

BRIEF PROBES: A METHOD FOR ANALYZING  
THE FUNCTION OF DISRUPTIVE BEHAVIOUR  
IN THE NATURAL ENVIRONMENT.  
EXTENDED REPORT.

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Running Head: "Functional Analysis in the Natural Environment"

## **Abstract**

The present study illustrates the use of brief functional analysis probe conditions to verify the results of a descriptive assessment. An initial descriptive assessment of the disruptive behaviour of an 8-year old student with severe developmental disabilities showed that levels of disruptive behaviour (screaming and throwing equipment) were higher in some lessons than others and suggested that the behaviour might be maintained by escape from task demands. An intervention in which work demands were alternated with 5-minute periods of free activity reduced levels of screaming to under 50%, and of throwing to under 25%, of baseline levels. Brief experimental variations of demand level in some lessons confirmed that levels of disruption were generally higher under high demand conditions. We conclude that brief probes provide a method by which experimental analyses can be conducted in the client's natural environment, reducing the problem of non-occurrence of the target behaviour which can pose problems for analogue assessments and facilitating ongoing assessment during initial intervention. We note also however that the consequent reduction in control over establishing operations may reduce the precision of the analysis and that ethical considerations limit the range of behaviours for which the method is appropriate.

Keywords: functional analysis, severe developmental disabilities, disruptive behaviour, natural environment.

## **Introduction**

In recent years researchers have attempted to adapt functional analysis methodologies to the time and resource constraints typical of clinical settings. Wacker and his colleagues (Wacker et al., 1994) have developed brief functional analysis procedures typically comprising a single session using the methods of Iwata et al. (1982) followed by a brief evaluation of hypotheses derived from that analysis in a mini-reversal or multielement design. Results from such methods correspond with those from extended functional analyses in over 60% of cases (Kahng & Iwata, 1999), but these brief analyses fail to identify the functions of challenging behaviours in over 30% of cases, most commonly because the client shows no challenging behaviour during the assessment (Derby et al., 1992). Experimental analyses conducted in settings and by personnel other than those of the client's everyday environment may yield undifferentiated results because specific establishing operations, discriminative stimuli, and reinforcers occasioning or maintaining the problem behaviour in the natural environment are not replicated in the analogue environment (see, e.g., Carr, Yarbrough & Langdon, 1997; Richman & Hagopian, 1999; Ringdahl & Sellers, 2000). Carr, Yarbrough and Langdon (1997) and Vollmer and Smith (1996) have recommended use of descriptive analyses to identify relevant stimuli for incorporation into experimental analyses. An alternative strategy is to implement an experimental analysis in the client's natural environment. Sigafos and Sagers (1995) described a brief "discrete-trial" approach to functional analysis of the problem behaviours of two children with autism which was implemented in the children's regular classroom by their teacher. More recently, Anderson and colleagues (Anderson & Long, 2002; Freeman, Anderson & Scotti, 2000) have described the use of a structured

descriptive assessment method in which carers are asked to systematically and repeatedly implement in the client's natural environment antecedent conditions similar to those typically used in experimental analyses (e.g. task demands, reduced attention levels, or withdrawal of preferred objects), but without systematic control of consequences following challenging behaviour. In this paper we illustrate the use of an approach which is conceptually related, but so far as we are aware procedurally novel, namely brief functional analysis probe conditions implemented by the client's regular carers in the course of an intervention.

## **Method**

### *Participant*

The participant was Beth, an 8-year old female with severe developmental disabilities attending a residential school for children with challenging behaviour associated with autism and/or severe learning disabilities. Beth was independent in basic self-care skills such as eating, dressing and toileting, but required support in washing, bathing, and more advanced self-care skills. She spoke in simple sentences, understood multi-step instructions, and could name people and objects in pictures. Assessment using the AAMR Adaptive Behavior Scale- School (2<sup>nd</sup>. Edition) (Lambert, Nihira & Leland, 1993) yielded Part One domain standard scores of 10 for "Independent Functioning", 17 for "Physical Development", 11 for "Language Development", and ranging between 6 and 9 for other Part One domains. Beth's Part Two domain standard scores were 7 for "Social Behavior", 6 for "Conformity", and between 8 and 11 for other Part Two domains. Her challenging behaviours included frequent episodes of screaming and throwing equipment

in the classroom and, less frequently, physical aggression towards others including hitting and kicking.

