

*INCREASING ACCURACY AND DECREASING LATENCY  
DURING CLEAN INTERMITTENT SELF-CATHETERIZATION  
PROCEDURES WITH YOUNG CHILDREN*

JENNIFER J. McCOMAS

QUEENS COLLEGE/CUNY

JOSEPH S. LALLI

UNIVERSITY OF PENNSYLVANIA SCHOOL OF MEDICINE

AND

CHRISTIAN BENAVIDES

THE GRADUATE SCHOOL AND UNIVERSITY CENTER OF CUNY

We examined the effects of simulation training on performance of clean intermittent self-catheterization procedures with 2 young girls. Simulation training was conducted, after which independent performance was assessed within a multiple baseline design. The training resulted in increased accuracy and decreased latency for both girls.

DESCRIPTORS: intermittent self-catheterization, simulation training, compliance with medical procedures, pediatric psychology, behavioral medicine

Incorrect technique or failure to catheterize can result in serious medical problems, including permanent damage to the kidneys and social stigmatization related to urinary incontinence. Since clean intermittent self-catheterization (CIC) was introduced in the medical literature, it has been advocated as the treatment of choice for persons with neurogenic (Wolraich, Hawtry, Mapel, & Henderson, 1983) and other bladder dysfunction. Simulation training has been successfully used to improve the accurate completion of CIC and other medically self-administered procedures (Neef, Parrish, Hanigan, Page, & Iwata, 1989; Reimers, Vance, & Young, 1995), yet the effects of simula-

tion training on variables other than accuracy are unknown. We conducted this investigation to extend previous experiments that focused on accuracy by examining the effects of simulation training on both (a) accurate performance and (b) latency to perform CIC procedures for 2 young girls.

## METHOD

### *Participants and Setting*

Two 5-year-old girls with normal intelligence had been referred by their urologists for intensive instruction in CIC procedures on a pediatric inpatient unit. Prior to this investigation, both participants had been catheterized several times and had received preliminary training in CIC procedures by nurses but refused to complete the procedures. Denise was born with spinal lipoma with secondary complications, including bilateral reflux and frequent kidney infections. Kelly had been involved in a motor vehicle accident that crushed her pelvis and neces-

---

We thank John Parrish for his helpful suggestions at the beginning of this investigation and to the nursing staff for their assistance. Copies of individualized task analyses and procedural details are available from the first author upon request.

Address correspondence to Jennifer J. McComas, Department of Psychology, Queens College/CUNY, 65-30 Kissena Blvd., Flushing, New York 11367-1597.

sitated reconstructive surgery to repair several of her abdominal organs and her pelvis. The surgery included a urinary diversion that allowed urine to drain through a surgically created hole in her abdomen. The study was conducted in a semiprivate room with catheterization supplies stored in a bedside table.

#### *Target Behavior, Data Collection, and Design*

Individualized task analyses of the steps for the CIC procedure were developed for each participant. Denise's task analysis was separated into three components, each similar in difficulty (31 steps; 9 to 11 steps per component). Kelly's task analysis (24 steps) was not separated into components. For both girls, data were collected at least twice per day, 5 days per week during baseline, treatment, and follow-up, and at least weekly after discharge. The data reflected (a) accuracy, defined as the percentage of steps completed correctly in the required sequence without any prompts or assistance, and (b) the latency in seconds to begin each step. At the end of each probe, the mean latency was calculated. A registered nurse was always present to offer guidance if needed and was the only experimenter present during several probes. The nurse and the first author conducted probes, collected data, and served as instructors. Exact interobserver agreement data were collected on the percentage of steps completed accurately and the number of seconds to begin each step during at least 27% of the probes across conditions ( $M = 87\%$ ; range, 79% to 100%). The effects of training were evaluated for Denise via a multiple baseline design across skill components and a nonconcurrent multiple baseline across participants.

