Behavioral and Self-Concept Changes After Six Months of Enuresis Treatment: A Randomized, Controlled Trial

Sally Longstaffe, MD, FRCP;* Michael E. K. Moffatt, MD, FRCP;* and Jeanne C. Whalen, MSc

Abstract. Background. Previous studies have suggested changes in self-concept with successful treatment of primary nocturnal enuresis (PNE), but behavioral changes have not been reported as a consistent associated finding.

Objective. To determine if self-concept and behavior change after 6 months of treatment of monosymptomatic PNE by conditioning alarm or desmopressin acetate (DDAVP).

Design. Randomized, controlled trial in an inner-city hospital clinic. Subjects were 182 children referred or recruited through media publicity, randomly assigned both to 1 of 8 pediatricians and 1 of 3 treatment groups (alarm, DDAVP, or placebo). Included were children >7 years old with PNE, no daytime symptoms, bladder capacity >50% expected, and wetting >3 times a week. Excluded were children with central nervous system disorders or developmental delays, and those currently on DDAVP or alarm. Subjects completed the Piers-Harris Children's Self-Concept Scale and Harter's Perceived Competence Scale for Children (PCSC) at initial visit and after 6 months of treatment. Parents completed the Achenbach Child Behavior Checklist (CBCL) at the same times.

Results. After 6 months of treatment the Piers-Harris total score showed a highly significant treatment by period interaction effect for DDAVP, a significant effect for alarm, and no effect for placebo. For children who achieved 75% dryness the CBCL showed a treatment by improvement interaction effect that was highly significant for DDAVP and placebo with no effect for alarm. For the PCSC there were no treatment or outcome interaction effects.

After 6 months of treatment there were significant changes over time unrelated to outcome or treatment in the Piers-Harris Subscales and in the CBCL Internalizing and Externalizing Scores, and the Social Thought and Attention Problems Subscales. The PCSC was more stable with no changes in total score, and positive changes over time in only 2 Subscales, Scholastic and Social.

Conclusion. Children's self-concept improved with the type of treatment and amount of success. Parents' perceptions of behavior improve with type of treatment and amount of success. Children rate their self-concept and some physical attributes better after treatment with any of DDAVP, alarm, or placebo regardless of outcome. Frequent follow-up with emotional support and encouragement appear to be important components of an efficacious intervention for children with nocturnal enuresis. Pediatrics 2000;105:935–940; enuresis, self-concept.

ABBREVIATIONS. DDAVP, desmopressin acetate; PCSC, Harter's Perceived Competence Scale for Children; CBCL, Achenbach's Child Behavior Checklist.

The literature on enuresis has had conflicting conclusions about whether or not this condition is a symptom of an underlying alteration in mental health or a benign self-limited variation in biobehavioral functioning. Early studies suggested that enuretic children are likely to have more behavior problems than their dry counterparts. Results were, however, difficult to interpret because of the presence of selection bias and lack of prospective study design. More recent studies with more representative study samples have shown less difference between enuretic and nonenuretic children with most enuretic children not experiencing behavior problems. It has been shown that enuretic children brought for medical help have more behavior problems and distress than those who do not seek such help. In addition, most studies have not demonstrated symptom substitution with successful treatment. A recent study by Friman et al reviewed records of children with enuresis compared with a sample of children referred with behavior problems, and a nonclinical sample, finding no significant behavioral comorbidity in the enuretic group compared with the clinical sample of children with behavior problems.

Self-esteem is considered an important psychological attribute thought to be associated with mental health. Low self-esteem is seen in various psychiatric disorders. There are concerns that low self-esteem, if present in enuretic children, might be an indicator of present and possible later psychological dysfunction. Social factors associated with enuresis such as missing peer overnight social experiences, and unmet expectations of parents or parental frustration could lead to a child experiencing a feeling of failure, with lower self-esteem. One randomized, controlled trial of behavior and self-concept in a treated group compared with wait list controls showed significantly improved self-concept in the treated group. When the control group was subsequently treated, similar improvement in scores was achieved.
A recent case-control study of self-esteem in children with nocturnal enuresis and daytime incontinence showed impaired self-esteem in patients compared with control children before treatment. Patients improved to the level of controls after 6 months of treatment. Self-esteem was better in those who attained dryness than those with persistent problems. Another recent nonrandomized prospective study showed impaired self-esteem in enuretic children before treatment with improvement after 6 months of treatment.

