CHAPTER 4  EVIDENCE-BASED TREATMENT OF BEHAVIORAL EXCESSES DEFICITS

FUNCTIONAL BEHAVIOR ASSESSMENT

Functional behavior assessment or analysis is the evidence-based foundation of all that follows in the treatment of challenging behavior in those with ASD. Its importance is underscored by the inclusion of this technique at the beginning of this chapter. Simply put, whether the behavior problem is described as self-injury, aggression, food refusal, sleep disorders, pica, or any of a number of other forms of behavior, an analysis of behavioral function is essential. The behavioral treatment of challenging behavior in autism spectrum disorders without a prior functional assessment should be questioned in all cases, as it increases the risk of negative effects of treatment and compromised outcomes.

Assessing behavior through data-based collection procedures is a necessary component of applied behavior analysis, facilitating the primary goal of establishing a reliable relationship between the treatment and behavior change. This concept forms the basis for the assessment of challenging behavior in applied behavior analysis. Functional analysis is the procedure by which environmental conditions are manipulated to reliably evoke a target behavior (Carr and Durand 1985; Cooper and Harding 1993; Iwata et al. 1982, 1990, 1994a, b). Based upon the results of these assessments, maladaptive behavior is conceptualized as being motivated by a particular function, thus allowing appropriate interventions to be developed. An important component of functional analytic methodology is that behavior must be understood by its consequences within the environment and not solely by its topography or form (Cooper and Harding 1993). Further, the process of completing a functional analysis often requires attention to individual-specific variables that are systematically programmed for within a more traditional analogue model (Carr et al. 1997; LaBelle and Charlop-Christy 2002). As the research base on various analogue functional analysis procedures expands, consistency among critical components often remains as the majority of functional analysis procedures currently used are based upon the seminal work of Iwata et al. (Herzinger and Campbell 2007).

Functional analysis methodology has been applied to a variety of treatment settings. The original research on these procedures was conducted in highly controlled treatment settings (Carr and Durand 1985; Cooper and Harding 1993; Iwata et al. 1982, 1990, 1994). In these environments, experimenters have exposed participants to repeated treatment conditions in order to establish a reliable relationship between environmental contingencies and the occurrence of a target behavior (Carr and Durand 1985; Cooper and Harding 1993; Iwata et al. 1982, 1990, 1994). Recently, research attention has shifted toward evaluating the use of functional analytic procedures in outpatient settings with less precise and sustained control (Asmus et al. 2002; Cihak et al. 2007; Cooper and Harding 1993; Sigafos and Sagers 1995). This research has provided a great deal of support for brief functional analysis as a means of assessing challenging behavior (Cihak et al. 2007; Cooper et al. 1992; Derby et al. 1994). These assessments follow the same conceptual guides as does extended functional analysis; however, their structure and duration allows for them to be more successfully integrated into outpatient settings.

Empirical Foundations of Functional Analysis

While Carr (1977) established the conceptual foundation for functional analysis, the model for clinical practice is most closely associated with the work of Iwata et al. (1982, 1990) and Carr and Durand (1985).
The methodology developed in these studies has since been widely examined and used extensively in the applied behavior analysis literature (Hanley et al. 2003).

The initial study by Iwata et al. (1982, 1994) utilized four assessment conditions to evaluate self-injurious behavior in nine individuals with developmental disability, ranging in age from 19 months to 17 years and 2 months. The conditions included in the functional analysis were social disapproval, academic demand, unstructured play, and alone. During the assessments, conditions lasted for 15 min and were randomly ordered for each participant. The functional analysis continued until stable levels of responding were observed in each condition or until 12 days of assessment were completed.

The social disapproval condition was designed to replicate contingencies for positive reinforcement in the form of attention for engaging in self-injury. The participant was instructed to play with toys while the experimenter worked. If the participant engaged in self-injury, the experimenter provided physical and vocal attention. The academic demand condition tested for the presence of negative reinforcement contingencies in the form of escape from work for engaging in self-injury. The experimenter ran academic programs appropriate to each participant's ability level. Social praise was delivered after each response whether or not the response was correct. If the participant engaged in self-injurious behavior, the experimenter terminated the learning trial. The alone condition was designed to assess for self-injurious behavior maintained by automatic reinforcement. The participant was left alone without access to attention or tangible items. The experimenter did not provide a consequence for an occurrence of self-injury. Finally, the unstructured play condition served as a control condition for the functional analysis. In this condition, the experimenter provided noncontingent attention and gave no demands. Again, no consequence was provided contingent upon an occurrence of self-injury.