#### *Recording and assessment methods*

Beth's teacher and care staff had initially identified six behaviours of concern. These were fidgeting/rubbing (defined as rapidly moving backwards and forwards when sitting on a chair or other hard surface), placing her hands down her trousers, crying and screaming, exposing herself or removing clothes, throwing objects, climbing on top of furniture, and physical aggression (defined as hitting, kicking, pinching, or pulling the hair of other people, or pushing furniture over). Throughout the study, her teacher recorded the number of episodes of each of these behaviours during each fifteen-minute interval during the school day. A copy of the recording form used is given at Appendix A. Frequency recording was used during primary data collection because this was the only method with which the teacher was familiar. Since for several of the above behaviours duration as well as frequency was of clinical interest, and also in order to obtain a measure of acceptable reliability (see below), the data obtained from the teacher's recordings was reduced to a measure of the occurrence or non-occurrence of each behaviour in each 15-minute interval, i.e. effectively to a 15-minute partial interval record, and the data were then analysed in terms of the number and percentage of intervals in which each behaviour occurred.

During a two-week baseline period, (i.e. ten school days) the teacher also recorded the activity in which Beth was engaged during each 15-minute interval (see Appendix A). Data were recorded for a total of 180 such 15-minute intervals during the 10-day period.

The results of this assessment showed that Beth was recorded as fidgeting during 16 such intervals (i.e. 8.9% of the total), placing her hands down her trousers during 0 intervals, exposing herself or removing clothing during 1 interval (less than 1% of the total), climbing on furniture during 4 intervals (2.2% of the total), and engaging in physical aggression during 2 intervals (1.1% of the total). In view of their relatively low frequency of occurrence these behaviours were not assessed further in the period covered by this report. Screaming however occurred during 38 intervals (21.1% of the total), and throwing equipment during 28 intervals (15.6% of the total).

Appendix B shows the number of intervals in which Beth was engaged in various school activities and the number and percentage of intervals within each activity in which screaming and throwing were observed. Appendix B also provides a characterisation (based on informal observation) of the typical task demand characteristics of each activity. “High Academic Demand” activities were observed to involve Beth being asked questions by the teacher which required her to sign or speak an answer or independently perform a task such as counting or reading numbers from a card. “Low Academic Demand” activities were observed to involve Beth in passive participation (e.g. listening to a story), or in activities where high levels of assistance (e.g. hand-over-hand guidance) were given by carers, or in situations where no demands at all were made on her. “Break” activities comprised consuming drinks and snacks and unstructured free play.

The data from the initial assessment demonstrated that overall, screaming and throwing equipment occurred at higher levels during activities characterised by higher levels of

academic demand. We hypothesized therefore that the behaviour might be maintained by escape from academic task demands.

The data from the initial 10 days of observation and recording in school were also used as baseline measures of levels of screaming and throwing equipment in order to evaluate the impact of the subsequent intervention.

### *Intervention*

Based on the above assessment, an intervention was implemented in which the classroom teacher was asked during lessons involving high levels of academic demand to alternate academic demands on the participant with 5-minute periods of free activity. Specifically, staff supporting the student in the classroom were asked to ensure that after Beth had engaged in classroom work for approximately 5 minutes she should be allowed to play with toys, or cut paper, (both preferred activities) for 5 minutes before a further 5-minute period of academic work was required. Typically, activities involving high levels of academic demand involved the student working individually, with support from a staff member, at individually set tasks, the materials for which were kept in an individual work-tray. During the intervention, the carer was asked to support Beth to complete one task from her work-tray, usually requiring approximately 5 minutes' work, and then to remove the work-tray from her sight and offer her the choice of toy play or cutting for 5 minutes before replacing her work-tray on the table and prompting her to engage in a further academic task. A reminder sheet (Appendix C) was placed in her school work file to prompt the care staff who normally supported Beth in the classroom to implement the intervention, and the teacher instructed or reminded carers to implement the procedure as

necessary. It was hypothesised that the resultant reduction in the intensity of task demands would reduce escape-maintained disruptive behaviour. The impact of the intervention on the participant's behaviour was evaluated for a further ten whole school days.