A case-control study of enuretic children comparing the stress of enuresis with 11 critical life events showed enuretic children ranked the stress of their problem high among all possible critical life events while control children attributed minor importance to nocturnal enuresis as a stressor. The authors concluded that enuresis causes considerable emotional suffering for children.

A randomized, controlled trial measuring behavior problems and self-esteem in enuretic children compared with matched controls before and after long-term enuresis treatment has not been done and would provide additional evidence about the relative importance of treatment in promoting children's well being.

OBJECTIVE

To determine if self-concept and behavior improves after 6 months of treatment of primary monosymptomatic (isolated) nocturnal enuresis by conditioning alarm or desmopressin acetate (DDAVP) nasal spray or placebo.

METHODS

This report represents analysis of a secondary objective of a larger study examining the effectiveness of treatment for nocturnal enuresis. The study was a randomized, controlled trial conducted in a teaching hospital-based ambulatory facility. There were 3 balanced treatment arms: conditioning alarm, DDAVP, and placebo. The pharmacotherapy arms were double-blinded, but the alarm side was open. The randomization scheme used a computer-generated program kept by the hospital research pharmacist. Study personnel had no prior access to the code and assignment to alarm or pharmacotherapy was only revealed after baseline studies were completed. Physicians providing the intervention were ambulatory hospital-based pediatricians who were not the primary care physicians for the patients. There were 8 strata for physician assignment. This was not considered in analysis because for patient convenience, continuity between each patient and assigned physician could not be maintained.

Subjects were recruited by various means including physician advisement, posters, newspaper advertisements, and radio interview. Eligible children were ≥7 years old with monosymptomatic nocturnal enuresis at least 12 times during a 4-week period, with normal urinalysis, no history of fecal soiling and symptomatic nocturnal enuresis at least 12 times during a 4-week period. Children who attained dryness were continued on the original treatment until 12 months after randomized assignment of treatment. Children with nocturnal enuresis and daytime incontinence showed impaired self-esteem in patients compared with control children before treatment.

Informed consent was obtained from the parents and assent was obtained from the children.

Instruments

The Achenbach Child Behavior Checklist (CBCL) was completed by parents. This instrument has been designed to score in a standardized format, children’s competencies and problems as reported by parent or parent surrogates. For each of the 113 specific questions, 1 of 4 possible descriptors is chosen. Satisfactory interrater and test-retest reliability has been demonstrated. There is satisfactory agreement between parents, and stability in test scores over 1- and 2-year periods.

Children completed the Piers-Harris Self-Concept Scale, an 80-item questionnaire that is a quantitative self-report measure of children’s self-concepts. The test has been standardized for use beyond grade 3 reading level. Answers are categorical. Cluster scales are included for the domains of behavior (PH1), intellectual and school status (PH2), physical appearance and attributes (PH3), anxiety (PH4), popularity (PH5), and happiness and satisfaction (PH6). Normative data were collected from a large population of public school children in an American school district in grades 4 through 12. No sex or grade differences have been documented. Threats to validity include distortions to socially desirable responses, acquiescence bias in responses, and random responses for reasons such as lack of understanding or motivation. Analysis of test results can show profiles likely to represent the effect of these response patterns.

The test is recognized as being inappropriate for children who are overly hostile, uncooperative, or severely disorganized in thinking. In addition, caution is suggested in interpreting results in children from institutional settings or from populations of different ethnic or cultural backgrounds from those of the normative sample.

Children also completed Harter’s Perceived Competence Scale for Children. This instrument provides a profile of the child’s estimate of their own competence in the cognitive, social, and physical domains and measures self-worth. Standardization on multiple populations has been done. On each question several choices of descriptors are possible to offset the tendency to give socially desirable responses.