#### *Procedure*

During all probes, the nurse intervened if necessary to prevent injury or infection. All

probes began with the instructor asking the participant to do her best. The instructor did not provide any additional direction or feedback. A general praise statement was provided after each probe (e.g., "Good job!"). Following baseline, each participant was trained to conduct the procedures on a simulation doll. In addition, for Kelly, a tape "flag" was attached to the catheter 12 cm from the end to be inserted to prevent her from inserting the catheter too far. Training sessions were conducted until each participant conducted the procedure with 100% accuracy (seven and two sessions for Denise and Kelly, respectively). When Denise correctly completed all steps within a component for at least two consecutive probes, the instructor began training in the next component (in backward chain fashion beginning with Component 3). Follow-up probes were collected in the hospital, in school, and at home during the 4 weeks following discharge for Denise and 2 weeks after discharge for Kelly. In addition, generalization was assessed for Kelly by collecting data each time she performed the procedure in the presence of a new person (e.g., parent, teacher).

## RESULTS AND DISCUSSION

Denise's mean accuracy (percentage of steps performed correctly) increased from 53%, 66%, and 75% of steps in baseline to 95%, 98%, and 97% in treatment and 99%, 99%, and 100% in follow-up for Components 3, 2, and 1, respectively (top three panels of Figure 1). Denise's mean latencies in baseline were 63 s, 36 s, and 7 s in Components 3, 2, and 1, respectively, with the data showing an increase across probes in Components 2 and 3. After training, her mean latencies decreased to 5 s, 28 s, and 0 s and were 0 s, 6 s, and 0 s in follow-up.

