacted interested parents and conducted a brief phone screening to ensure study eligibility. If families met inclusion criteria, they were asked to read, complete, and sign informed consent and assent forms. A more comprehensive interview was then conducted during which parents reported the number of bowel accidents their children had experienced during the past 2 weeks, whether the parent was currently receiving treatment for depression, and how comfortable the parent was using the Internet. After this interview, participants received an e-mail with login information to the Internet program. They were first asked to complete an online preassessment questionnaire that included items used to assess parental worry about their children's health and how encopresis interfered with various parts of their children's life. Once the preassessment was completed, participants were directed to their homepage, which provided instructions on how to use the program and what sections they needed to complete. At this time, participants were made aware of their assigned study group of either TAU or TAU + immediate access to the Internet intervention. This Internet intervention group was then allowed to use the program, and participants' use was tracked. All procedures were approved by the Internal Review Board at the University of Virginia Health System.

Data Analysis

The main purpose of this study was to examine whether parental worry about their children's health would predict usage of an Internet intervention for pediatric encopresis, and whether it would predict usage above and beyond a range of other possible relevant predictors. A two-step approach to testing this question was taken. First, simultaneous multiple regression was used to examine the contribution of each predictor to usage. We also examined intercorrelations among the predictors to identify the relative independence and overlap of predictors. Second, a hierarchical linear regression was conducted in which parental worry about their children's health was entered in a second step after the variance explained by the other predictors was accounted for in the first step. This test determined if parental worry about their children's health uniquely predicted usage above and beyond the other variables.

Parents' current depression treatment status was coded dichotomously in all regressions, with the depression treatment group coded as 1 and the nontreatment group as 0. Because three variables (i.e., parental worry about their children's health, number of bowel accidents, and interference for the child,) were slightly positively skewed, square root transformations were conducted prior to the analyses to normalize the distributions. The results with transformations, however, showed the same pattern of relationships and only minimal differences in the magnitude of the relationships compared to the original variables. Thus, the original variables are reported to ease interpretability.

Results

Predictors of Program Usage

Figure 1 shows the results of the initial multiple regression. When entered simultaneously, the set of independent variables significantly predicted program usage, [$F(5, 32) = 2.31, p = .03, R^2 = .31$]. For individual predictors, as hypothesized, parental worry about their children's health was a significant predictor of program usage (standardized regression weight of $\beta = .52, p = .002$).

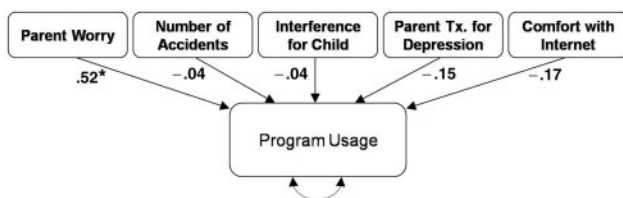


Figure 1. Path diagram of variables predicting program usage.

Somewhat surprisingly, neither the frequency of bowel accidents the child had experienced over 2 weeks ($\beta = -.04, p = .80$) nor how much parents perceived encopresis to interfere with their children's daily life ($\beta = -.04, p = .79$) predicted usage of the Internet program, with both effects showing very small magnitude. As expected, parents who were being treated for depression did not use the program significantly more or less than parents who were not being treated for depression ($\beta = -.15, p = .33$). In contrast to expectations, there was no association between how comfortable parents were with the Internet and how much they used the program ($\beta = .17, p = .26$).

Table II reports the intercorrelations among the predictor variables; the reliabilities of predictor variables are reported where applicable. There were only small relationships between parental worry about their children's health and the other predictors of program usage, with the correlation with interference for the child showing the highest magnitude ($r = .20, p = .22$). These results indicate that parental worry about their children's health can be interpreted relatively independently from the other predictors entered in the multiple regression.