### *Experimental Functional Analysis*

In order to verify the results of the descriptive analysis, two sessions of experimental analysis were incorporated within the intervention phase. Each session was one hour long and was conducted between 9.30 and 10.30 am when Maths and English were scheduled in the classroom timetable. In these sessions intervention conditions and continuous presentation of task demands were each implemented for 30 minutes, in counter-balanced order. In intervention conditions, Beth's staff were asked to continue to alternate 5-minute periods of academic demands with 5-minute periods of free activity, as described above. In the alternative condition, Beth's carers were asked to present academic demands continuously as they had during baseline. In this condition, the only breaks from task demands during the session were brief pauses which occurred naturally while staff members recorded Beth's responses to each academic task.

### *Follow-up*

Following the above monitoring, the intervention continued, and twelve weeks after the end of the previous recording the student's behaviour was again observed for five full school days.



### *Inter-observer reliability*

Inter-observer agreement was assessed by having a second observer record Beth's behaviour during eight one-hour sessions (four during baseline, two during the initial intervention, and two at follow-up), all on separate days. The second observer was an Assistant Psychologist holding a bachelor's degree in psychology. The original recording involved a frequency count of each of the behaviours originally described as of concern within 5-minute periods (see Appendix D for a copy of the recording form). In order to assess the level of agreement between the teacher and the second observer, however, the second observer's data were also reduced to a measure of the occurrence or non-occurrence of screaming and throwing within 15-minute periods corresponding to those of the teacher's records. Inter-observer agreement was calculated by dividing the number of 15-minute periods in which the teacher and second observer agreed on the occurrence or nonoccurrence of a behaviour by the number of such agreements plus disagreements and expressing this figure as a percentage. Mean inter-observer agreement for screaming was 84% (range 75-100%) and mean inter-observer agreement for throwing was 72% (range 50-100%). Cohen's Kappa (calculated across all observations for each behaviour) was 0.64 for screaming and 0.4 for throwing. It should be noted that while Fleiss (1981) argues that a kappa value of 0.4 represents the lower limit of acceptable agreement, other researchers using observational methods have taken 0.6 as the minimal acceptable value (see, e.g., Emerson, Reeves, Thompson, Henderson, Robertson & Howard, 1996).

## **Results**

As shown by Figure 1, alternation of work demands with 5-minute periods of free activity reduced screaming from a mean level of 22% of intervals during baseline to a mean level of 10% of intervals during intervention; throwing decreased from a mean level of 13% of intervals during baseline to a mean of 3% of intervals during intervention. These reductions were maintained at follow-up 12 weeks later. The brief probes confirmed that levels of disruptive behaviour returned to baseline levels under high demand conditions in three out of four cases; in the fourth (screaming in the first probe session) no screaming occurred in either high or low demand conditions.

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INSERT FIGURE 1 ABOUT HERE

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## **Discussion**

The antecedent intervention of reducing the level of academic task demands placed on the participant in lessons characterised by high levels of academic demand reduced the mean level of screaming to under 50%, and mean level of throwing to under 25%, of mean baseline levels. Nevertheless, these problem behaviours were not reduced to zero levels, and there is some overlap between baseline and intervention data points. This pattern of results may result from either or both of two factors. Firstly, it is clear from the data collected during the initial descriptive assessment that although overall, Beth's