To address individual differences in the topography of self-injury, operational definitions were provided for the self-injury that each participant experienced. Interobserver agreement was calculated to ensure that all observers were able to reliably identify all the topographies of challenging behavior. The results of the Iwata et al. (1982, 1994) study demonstrated that similar topographies of behavior can serve different functions. In their study, the level of responding varied from individual to individual across the assessment conditions. As a result of these data, Iwata et al. (1982, 1994) supported functional analysis as a means of systematically evaluating the stimuli-maintaining behavior and, subsequently, the use of individualized assessment and intervention procedures for self-injurious behavior.

Carr and Durand (1985) confirmed the Iwata et al. (1982, 1994) results, showing that similar forms of challenging behavior can be maintained by different contingencies in each individual. The study evaluated a number of topographies of challenging behavior experienced by four participants, aged 7–14 years, with either developmental disabilities or brain damage. The functional analysis conditions were designed to assess escape and attention motivations for each target behavior. The “easy 100” condition served as the control condition for the analysis. In this condition, the experimenter provided easy demands and attention during 100% of the condition's intervals. In the “easy 33” condition, the experimenter again utilized easy demands but only provided attention during 33% of the intervals. This condition was used to assess for an attention motivation for each target behavior. During the “difficult 100” condition, the participants were given challenging demands and attention during 100% of the
condition's intervals. It was expected that this condition would assess for an escape function maintaining any target behavior.

Consequences were provided for all topographies of behavior in the same manner during each condition. All behavior except darting and responses that risked physical injury were placed on extinction (Carr and Durand 1985). If the participant darted from work and did not return in 10 s, she or he was physically guided back to the table. In cases where physical risk was a concern, the participant's hands were restrained for 5–10 s while the experimenter followed through with the work demands. The results of the functional analyses suggested that the various forms of challenging behavior of the participants were maintained by different environmental contingencies. The data from Carr and Durand (1985) supported those obtained by Iwata et al. (1982, 1994) substantiating functional analysis as an efficient means for evaluating challenging behavior.

Carr and Durand (1985) further supported functional analysis as a means of assessing and treating challenging behavior by implementing functional communication training for each of the participants. The targets of the training were mands for attention and help, consistent with the attention and escape motivations for the forms of challenging behavior. By providing consistent reinforcement for appropriate requests for attention and help, all participants' challenging behavior decreased. Functionally equivalent interventions were thereby supported as the optimal treatment for challenging behavior.

Considerable research has been conducted on functional analysis methodology since the seminal studies by Carr and Durand (1985) and Iwata et al. (1982, 1994). Systematic reviews of the literature on functional analysis have consistently supported the procedure's efficacy in identifying the function or functions of challenging behavior (Hanley et al. 2003; Herzinger and Campbell 2007; Iwata et al. 1994). Hanley et al. (2003) reviewed 575 functional analysis studies, 96% of which rendered usable outcomes. While the functional analysis procedures utilized in typical studies are rarely identical, the basic premise of controlled antecedents and consequences as defined by environmental manipulations has aided in the development of functionally equivalent interventions leading to a decrease in problem behavior and an increase in targeted replacement skills (Hanley et al. 2003; Iwata et al. 1994). The clinical utility of these procedures has been consistently supported, even though they often require significant resources. In a review of 58 articles detailing 106 functional behavioral assessment procedures, Herzinger and Campbell (2007) found that treatments derived from the completion of functional analysis procedures were more successful at treating challenging behavior than were those derived from behavioral assessment procedures that did not include systematic manipulations of environmental contingencies.

Hanley et al. (2003) reviewed the literature to identify trends for best practices in functional analysis methodology. Their review supported the use of functional analysis to study many topographies of challenging behavior in individuals with disabilities of varying severities. While functional analysis has been applied primarily to learners with pervasive developmental disorder or intellectual disabilities, it is important to note that a variety of other mental disorders and mild behavior problems have been included in analyses (Cooper et al. 1990; Doggett et al. 2001).

Critical Issues in the Development of Functional Analysis Conditions

The experimental conditions most prevalent in the literature are based upon those used by Iwata et al. (1982, 1994). These...
Length of sessions. Session duration is an important topic in functional analysis methodology. A number of studies have demonstrated the use of functional analysis in less-controlled settings such as schools and outpatient clinics (Asmus et al. 2002; Cooper et al. 1992; Cooper and Harding 1993; Iwata et al. 2000; Moore et al. 2002; Umbreit 1995). To be applied within these settings, topics related to the efficient application of functional analysis procedures must be considered. A study by Wallace and Iwata (1999) considered the influence of session duration on determining function. A group of 46 individuals participated in functional analyses based on the model described by Iwata et al. (1987, 1994). Tangible conditions were also run for those individuals whose indirect assessment suggested that access to tangible items might evoke the target behavior. The sessions were videotaped and three sets of data were prepared for each participant, by using the first 5, 10, and 15 min of the sessions. Trained independent raters evaluated data from each video. The results rendered strong agreement between the 15- and 10-min sessions and only three disagreements between 15- and 5-min sessions. As a result, shorter session duration was supported as a means for increasing the practical application of functional analysis methodology (Wallace and Iwata 1999).