Next, an examination of the relationship of parental worry about their children's health with program usage was conducted to ensure that other predictors did not better account for the relationship. A hierarchical multiple regression was performed in which the severity of encopresis, whether the parent was being treated for depression, and the parent's level of comfort with the Internet were entered as predictors of program usage in a first step. If parental worry about their children's health was accounted for by any of the other variables, then one would expect that entering it in a second step would not add an incremental contribution to the overall variance explained. However, this was not supported. As expected, entering parental worry about their children's health resulted in a significant change in R^2 over the other variables, $R^2 = .31, R^2$ change = .26, $F(1, 32) = 12.04, p = .002$. Thus, using Cohen's (1992) guidelines for interpreting effect sizes, it appears that parental worry about their

Table II. Correlations among the Predictors of Program Usage

Variable	1	2	3	4	5
1. Parental worry about their child's health	(.82)				
2. Number of bowel accidents	.07	–			
3. Interference due to encopresis for child	.20	.26	(.92)		
4. Parent treatment for depression	.00	.20	.19	–	
5. Parent comfort with Internet	–.04	.25	.02	.01	–

Note. All correlations are $p > .10$. Reliabilities are presented in parenthesis for applicable variables.

children's health shows a large, independent relationship to program usage.

Child's Age as a Moderator of the Relationship Between Parental Worry about their Children's Health and Program Usage

In an exploratory analysis, we hypothesized that parent's worry about their children's health would predict program usage to a greater extent for younger children than for older children. To explore whether the relationship between these variables varied according to the child's age, we conducted a hierarchical linear regression in which an interaction term of parental worry about their children's health and children's age was entered in a second step after the main effects of each variable were accounted for in a first step. The second step did not result in a significant change in R^2 over the main effects of each variable, $R^2 = .29$, R^2 change = .02, $F(1, 35) = .91$, $p = .35$. Although the variance explained was not significant, we did find a small effect size for child's age according to Cohen's (1992) guidelines and thus further explored the data purely for illustrative purposes. Specifically, children were split into three age groups of approximately equal size (5–6, 7–9, and 10–12 years), and the correlation for each age group was examined separately. Interestingly, the variables showed a diminishing relationship as age increased. The correlation between parental worry about child's health and program usage was $r = .79$, $p = .002$ for the youngest group ($n = 12$); $r = .54$, $p = .03$ for the middle-age group ($n = 16$); and $r = .24$, $p > .10$ for the oldest group ($n = 11$). While exploratory and not statistically significant, these results suggest that it would be worthwhile for future studies with greater power to test the notion that parental worry about their children's health may show less of a relationship with children's self-care behavior at later ages.

Discussion

The current study extends research on the user characteristics influencing usage of traditional pediatric health interventions (e.g., Janicke et al., 2001) by examining predictors of usage in an Internet intervention for children. The results support the hypothesis that parental worry about their children's health is an important predictor of program usage for an Internet intervention for pediatric encopresis, and this parental worry predicts usage independently of several other factors that might be expected to influence usage, including parents' report of severity of their children's encopresis. In other words, usage may be more motivated by parents' cognitions about

their children's illnesses than parents' judgments of problem severity.

The finding that parent ratings of encopresis severity did not predict usage is somewhat counterintuitive and contrary to our expectations, albeit not entirely unprecedented. Previous studies of traditional health services have not consistently demonstrated that the severity of illness predicts utilization of health care resources (Brown et al., 2006), and in those cases where there has been a positive association, the effects have generally been rather weak. Further, we did not measure bowel accidents prospectively, or ask for child estimates of bowel accidents, which may have shown stronger relationships than parental retrospective estimates of bowel accidents. Nonetheless, while the current nonsignificant relationships must be interpreted cautiously due to relatively low power to detect small effects, the effect sizes were still extremely small, and are consistent with the idea that immediate emotional indicators (e.g., worry) are a relatively stronger influence for parents, while parental estimates of symptom severity (e.g., number of bowel accidents or interference for the child) have somewhat less influence on treatment utilization in this type of intervention. For clinicians assessing the likelihood of Internet treatment utilization among parents, these findings suggest that clinicians should pay attention to *how* worried parents are about symptoms, and not only degree of symptom severity. These findings should also be considered in the development of future pediatric online treatments as they indicate less worried parents may be less likely to engage in treatment, requiring, potentially, additional support to use the system as it is prescribed.