Kelly's accuracy improved from a mean of

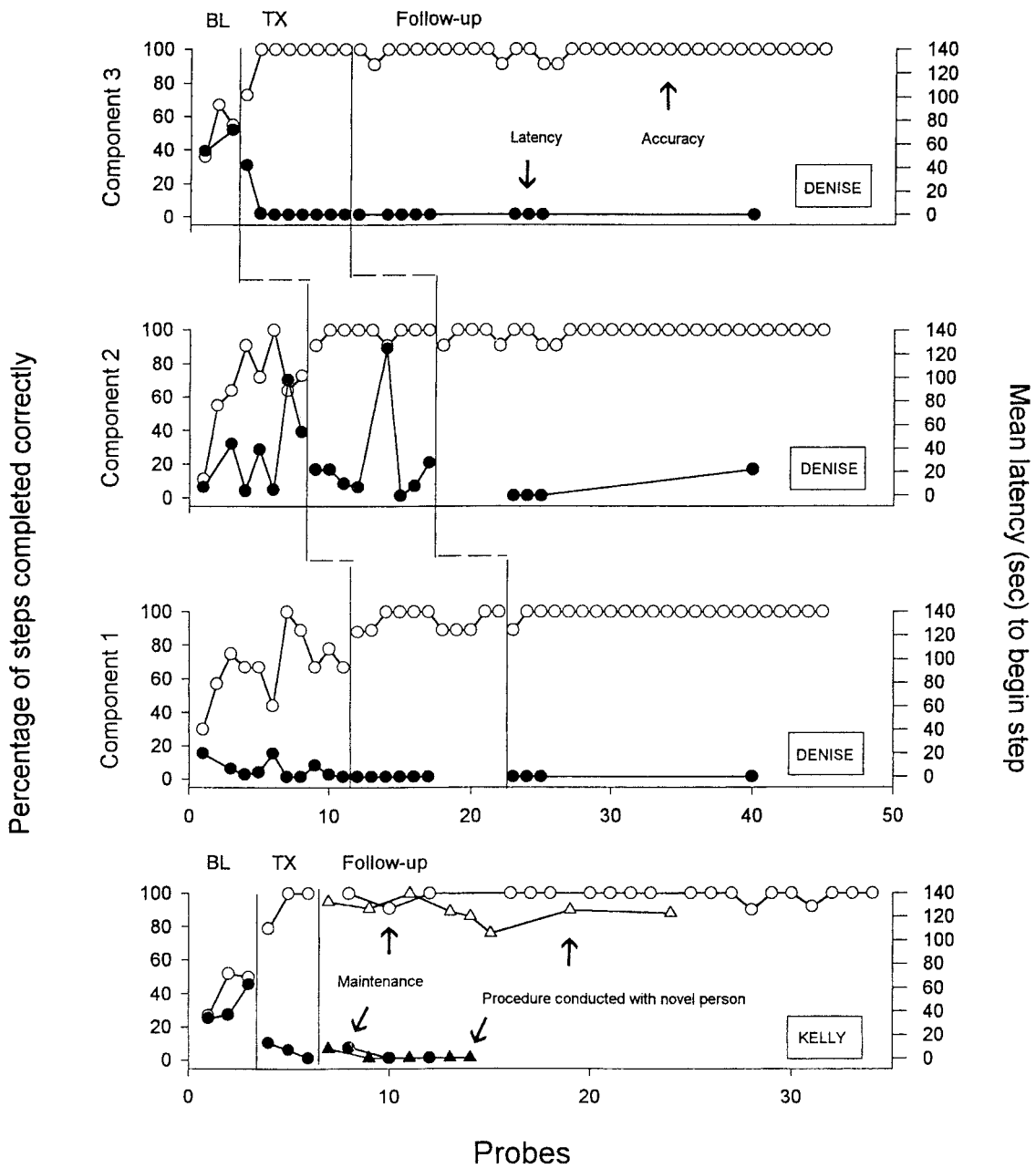


Figure 1. Percentage of steps completed accurately and mean latency in seconds to begin each step in each of the three components of the 31-step CIC procedure for Denise (top three panels) and percentage of steps completed accurately and mean latency to begin each step for Kelly (bottom panel).

43% of the steps during baseline to 93% in treatment. The mean latency during baseline was 45 s, with an increasing trend (bottom panel of Figure 1) that decreased after training. Further, Kelly performed the steps with

a mean accuracy of 80% and a latency of 3 s when she completed the procedures with a new person, and maintained accuracy at 99% and latency of 2 s over several follow-up probes. During probes in which only the

nurse was present, it was not feasible for her to collect latency data; therefore, there are probes in which no latency data are displayed. Follow-up reports from parents and school personnel indicated that both girls continue to conduct the procedures with good integrity. Of particular note, Denise's urologist reported that Denise has had fewer kidney infections and that, due to the success of the CIC regimen, he was able to perform surgery to increase the capacity of her bladder.

Improved accuracy and latency occurred with very few training sessions, each less than 60 min long; thus, results were produced with a small investment of time. Generalization probes indicated that accuracy in Kelly's first performance with a novel person was slightly lower than in subsequent sessions with those persons.

The results of this study extend previous research by demonstrating that simulation training can result in improvement in two dimensions of performance: accurate and timely completion of invasive medical procedures. The findings are limited somewhat

because both participants demonstrated some improvement in accuracy during baseline, compromising interpretation of the results. In addition, the effects of simulation training were not compared to other training methods. Nevertheless, the sharp and sustained increase in correct responding immediately following simulation training provides a credible impetus for continued research on this form of medical self-care training.

#### REFERENCES

- Neef, N. A., Parrish, J. M., Hannigan, K. F., Page, T. J., & Iwata, B. A. (1989). Teaching self-catheterization skills to children with neurogenic bladder complications. *Journal of Applied Behavior Analysis*, *22*, 237–243.
- Reimers, T. M., Vance, M. D., & Young, R. J. (1995). Teaching self-administration of nasogastric tube insertion to an adolescent with Crohn's disease. *Journal of Applied Behavior Analysis*, *28*, 231–232.
- Wolraich, M. L., Hawtry, C., Mapel, J., & Henderson, M. (1983). Results of clean intermittent catheterization for children with neurogenic bladders. *Urology*, *23*(5), 479–482.
- Received July 24, 1998*  
*Initial editorial decision September 17, 1998*  
*Final acceptance November 22, 1998*  
*Action Editor, Patrick C. Friman*