Functional analysis in diverse treatment settings. The majority of research on functional analysis has been conducted in controlled settings where naturally occurring environmental events are much less likely to influence assessment conditions. One potential result of this structure is that the functional analysis may suggest a relationship that does not exist in the natural environment (Hanley et al. 2003) and may compromise the ecological validity of the findings. In addition, most individuals referred for treatment are not admitted directly to inpatient facilities; typically, intervention attempts on an outpatient basis constitute the first stage of treatment (Cooper et al. 1990). By developing a model compatible with an outpatient treatment facility and using parents during a functional analysis, Cooper et al. (1990) were able to identify the functions maintaining different topographies of challenging behavior and develop successful treatment interventions.

A growing body of research has demonstrated the use of functional analysis procedures in a variety of treatment settings, such as outpatient clinics, schools, and homes (Asmus et al. 2002; Cooper and Harding 1993; Cooper et al. 1990; Dorsett et al. 2001; Lohmann-O’Rourke and Yurman 2001; Umbreit 1995). Often, these procedures incorporate parent or teacher training components (Lohmann-O’Rourke and Yurman 2001) in an attempt to evoke the fewest changes possible to the natural environment. Such procedures have resulted in the completion of functional analyses within naturalistic settings which, potentially as a result of an improved quality of data collection and social validity, may then better inform treatment planning.

Hypothesis-driven condition selection. To help address the time-consuming nature of a full functional analysis, professionals in outpatient and classroom settings may use indirect and direct descriptive data collection methods as practical ways to gain information before constructing the assessment conditions (Asmus et al. 2002; Cooper and Harding 1993; Cooper et al. 1992; Herzinger and Campbell 2007). Asmus, Vollmer, and Borrero offer a model for progressing from initial background data collection procedures and through functional analysis at home and at school. In such models the indirect data collection procedures directly inform decision-making and analysis procedures. Once constructed, functional analysis conditions that are informed by many levels of information collection are typically more easily incorporated into naturalistic environments where trained teachers or parents run the assessment conditions.
The Harding et al. (1994) study achieved improved rates of appropriate behavior in all seven participants. The conditions that evoked improved behavior varied by participant, as did the percentage increase in appropriate responding. Further, experimental control via brief reversals was demonstrated for six participants. All assessments were completed within the 90-min period and allowed for treatment recommendations to be provided to the parents (Harding et al. 1994). Follow-up reports from the parents regarding the implementation of the treatment suggestions indicated a high degree of satisfaction with the treatments derived from the analysis. The model proposed by Harding et al. further supports the use of brief assessment models.

Similar to Cooper et al. (1990) and Harding et al. (1994), Northup et al. (1991) developed a model for brief assessment that could be completed within 90 min and contained a contingency reversal phase. In addition, Northup et al. enhanced the brief analysis model by including the reinforcement of an alternative behavior. The initial analogue assessment conditions (alone, social attention, and escape) followed those outlined by Iwata et al. (1982, 1994). In addition, a tangible condition was included where the participants were granted access to items contingent on an occurrence of the target behavior.

The contingency reversal phase began following the initial assessment. The condition producing the highest amount of the target behavior was repeated; however, in the contingency reversal, a functionally equivalent alternative behavior was identified and reinforced (e.g., providing access to a break, a tangible, or attention for communicating “please”) (Northup et al. 1991). The reversal was achieved by reinstating the contingencies that evoked the highest levels of the target behavior. That is, the challenging behavior was again reinforced and all appropriate behavior was ignored. Finally, the contingency reversal condition was repeated. Northup et al. 1991 both decreased inappropriate behavior during the contingency reversal and increased the target skills. These manipulations were then cited as indications of a potentially effective treatment derived from the analogue functional analysis.

The model proposed by Northup et al. (1991) was partially replicated by Derby et al. (1992). Derby et al. summarized the brief assessments conducted with 79 patients. These assessments, however, were conducted in an outpatient setting with the participant’s parents acting as therapists. The target topographies of behavior were evoked by the assessments in 63% of the cases. Of those assessments, 74% identified the maintaining contingencies and 54% resulted in a decrease in the target behavior. Derby et al. suggested that the brief assessment model was limited to those patients that exhibit the target behavior at high rates. The inability of the assessment to reliably evoke all target behavior could be conceptualized as a limitation of the procedure. Cihak et al. (2007) adapted the models described by Northup et al. (1991) and Vollmer et al. (1993) to implement analyses in community settings. Their strategies provided information that appropriately informed treatment planning and allowed for an evaluation of those procedures likely to evoke therapeutic change and maximize teacher impressions of social validity.