screaming and throwing of equipment occurred at higher levels during activities characterised as involving high levels of academic demands, there were some hypothesized “high demand” activities (e.g. PHSE in class and communication groupwork) where these behaviours occurred at low or zero levels, and some hypothesized “low demand” activities (e.g. Design and Technology in class and Storytime) in which these behaviours occurred at high levels. This may simply reflect the possibility that our typology of the demand characteristics of these activities (based on informal observation) was inaccurate. It is also possible however that Beth’s screaming and throwing were reinforced not only by escape from academic demands but also by escape from other aversive classroom conditions such as being required to sit passively and that the latter conditions were not explicitly targeted by our intervention. The second factor which may explain the failure of the intervention to reduce levels of screaming and throwing to zero is simply that the intervention reduced, but did not remove completely, task demands placed on Beth. The intervention was implemented only during those classroom activities which were hypothesized to involve high levels of academic demand, and in those activities such demands were alternated with brief periods of free activity rather than being eliminated completely. The impact of the intervention was however evaluated by comparing levels of screaming and throwing in baseline and during intervention using data from observations conducted throughout the whole of the school day, not just during those “high demand” periods when the intervention was actually implemented. Given these factors, the observed results of the intervention in reducing but not eliminating the two problem behaviours was as expected.

The key finding of this study was however that in this situation (not unusual in clinical practice) in which an intervention appeared to have had a positive impact but some level of challenging behaviour continued to occur, that the functional relationship between the intervention and the improvement in the student's behaviour during the intervention phase was demonstrated by the functional analysis probes in which levels of disruptive behaviour were reduced during low demand conditions but generally returned to baseline levels during the high demand condition. The study therefore illustrates a further method for incorporating experimental analyses into interventions conducted within the client's natural environment so as to confirm that treatment effects are functionally related to the intervention procedure.

Nonoccurrence of the behaviour to be assessed is a substantial problem for single-session functional assessments conducted in analogue settings (Derby et al., 1992). In this study too, in one probe session, one behaviour (screaming), was seen in neither high nor low demand conditions, so this difficulty may not be entirely eliminated by implementing the functional analysis within the client's natural environment. Research directly comparing outcomes from analyses conducted in the natural environment and in analogue settings will be necessary to determine which strategy is more frequently successful in demonstrating differentiated patterns of responding across conditions. Embedding brief functional analysis probes within daily routines could also lead to other problems which may be better addressed by analogue environment procedures. Firstly, control over potential establishing operations for reinforcers may be reduced. Secondly, challenging behaviour may be sensitive to brief probes within extended treatment conditions only when the procedure involves manipulation of antecedent variables. Where consequence

manipulations are involved use of brief probe conditions may allow insufficient opportunity for the client's behaviour to contact and respond to the change in contingencies. Finally, the use of experimental analyses in relatively uncontrolled conditions would only be appropriate (as in the present case) with relatively low-risk behaviours. For a behaviour such as self-injury or serious physical aggression, an experimental analysis could be justified only under appropriately controlled conditions.

Despite these limitations, conducting functional analyses in the natural environment, and especially embedded within the treatment phase, may have the advantage of allowing analyses to be continued without repeatedly removing the client from his/her natural setting or delaying the initiation of treatment, and hence may enable more extended and detailed analyses to be conducted (cf. Horner, 1994). The analysis in the present case could for example be extended to determine exactly what it is about demands (e.g. task difficulty or subject matter) that is aversive. The use of brief functional analysis probes within interventions in the natural environment may therefore enable more detailed assessment and hence more individualised interventions in everyday clinical practice.

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**APPENDIX A.**

**BETH X**

**BEHAVIOUR RECORD DATE:** \_\_\_\_\_

Please put a tick in the box **every time** Beth displays any of the listed behaviours writing the activity (including lesson if in class) in the left hand column provided.

**Definitions**

**Fidgeting/Rubbing** = when sitting on a chair or other hard surface Beth will move quickly backwards and forwards on the chair

**Physical Aggression** = hitting, kicking, pinching, hair pulling, pushing furniture over

	Fidgeting/ Rubbing	Hand down trousers	Crying/ Screaming	Exposes self/remov es clothes	Throws objects (specify)	Climbs on top of furniture	Physical aggression (specify)
09.00-09.15 AM Activity:							
09.15-09.30 AM Activity:							
09.30-09.45 AM Activity:							
09.45-10.00 AM Activity:							
10.00-10.15 AM Activity:							
10.15-10.30 AM Activity:							
10.30-10.45 AM Activity:							
10.45-11.00 AM Activity:							
11.00-11.15 AM Activity:							
11.15-11.30 AM Activity:							