It is important to consider what level of parental worry is adaptive and beneficial to the child, motivating successful usage of Internet interventions, and what levels of parental worry are maladaptive, preventing effective usage of pediatric interventions. Because the current study did not include instruments that would yield diagnoses of clinically elevated worry, such as in generalized anxiety disorder, we are unable to determine the range of parental worry present. We intended to focus on nonclinical levels of worry, allowing greater generalizability to the larger population of parents using pediatric Internet interventions. If the current sample indeed endorsed nonclinical levels of worry, it is possible that the pattern of relationships for parents with clinical worry may be different, as one might expect truly excessive worry to be maladaptive and possibly impair treatment usage. On the other end of the spectrum, parents with abnormally low levels of worry may show little motivation for treatment, leaving their children at risk for

receiving suboptimal doses of treatment. Future research could test the impact of extreme levels of parental worry.

Another issue raised by the current study is the need to disentangle the *quantity* of usage from the *quality* of usage. In the current study, completion of the intervention components (i.e., cores, modules, and follow-ups) was used to operationalize usage. While we believe this is a meaningful conceptualization of usage, the capabilities of the system did not allow for consideration of how engaged participants were with the material when completing it, how much time was spent reviewing the material, or whether usage resulted in actual implementation of content. It will be critical for future studies to tease apart quality of usage from quantity of usage and determine whether parental worry about their children's health shows distinct relations to the two related constructs.

The analyses examining child age, although exploratory, offer intriguing hints about the dynamic between parents and children when engaged in health interventions. While the results were cross-sectional, they may be picking up on a developmental shift in which the impact of parental attitudes on treatment utilization wanes as children age (Kopp, 1989). This will be a crucial area for developers of pediatric Internet interventions to attend to in future interventions, as the optimal balance of information targeted toward parents versus children may need to change according to children's age. Future studies with increased sample size and statistical power should provide a stronger test of this hypothesis.

Limitations and Conclusion

The current study involved a relatively small, largely Caucasian sample, and was not designed to systematically assess clinical levels of parental worry. Generalizing the results to representative samples of other ethnic and mental health groups will be necessary in future research. Nonetheless, the current results are consistent with findings by researchers examining face-to-face health interventions (Janicke et al., 2001) who used larger, more ethnically diverse samples. The current measure of parental treatment for depression was included to provide a more rigorous test for the predictive power of parental worry above and beyond other predictors, rather than to offer a strong investigation of the relationships of parental depression or treatment seeking to usage. Researchers using more comprehensive measures of depression, treatment seeking, and other forms of psychopathology should provide a stronger test of these relationships in the future. Finally, the small sample size of the current study led to low

power and an inability to adequately test other questions such as whether child's age, parental comfort with the Internet, or encopresis severity might interact with parental worry about their children's health to predict program usage. Future research should investigate whether interactions or even curvilinear relationships between parental worry about their children's health and program usage might emerge once these factors are considered.

To our knowledge, this is the first study examining parental worry about their children's health as a predictor of usage in pediatric Internet interventions, and one of very few papers examining whether any type of user characteristic predicts usage in Internet interventions (Christensen et al., 2006). We found that parental worry is a critical construct as it predicted usage above and beyond parent-reported encopresis severity, current parental treatment for depression, and parent comfort with the Internet. Future research evaluating user characteristics within Internet interventions should help determine the clinical importance of such constructs in improving or weakening treatment utilization (and ultimately treatment outcomes) for a range of pediatric problems.

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