Procedures

Baseline measures included history, demographic data collection, wetting diary, bladder capacity, and night diuresis measurements. The Achenbach CBCL was completed and the Piers-Harris and Harter scales were completed initially and at 6 and 12 months after randomized assignment of treatment. Complete dryness was defined as dry nights in 12 of 14 consecutive nights without later relapse during the first 6-month study period. Other outcomes were 75% dry nights by 6 months on treatment. Diaries of wet and dry nights were maintained by the children under parental supervision and inspected by project staff at study visits (3 weekly for the initial 3 months, then 3 monthly after). Compliance was estimated at each visit after discussion with the children and parents with an estimate of whether the alarm or DDAVP were being used at least 90% of the time. Children were asked to return medication containers to the pharmacist at each visit to monitor compliance. Children with treatment failures at 6 months were given the option of switching to the alternate treatment. Thus, randomized, controlled trial outcomes could only be measured at 6 months. Children who were successful were continued on the original treatment until 12 months.

Data Analysis

The Statistical Analysis (SAS-PC) system was used for data analysis. Changes in the Achenbach CBCL and Piers-Harris Self-Concept Scale as well as the PCSC were compared by repeated measures analysis of variance with scale scores as dependant variables and therapy type, period and success as independent variables. The general linear models procedure (least squares means) was used to assess treatment by time and treatment by
improvement effects. Missing points were excluded from the analysis.

RESULTS

Six hundred seventy-two children were contacted about the study. One hundred eighty-nine of the children were ineligible by the entrance criteria; 296 families declined participation for several reasons (Fig 1). Five children did not return for the randomization visit. One hundred eighty-two children were then randomized with 61 children receiving treatment with the conditioning alarm, 60 with DDAVP, and 61 with placebo. Between 0 and 6 months there were 17 withdrawals who were considered as having treatment failures. At the 6-month period, 53 children continued or had completed treatment with the alarm, 55 with DDAVP, and 57 with placebo (Fig 2). Baseline characteristics of the 2 groups show that the 3 groups were comparable (Table 1).

The Piers-Harris total score showed a highly significant treatment by time interaction effect with or without improvement for DDAVP as measured by change in least squares mean between time 0 and 6 months ($P < .0001$). There was a significant effect for alarm ($P < .02$), but no effect for placebo (Fig 3).

In children who achieved 75% dryness (<7 wet nights/4 weeks), the Achenbach CBCL total score showed a treatment by improvement interaction effect as measured by change in least squares mean between time 0 and 6 months which was highly significant for DDAVP ($P < .0002$), and placebo ($P < .0002$), but not for alarm (Fig 4). For children who did not achieve 75% dryness there were highly significant treatment by improvement ef-

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**Fig 1.** Study enrollment.

**Fig 2.** Treatment randomization.
effects for both DDAVP ($P < .0002$) and alarm ($P < .004$) with no effect for placebo (Fig 5). The treatment by improvement effects were sustained at 12 months in completely dry children who remained on initial treatment over the 12-month study period.

For the PCSC, there were no treatment or outcome interaction effects in any of the treatment groups.

After 6 months of treatment, there were significant positive changes over time unrelated to outcome or treatment in Piers-Harris Subscales PH1 (intellectual), PH2 (physical appearance), PH4 (anxiety), and PH5 (popularity) ($P < .05$). There were similar significant positive changes over time unrelated to outcome or treatment assignment in the Achenbach CBCL, Internalizing and Externalizing Behavior Scores and in the Social, Thought, and Attention Problems Subscales. The PCSC was stable with no changes in total score and positive changes over time in only 2 Subscales: Perceived Scholastic Competence, and Perceived Social Competence (Table 2).