Functional assessment procedures, including indirect data collection, descriptive analyses, and functional analyses, have been consistently supported within the literature as appropriate procedures for identifying the maintaining variables of challenging behavior. This information then informs treatment planning in a reliable fashion. There is increasing evidence that among the broad range of functional
assessment procedures, functional analyses are more effective (Herzinger and Campbell 2007). The use of such procedures, however, remains complicated. This is perhaps most evident in public school settings which often find it difficult to achieve the training and time resources necessary for their implementation (Johnston and O'Neil 2001). As the already substantial empirical foundation for functional analysis methodology continues to expand to offer further iterations of procedures that include brief models, public settings, and caregiver training, the discrepancy between procedures conducted in well-controlled, highly resourced, environments and public settings will continue to decrease.

Functional behavior assessment and functional analysis are well-documented and empirically supported procedures that remain essentially consistent with those described by Iwata et al. (1982, 1994). From this substantial basic and applied research literature, a number of practice parameters emerge, which are presented in Table 4.1.

### Table 4.1 Practice parameters for evidence-based functional behavior assessment for the treatment of problem behaviors in individuals with ASD

1. Each topography of behavior must be operationally defined so that all individuals responsible for participation in the functional analysis can reliably identify an instance of the challenging behavior. Further, functional assessment procedures must collect information on each topography of challenging behavior separately in order to avoid any inappropriate grouping of topographies into response classes. Such grouping requires reliable data indicating equality in maintaining variables.

2. In any functional analysis procedure, all conditions must be fully described with respect to environmental characteristics, antecedent manipulations, consequences to challenging behavior, stimuli to be included in the analysis, session duration, and data collection procedures. Further, while AB models of functional analysis have rendered meaningful findings, ABC models are considered more rigorous. Without a comprehensive description of each condition, implementation errors are likely, thereby nullifying the ability of the analysis to appropriately inform treatment planning.

3. Indirect data collection procedures should be undertaken to thoroughly inform the development of functional analysis conditions. These include procedures such as clinical interviews, rating scales, and archival reviews that are likely to render essential background information on the client. Also, descriptive assessment procedures (e.g., ABC) are often completed to better conceptualize the case and facilitate the development of hypotheses regarding the maintaining variables of the target behavior. These procedures become essential if the functional assessment process do not include an analogue analysis as they offer a useful alternative to achieve direct observation data collection.

4. Measures of procedural fidelity allow researchers and clinicians to verify the integrity of the data collection before making recommendations for treatment planning. Given the complexity of session implementation and data collection, it is essential that all procedures are reviewed consistently.

5. While no consistent standard exists for executing data analysis (e.g., statistical versus visual), it is essential that the functional analysis protocol clearly delineate those procedures to be used so that they may be objectively evaluated.
results indicate clear differences between treatment sessions that provided NCR in the form of social attention or tangible from those where extinction alone was used. Van Camp et al. (2000) compared the effects of fixed-time and variable-time schedules of reinforcer delivery during NCR on the aggressive and self-injurious behavior of two students with severe-to-profound intellectual disability. Results showed that problem behavior in one individual decreased from a baseline of approximately four episodes per minute to near zero by the 40th session, and for the second individual behavior decreased from about 1.5 episodes per minute during baseline to zero by the 50th session. Both schedules were similar in their effectiveness, providing support for the use of variable-time schedules as the clinical situation dictates. Carr et al. (2009) conducted a comprehensive review of research on NCR to treat challenging behavior of individuals with developmental disabilities and concluded that, overall, fixed-time schedules of reinforcer delivery with extinction and schedule thinning were superior to both fixed-time and variable-time schedules with extinction, with the former being identified as well-established as an evidence-based treatment and the latter two as probably efficacious. The efficacy of noncontingent reinforcement procedures for the treatment of a wide range of behavioral topographies and functions has been well established in the literature. Operational components that significantly increase the effectiveness of NCR are shown in Table 4.3.