	Fidgeting/ Rubbing	Hand down trousers	Crying/ Screaming	Exposes self/remov es clothes	Throws objects	Climbs on top of furniture	Physical aggression
11.30-11.45 AM Activity:							
11.45-12.00 PM Activity:							
12.00-12.15 PM Activity:							
12.15-12.30 PM Activity:							
<b>LUNCH BREAK</b>							
01.30-01.45 PM Activity:							
01.45-02.00 PM Activity:							
02.00-02.15 PM Activity:							
02.15-02.30 PM Activity:							
02.30-02.45 PM Activity:							
02.45-03.00 PM Activity:							
03.00-03.15 PM Activity:							
03.15-03.30 PM Activity:							

**APPENDIX B.**

NUMBER OF 15-MINUTE BASELINE INTERVALS IN VARIOUS SCHOOL ACTIVITIES, AND NUMBER AND PERCENTAGE OF INTERVALS IN EACH ACTIVITY IN WHICH SCREAMING AND THROWING EQUIPMENT WERE OBSERVED.

Activity	Demand level	Total intervals	Number (percentage) intervals with screaming	Number (percentage) intervals with throwing
Maths	High	8	4 (50%)	4 (50%)
PHSE (in class)	High	4	0 (0%)	2 (50%)
Communication groupwork	High	4	0 (0%)	0 (0%)
English	High	8	4 (50%)	3 (37.5%)
Science	High	8	5 (62.5%)	4 (50%)
<b>TOTAL HIGH DEMAND</b>		32	13 (40.6%)	13 (40.6%)
Maths (counting/singing)	Low	4	0 (0%)	0 (0%)
PHSE (minibus trip)	Low	4	1 (25%)	0 (0%)
Sex Education	Low	4	1 (25%)	1 (25%)
Art	Low	8	2 (25%)	1 (12.5%)
Minibus Trip	Low	8	3 (37.5%)	1 (12.5%)
School Assembly	Low	8	1 (12.5%)	0 (0%)
Design & Technology (in class)	Low	4	3 (75%)	2 (50%)
Design & Technology (baking)	Low	4	0 (0%)	1 (25%)
Careers	Low	8	1 (12.5%)	1 (12.5%)
Storytime	Low	4	4 (100%)	1 (25%)
Soft Play	Low	10	1 (10%)	0 (0%)
“Good Morning” routine	Low	20	6 (30%)	3 (15%)
Leisure Activity	Low	4	2 (50%)	1 (25%)
Music	Low	8	0 (0%)	0 (0%)
History/Geography	Low	4	0 (0%)	0 (0%)
<b>TOTAL LOW DEMAND</b>		102	25 (24.5%)	12 (11.8%)
Breaktime	Break	46	0 (0%)	3 (6.5%)
<b>TOTAL BREAK</b>		46	0 (0%)	3 (6.5%)
<b>ALL ACTIVITIES</b>		180	38 (21.1%)	28 (15.6%)

APPENDIX C.

INTERVENTION REMINDER SHEET.

When Beth has completed one piece of work from her orange file she is allowed to cut or have a toy for 5 minutes before starting another piece of work.

**APPENDIX D.**

**BETH X**

**BEHAVIOUR RECORD DATE:** \_\_\_\_\_

Please put a tick in the box **every time** Beth displays any of the listed behaviours writing the activity (including lesson if in class) in the left hand column provided.