**DISCUSSION**

This is the first randomized, controlled trial of behavior and self-concept changes in a group of enuretic children that included a placebo control group and followed children over a 6-month period. Results in this study suggest improvement both in treated and control children in their own and their parents’ perceptions of their behavior and self-concept with 6 months of treatment regardless of outcome or treatment assignment. It is likely that the attention, support, and reassurance inherent in participation in such a study was beneficial to all participant children. It is also possible that other

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**TABLE 1.** Baseline Comparisons Between Treatment Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Alarm 61</th>
<th>DDAVP 60</th>
<th>Placebo 60</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex-male</td>
<td>48 (78.7)</td>
<td>45 (75)</td>
<td>37 (61.7)</td>
<td>.09</td>
</tr>
<tr>
<td>Firstborn</td>
<td>23 (37.7)</td>
<td>25 (41.7)</td>
<td>20 (34.5)</td>
<td>.7</td>
</tr>
<tr>
<td>Past history, urinary tract infection</td>
<td>8 (13.4)</td>
<td>4 (6.7)</td>
<td>8 (13.8)</td>
<td>&gt;.1</td>
</tr>
<tr>
<td>Constipation ($&gt;3$ days between bowel movement)</td>
<td>14 (24.6)</td>
<td>14 (23.3)</td>
<td>12 (21.4)</td>
<td>.9</td>
</tr>
<tr>
<td>Previous prescription</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid restriction</td>
<td>56 (94.9)</td>
<td>54 (90)</td>
<td>55 (91.7)</td>
<td>.6</td>
</tr>
<tr>
<td>Lifting</td>
<td>54 (90)</td>
<td>52 (86.7)</td>
<td>57 (95)</td>
<td>.3</td>
</tr>
<tr>
<td>Behavioral</td>
<td>32 (53.3)</td>
<td>35 (58.3)</td>
<td>40 (67.8)</td>
<td>.3</td>
</tr>
<tr>
<td>Bladder exercises</td>
<td>2 (3.4)</td>
<td>7 (11.7)</td>
<td>11 (19.0)</td>
<td>.03*</td>
</tr>
<tr>
<td>Conditioning alarm</td>
<td>12 (20)</td>
<td>11 (18.3)</td>
<td>14 (23.3)</td>
<td>.8</td>
</tr>
<tr>
<td>DDAVP</td>
<td>8 (13.3)</td>
<td>13 (21.7)</td>
<td>11 (18.3)</td>
<td>.5</td>
</tr>
<tr>
<td>Imipramine</td>
<td>8 (14.3)</td>
<td>10 (16.7)</td>
<td>9 (15.5)</td>
<td>.9</td>
</tr>
<tr>
<td>Oxybutinin</td>
<td>6 (10.9)</td>
<td>5 (8.6)</td>
<td>5 (8.6)</td>
<td>.9</td>
</tr>
<tr>
<td>Family history</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both sides</td>
<td>21 (36.2)</td>
<td>25 (41.7)</td>
<td>26 (45.6)</td>
<td>.</td>
</tr>
<tr>
<td>One side</td>
<td>24 (41.4)</td>
<td>25 (41.7)</td>
<td>19 (33.3)</td>
<td>.5 (8 df)</td>
</tr>
<tr>
<td>Mother’s education ($\bar{y} \pm SD$)</td>
<td>13.7 $\pm$ 2.3</td>
<td>13.6 $\pm$ 2.2</td>
<td>13.3 $\pm$ 2.5</td>
<td>$F$.43, $P$.7</td>
</tr>
<tr>
<td>Father’s education ($\bar{y} \pm SD$)</td>
<td>13.9 $\pm$ 2.9</td>
<td>13.1 $\pm$ 2.6</td>
<td>13.0 $\pm$ 3.5</td>
<td>$F$.12, $P$.3</td>
</tr>
<tr>
<td>Baseline first morning urine osmolality ($\bar{y} \pm SD$)</td>
<td>829 $\pm$ 216</td>
<td>823 $\pm$ 263</td>
<td>800 $\pm$ 212</td>
<td>$F$.15, $P$.9</td>
</tr>
<tr>
<td>Baseline dry nights (%)</td>
<td>24.7</td>
<td>24.0</td>
<td>24.4</td>
<td>$F$.75, $P$.5</td>
</tr>
<tr>
<td>CBCL total score</td>
<td>55.1 $\pm$ 10.4</td>
<td>57.1 $\pm$ 8.7</td>
<td>56.3 $\pm$ 10.1</td>
<td>$F$.2, $P$.8</td>
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<tr>
<td>Piers-Harris Self-Concept</td>
<td>53.2 $\pm$ 6.0</td>
<td>52.2 $\pm$ 6.7</td>
<td>53.6 $\pm$ 5.9</td>
<td>$F$.8, $P$.7</td>
</tr>
</tbody>
</table>

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**Fig 3.** Treatment and period effects on self-esteem.
factors separate from the study were operative in influencing the results over time. The previously demonstrated stability of CBCL scores over time would not support a simple maturation or test-retest effect over time. The Piers-Harris Self-Concept Scale and PCSC have been examined less for stability over time.