Table 4.3 Practice parameters for noncontingent reinforcement for the treatment of problem behaviors in individuals with ASD

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<th>Parameter</th>
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<td>1. A functional analysis must first be conducted in order to determine the positive, negative, or automatic reinforcers maintaining problem behavior (Iwata et al., 1982, 1994a, b; Hanley et al. 2003).</td>
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<td>2. A reinforce preference assessment should be completed, and repeated throughout treatment as necessary, in order to determine those stimuli to be used during the NCR intervention (DeLeon et al. 2000).</td>
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<td>3. Noncontingent reinforcement must be presented more frequently than the baseline schedule of reinforcement (Ringdahl et al. 2001; Kahng et al. 2000a, b).</td>
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<td>4. Fixed-time reinforcement schedules combined with extinction and schedule thinning procedures are the most effective, but fixed time schedules incorporating extinction and variable time schedules incorporating extinction are also effective, even as they have a slightly less-conclusive research foundation (Carr et al. 2009).</td>
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<td>5. Adventitious reinforcement can be problematic, and chance pairings of the NCR delivery of reinforcement and the problem behavior should be monitored so that the problem behavior does not increase (Hagopian et al. 1994; Vollmer et al. 1997).</td>
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<td>6. Terminal criteria should be established for NCR (Kahng et al. 2000a, b; Cooper et al. 2007). That is, the amount of time to increase between presentation of stimuli during NCR should be scheduled (schedule thinning) should be accomplished by establishing the final duration of the NCR schedule. Kahng and colleagues (2000) observed that 5 min has become something of a convention in behavior analytic literature, and this duration remains effective. The degree to which this duration effectively matches natural schedules of reinforcement in an individuals' typical environment, and the extent to which behavior gains can be maintained with treatment integrity, remains an area for further investigation.</td>
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excessive daytime sleepiness (e.g., narcolepsy); and circadian rhythm disorders, whereby sleep is structurally normal but occurs at undesirable times (e.g., delayed sleep phase disorders). While sleep disorders can be split, for practical purposes, into those that are medically or organically and those that are behaviorally based, these two considerations frequently co-exist, are influenced by psychosocial and environmental factors, and must be comprehensively assessed prior to development of a treatment plan. Malow and McGrew (2008) discuss the evaluation and treatment of sleep disturbances in autism and recommend that, following determination and treatment of any potential underlying organic cause for the sleep problem (e.g., obstructive sleep disorder or circadian rhythm disorder), behavioral treatments should be the first-line interventions. Their conceptualization of treatment is consistent with earlier recommendations (Wiggs and France 2000) which drew the distinction between the treatment of sleep disorders and sleep architecture, noting that while behavioral interventions often appropriately addressed the former, attention to the latter (which includes a wide range of organic or medical conditions) is essential.

In discussing the research on treatment of sleep disturbances in autism we would reiterate the recommendation of Malow and McGrew (2008) that a thorough review of physical systems be undertaken prior to initiating behavioral treatment. This is important for several reasons, including the possibility of an organic basis may contribute to symptoms and behavior presentation. For example, Malow et al. (2006) documented the effect of adenotonsillectomy on behavioral symptomatology of a 5-year-old girl with autism spectrum disorder with obstructive sleep apnea, reporting significant improvements in alertness, emotional reactivity, and social communication and decreases in tactile sensitivity and repetitive behavior. It is reasonable to consider that reduced upper airway size or muscle tone (as may be observed in children with craniofacial syndromes or Down syndrome, respectively) may also be contributory factors that must be accounted for in the treatment planning process.

In this section, we consider various behavioral interventions that have been used to treat a number of sleep problems in children with autism. There are several caveats, however. As noted earlier, the literature on intervention with children diagnosed with autism spectrum disorders is quite small. A somewhat broader literature evaluating and treating those with other developmental disabilities contributes more conclusively to our understanding of treatment efficacy, particularly where specific evidence-based strategies are applied (e.g., extinction procedures). As such, while we note studies that included people with a diagnosis in the autism spectrum in our review, we believe that it is appropriate to also consider the results of treatment with individuals with different but related neurodevelopmental disorders (e.g., Fragile-X Syndrome or severe intellectual disability) in any evaluation of treatment efficacy.