**Definitions**

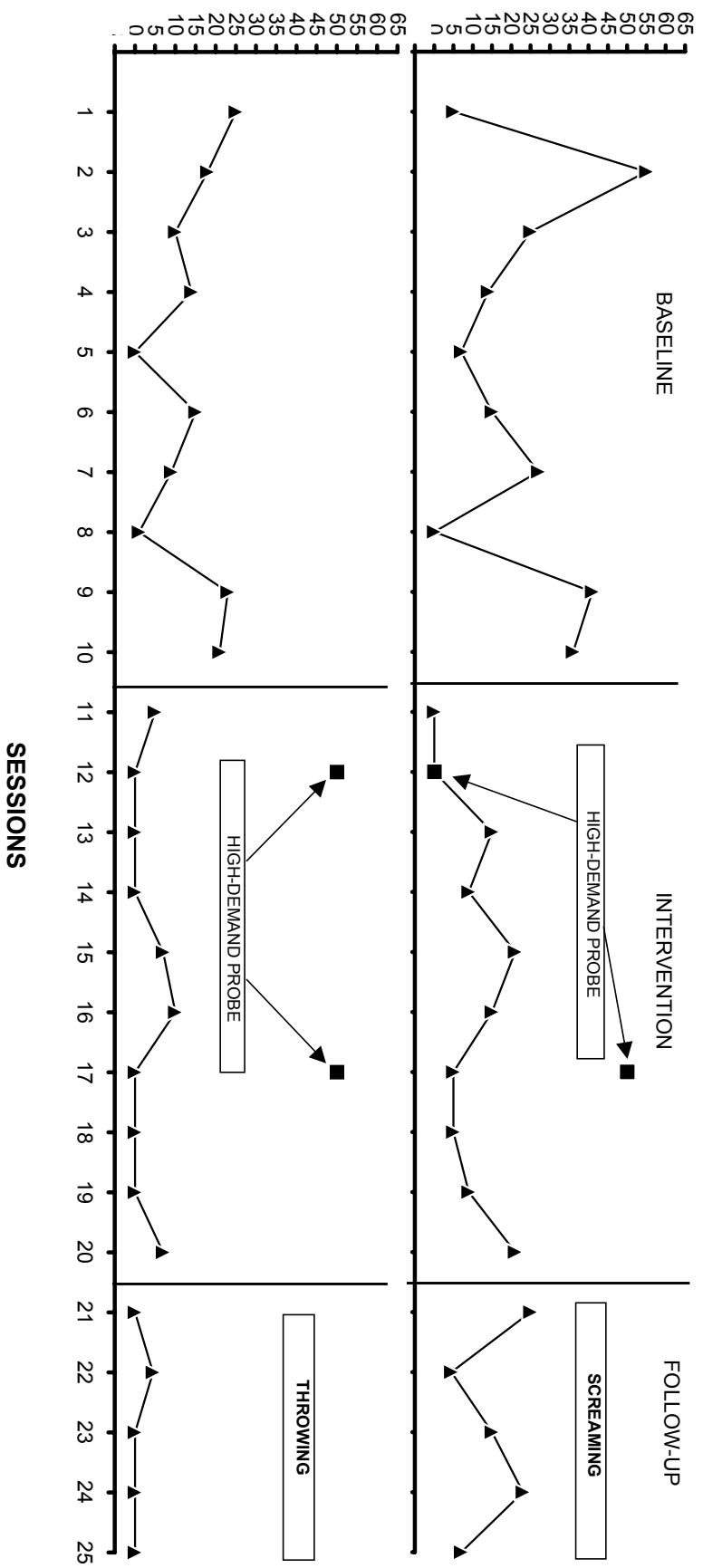
**Fidgeting/Rubbing** = when sitting on a chair or other hard surface Beth will move quickly backwards and forwards on the chair

**Physical Aggression** = hitting, kicking, pinching, hair pulling, pushing furniture over

	Fidgeting/ Rubbing	Hand down trousers	Crying/ Screaming	Exposes self/remov es clothes	Throws objects (specify)	Climbs on top of furniture	Physical aggression (specify)
11.30-11.35 AM Activity:							
11.35AM Activity:							
11.40 AM Activity:							
11.45AM Activity:							
11.50AM Activity:							
11.55AM Activity:							
12.00AM Activity:							
12.05 AM Activity:							
12.10AM Activity:							
12.15AM Activity:							

	<b>Fidgeting/ Rubbing</b>	<b>Hand down trousers</b>	<b>Crying/ Screaming</b>	<b>Exposes self/remov es clothes</b>	<b>Throws objects</b>	<b>Climbs on top of furniture</b>	<b>Physical aggression</b>
<b>12.20AM Activity:</b>							
<b>12.25AM Activity:</b>							

Percentage of intervals in which behaviour occurred



**Figure 1.** Levels of screaming and throwing during baseline, reduced-demand intervention (and high-demand probe periods) and follow-up.