The treatment by time interaction effect on the Piers-Harris Self-Concept Scale in both treatment groups but not the placebo group lends support to the beneficial effect of the treatment process on self-esteem.

Changes in parental perception of their children’s behavior as measured by the Achenbach CBCL suggest a relationship between type of treatment and success of treatment particularly for DDAVP where there was a highly significant relationship for children who achieved 75% dryness. It is not clear why in the alarm group, a less consistent treatment by improvement effect, was present or why the children on placebo who became >75% dry showed highly significant improvement in parental perceptions of behavior. It is possible that parental perceptions of behavior are influenced by the amount of effort required for the treatment. The placebo and DDAVP both require minimal investment of time or energy for the child or parent while the alarm requires commitment, sleep deprivation, and inconvenience for both children and parents.

The lack of treatment or improvement interaction effects for the Harter Scale suggests that children may not necessarily view themselves as more com-

![Fig 4. Effects on child behavior of treatment and improvement in dryness in children ≥75% dry.](image)

![Fig 5. Effects on child behavior of treatment and improvement in dryness in children <75% dry.](image)
These results lend weight to the importance of treatment in fostering emotional well-being in enuretic children. Additional studies are needed to clarify these relationships further.

ACKNOWLEDGMENTS

This research was supported by a grant from the National Health Research and Development Program (NHRDP) and Ferrering Inc (provider of the desmopressin acetate).

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REFERENCES


<table>
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<th>TABLE 2. Positive Score Changes Over Time</th>
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<tr>
<td>Piers Harris Self Concept Scale</td>
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<tr>
<td>PH1 (intellectual)</td>
</tr>
<tr>
<td>PH2 (physical appearance)</td>
</tr>
<tr>
<td>PH4 (anxiety)</td>
</tr>
<tr>
<td>PH5 (popularity)</td>
</tr>
<tr>
<td>Achenbach CBCL</td>
</tr>
<tr>
<td>Externalizing Behavior</td>
</tr>
<tr>
<td>Internalizing Behavior</td>
</tr>
<tr>
<td>Social Problems</td>
</tr>
<tr>
<td>Thought Problems</td>
</tr>
<tr>
<td>Attention Problems</td>
</tr>
<tr>
<td>PCSC</td>
</tr>
<tr>
<td>Scholastic Competence</td>
</tr>
<tr>
<td>Social Competence</td>
</tr>
</tbody>
</table>

* P < .05; ** P < .01.

petent even they have more positive opinions of themselves. The physical and cognitive self-competence components of the PCSC may be measures that might not be seen as different by a child even although control of enuresis had been achieved. Additional studies are needed to explore these relationships further.

Our study would have been enhanced by inclusion of a wait list group of control children. This would have allowed assessment of behavior and self-concept in children who were not subject to the emotional support of participation in the study. Another potential weakness in the possibility of selection bias because of the large number of children and families who declined to participate. Depending on the characteristics of these children and families, their inclusion in the study might have influenced the results. There was no analysis according to degree of compliance.

CONCLUSION

Children rate their self-concept and some personal attributes better after treatment with any of DDVP, alarm, or placebo regardless of outcome. Parents perceptions of behavior improve with treatment regardless of outcome.

Children’s self-concept improved with the type of treatment and amount of treatment. Parents’ perception of behavior improve with the type of treatment and amount of improvement. Children treated with DDAVP showed the most consistent and highly significant change in both more and less successfully treated children. Given the positive responses on most measures over time, it appears that frequent follow-up, emotional support, and encouragement are important parts of intervention for this group of children.
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