Extinction and its variants (e.g., graduated and non-graduated extinction procedures) have been studied extensively in typical children (Bramble 1997; Mindell et al. 2006) with consistent success, justifying use as an evidence-based procedure in those without developmental disabilities. Extinction has also been the subject of research in those with autism and related neurodevelopmental disorders. Non-graduated extinction represents a traditional extinction process, whereby the maintaining variable is systematically withheld contingent upon the problem behavior. Thus, in the case of a child who tantrums for social attention by an adult after being put to bed, removal of the social attention constitutes non-graduated extinction. In an early study with a 3-year-old with autism,
Wolf et al. (1964) used such an extinction procedure that also included a structured bedtime routine and a consequent procedure (door closed to the bedroom contingent upon tantrum behavior). Consistent with the experimental literature on extinction the child responded with an extinction problem behavior, with near zero rates after day 6. Weiskop et al. (2001) and Weiskop et al. (2005) also investigated the effect of non-graduated extinction on children with autism. Weiskop et al. (2001) reported that positive routines, reinforcement, for appropriate bedtime behavior, and extinction in reducing co-sleeping and remaining in bed throughout the night with a 5-year-old with autism. These authors found that positive routines and reinforcement were insufficient to reduce sleep problems, but with the addition of extinction procedures the child was able to fall asleep on his own and remain asleep in his bed throughout the night within 6 days. Results maintained at 3- and 12-month follow-ups. Weiskop et al. (2005) extended these findings by evaluating the effects of bedtime routines, positive reinforcement and extinction to reduce sleep problems in six children with autism and seven children with Fragile-X syndrome, all of whom ranged in age from 1+11 to 7+11 years, using a multiple-baseline-across-participants design. Functional assessment identified positive reinforcement in the form of parental attention as the maintaining variable in four children, with anxiety following a traumatic event hypothesized for the fifth child, and an organic cause (a possible seizure disorder) responsible for the sixth child. Treatment procedures included non-graduated extinction for the four whose behavior was maintained by attention or positive reinforcement, while a stimulus fading procedure with differential reinforcement was introduced for the fifth child. The sixth child was subsequently diagnosed with, and treated for, a seizure disorder during baseline. Following stabilization of the seizure disorder non-graduated extinction was used. All children...
these results are a promising extension of
the well-established efficacy of graduated
extinction in typically developing children.
Extinction involves the removal of the
reinforcing stimulus contingent upon the
problem behavior and, as such, can generate
characteristic immediate increases in
problem behavior after initial implementa-
tion of the procedure. This temporary
increase in the behavior (typically referred
to as an extinction burst) can be difficult
for parents to confront, sometimes com-
promising treatment integrity. Alternatives
to the use of extinction procedures designed
to alter sleep onset patterns have been
investigated, including sleep restriction
procedures and bedtime scheduling.
Durand and Christodulu (2004) evaluated
the effectiveness of sleep restriction proce-
dures on reducing night waking and bed-
time problem behavior with two 4-year-old
children, one with autism and one with
developmental delays. While sleep restric-
tion strategies have been reported previ-
sely for use with older patients (Lichstein
and Morin 2000) and with typical children
(Spielman et al. 1987), use of these proce-
dures to treat children with autism and
related developmental disabilities has been
underrepresented. The two children in this
study displayed a range of bedtime disrup-
tions including tantrums, delayed onset of
sleep unless accompanied by a parent, and
night waking culminating in co-sleeping.
Assessment included completion of several
sleep problem questionnaires, as well as a
sleep diary identifying sleep schedule, night
waking, behavior problems experienced,
frequency and duration of naps, etc.
Durand and Christodulu (2004) provide
a detailed description of this procedure.
Sleep restriction procedures involved lim-
iting the child’s time in bed to 90% of the
total time the child slept each night, derived
from the data in the sleep diary. The sleep
schedule was then reduced by altering
either the child’s bedtime or time awakened
in the morning. If bedtime alterations were
made and the child remained awake when
taken to bed, she was removed and allowed
to engage in a relaxing activity until she
appeared tired. Elimination or significant
reductions in bedtime problem behavior
over the course of 1 week led to an increase
in bedtime by 15 min. For example, for the
child with autism in this study baseline hours
slept per night averaged 8.75 h. Her sleep
restriction schedule duration was set at 7 h
per night, with bedtime moved to midnight
with awakening at 7 a.m. Bedtime was then
systematically faded back to a more typi-

cal hour as she progressed. Results indic-
te that while bedtime disturbances were
not evident in the child with autism dur-
ing baseline (due to the use of melatonin
throughout baseline), when melatonin was
discontinued following introduction of the
sleep restriction schedule, behavior prob-
lems remained at low levels. For this child,
night waking also decreased significantly
from a mean of 7.17 per week to 1.4 per
week. For the second child, bedtime prob-
lems occurred nightly, but after interven-
tion reduced to an average of 25% per week.
Duration of these problems decreased from
1.05 h per week to 0.1 h per week. Finally,
night waking decreased from an average
of 2.55 h per week to 1.38 h per week, with
duration dropping to .07 h per week from a
baseline of 1.4 h per week. Parent satisfac-
tion measures were consistent with these
treatment successes.

In a related study, Christodulu and Durand
(2004) again investigated sleep restriction
but also incorporated positive routines into
the intervention package. Consistent with
earlier reports, positive routines included a
series of relaxing activities followed consis-
tently that presumably would help the child
transition more successfully into sleep (e.g.,
reading a story, taking a bath). Four children
participated, two of whom were diagnosed
with an autism spectrum disorder. Several
dependent measures were investigated
across a multiple–baseline design, including
number of bedtime disturbances, number of

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nighttime awakenings, total sleep time, and parent satisfaction. Results indicate that all children experienced fewer bedtime disturbances from baseline to intervention, with three of the four demonstrating a significant reduction in nighttime awakenings. Sleep restriction and positive routines was more effective in 75% of the children, including both diagnosed with an autism spectrum disorder. Three of the four children also experienced a decrease in total sleep time (including both of those with autism), while the fourth child showed no change from baseline. All results maintained at 40- and 42-week follow-up. All parents reported greater satisfaction with their child’s sleep habits following intervention. Bedtime scheduling has also been used to eliminate sleep difficulties in children with developmental disabilities. Bedtime scheduling involves creating an established time and routine for bedtime, scheduling naps as appropriate daily, and having a set wake-up time in the morning. The key element in this intervention strategy is consistency and the provision of a series of stimulus cues that predict upcoming steps in the schedule. In an early study with typical infants and young children, Rickert and Johnson (1988) compared extinction and bedtime scheduling in the treatment of night waking and crying in 33 young typically developing children (mean age 20 months), randomly assigned to one of three groups: scheduled awakenings, systematic ignoring, or control. Scheduled awakenings involved waking the child at times during the evening preceding when the child normally would have awakened the parents. During this awakening interval, the parent would engage in whatever activity would have occurred if the child had awakened them (e.g., soothe or feed the child). The child would then be returned to bed. Their results indicate that while systematic ignoring was more effective than scheduled awakenings during the first week of treatment, both procedures were equally effective subsequently, and both were more effective in reducing night waking and tantrums than no treatment controls. Results maintained at follow-up at 3 and 6 weeks post-treatment. The response effort differs in some ways for these two procedures: in one case the parent must commit to allowing the child to “cry it out”, while in the other case the parent must commit to waking the child from a sleep state. As importantly, the social invalidity of the extinction procedure for some parents may preclude their being able to implement the strategy successfully. Rickert and Johnson’s findings suggest that viable alternatives exist with typically developing toddlers.

In an extension of these findings, Durand (2002) treated three children with autism who experienced chronic night terrors with a scheduled awakening procedure. Parents were initially instructed to keep detailed sleep records, identifying the time and duration of their child’s night terrors. Scheduled awakenings consisted of waking the child 30 min prior to the time that night terrors typically occurred, in an effort to interrupt Stage 3 and 4 non-REM sleep (when sleep terrors are most likely to occur), and then allow the child to fall back to sleep. This was to be done nightly until seven nights with no sleep terrors was achieved, at which time parents were instructed to skip one scheduled awakening each week, adding one skipped night per week as long as night terrors remained at zero. If an episode occurred, the parents were instructed to return to the nightly schedule and begin the schedule anew. Results indicate that all children reduced their weekly number of night terrors significantly from baseline (a mean of 7 for child one, 3 for child two, and 2.5 per week for child three) to less than 1 per week after implementation of the procedure. The mean number of weeks needed to achieve treatment criterion and discontinue the scheduled awakenings was 5.7. All children maintained at zero night terrors at 12-month follow-up.
Piazza and Fisher (1991) investigated the effect of faded bedtimes on the disruptive behavior of two children, one with ADHD and one with tuberous sclerosis. Bedtime fading involves setting a bedtime when the child is likely to fall asleep, and then gradually moving this earlier to a more acceptable and developmentally normal bedtime as the child demonstrates rapid sleep onset. Both children showed significant improvement in targeted responses following treatment, both in the increase of percentage of appropriate sleep time or onset and also a reduction in inappropriate sleep. While not specifically discussed by the authors, it is possible that the fading procedure served as a motivating operation for sleep onset, enhancing its efficacy and stability. Piazza et al. (1997) extended this work to 14 children with developmental disabilities, five of whom had an autism spectrum diagnosis, all exhibiting delayed sleep onset, night waking, or early waking. Bedtime scheduling was compared with a faded bedtime with response cost procedure. The response cost procedure added in this study involved removing the child from bed if sleep onset had not occurred within 15 min of the prescribed time and keeping the child awake for 1 h before returning to bed. Bedtime scheduling involved having the child go to bed and awaken at the same time each morning. Results indicate that bedtime fading, both with and without response cost, was successful in reducing all sleep problems and superior to bedtime scheduling. Two of three children with an autism spectrum disorder enrolled in the bedtime fading with response cost procedure successfully eliminated sleep concerns. Of the two children with autism spectrum disorders in the bedtime scheduling group, one showed minor improvements in sleep onset and a somewhat less successful response to reducing night waking. The other child showed no difference from baseline in either early waking or night waking. These results lend support for the use of bedtime fading with or without response cost over the use of bedtime scheduling alone to treat sleep problems in children with autism spectrum disorders.

The incorporation of bedtime routines into treatment protocols is typical in studies of sleep problems in autism. For example, Durand et al. (1996), Christodulu and Durand (2004), and Adams and Rickert (1989) all incorporated a specific schedule of predictable activities to be accomplished as part of the bedtime ritual into their intervention protocols. While only one study specifically evaluated the effectiveness of predictable routines (Christodulu and Durand 2004) in the treatment of bedtime problems in children with autism, these authors found that routines alone were not as successful as routines combined with another procedure, in their case, sleep restriction. Milan et al. (1981) compared enforced bedtimes (essentially escape extinction), following a "natural sleep baseline" (allowing the child to fall asleep on his or her own and subsequently placing the child in bed asleep), with the use of positive routines (essentially a set of predictable pre-retirement bedtime steps that are chained together and then systematically faded) to treat the behavior problems of three children with significant bedtime disruptions and developmental disabilities (but not autism). Results supported the efficacy of positive routines over escape extinction (i.e., enforced bedtimes) in reducing behavioral episodes associated with a required bedtime that is not preceded by a routine schedule.

One study reporting the effect of what is essentially a stimulus fading procedure is reported in the literature. Howlin (1984) discusses the effect of gradually moving the parent of a 6 year old with autism away from the child, who had become accustomed to his mother remaining with him to support sleep onset. The mother was proximally faded over time, from the child's bed, to an air mattress, to outside the child's door, and finally to the mother's room. While the child successfully learned to initiate sleep onset independently, periodic
behavior problems associated with bedtime remained at follow-up. While the use of stimulus fading procedures has intuitive appeal and is likely incorporated into components of behavioral treatment protocols on a regular basis, it remains to be demonstrated whether this strategy is efficacious alone, or only in combination with other strategies.

While the literature on the behavioral treatment of sleep problems in those with autism spectrum disorders has relatively sparse, there are several important implications for treatment derived from those that do exist. Moreover, given the structural nature of treatment of sleep and bedtime behavior problems in those with neurodevelopmental disorders, it appears imprudent to ignore the research addressing these problems in children with other significant developmental disabilities simply because the study sample does not include individuals with autism. As such, in proposing the following guidelines, we emphasize evidence-based procedures derived from the literature on autism, while also incorporating support from the treatment literature for children with other severe developmental disabilities Table 4.5.

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Table 4.5 Practice parameters for the treatment of sleep problems for children with ASD

1. The use of non-graduated extinction procedures enjoys considerable empirical support in treatment literature, and should be considered an established evidence-based procedure.

2. Non-graduated extinction procedures appear to be more efficient and effective when combined with differential reinforcement strategies. This conclusion is consistent with the use of attention extinction and escape extinction for other behavior problems encountered by individuals with ASD.

3. Graduated extinction appears to be effective in many cases, but does not enjoy the level of replication as the more traditional procedure. The use of graduated extinction can be considered as probably efficacious, for sleep problems maintained by positive reinforcement in the form of social attention. It remains to be demonstrated whether empirical support exists for sleep problems maintained by positive reinforcement in the form of tangibles.

4. The use of bedtime routines (including positive routines) and bedtime scheduling have demonstrated efficacy, but in a smaller number of studies and with a smaller number of individual cases. Nonetheless, these procedures are often part of the intervention package crafted to respond to the individual needs of the child with autism and related disorders. As such, while they should be deemed probably efficacious, there is a sufficient basis to consider including them in an individually-tailored treatment plan if the assessment data so dictate.

5. Sleep restriction procedures show promise, especially when combined with other procedures such as positive routines. At this time, however, there does not exist a sufficient empirical basis for widespread use of this strategy as an evidence-based procedure, and sleep restriction should more appropriately be considered possibly efficacious in reducing night waking and bedtime behavior problems.

6. Parent education in sleep hygiene and in the implementation of treatment procedures is an almost ubiquitous component of intervention, but the extent to which it has been formally evaluated is surprising small. With an understanding that data do not exist to conclusively include this procedure as an evidence-based procedure, successful implementation by parents of treatment procedures is well documented in other domains of need within autism and in other areas of child development. As such, it is at once appropriate to highlight the need for more substantial research in this area, but also to suggest that parent education and training should be incorporated into treatment protocols, minimally for purposes of supporting generalization and maintenance of gains achieved in more highly-controlled intervention settings.

7. The use of stimulus fading deserves greater research efforts, but our current understanding of the conditions of its use, and its comparative value in the treatment armamentarium remains to be determined with respect to the treatment of sleep problems for children with ASD.