

Report of the ABAI Task Force on Contingent Electric Skin Shock

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Contingent electric skin shock (CESS) is a positive punishment procedure that has been used for decades to rapidly reduce problem behavior. Advances in applied behavior analysis, in particular refinements in methods for assessing the function of problem behavior, have drastically reduced the use of positive punishment in general and CESS in particular, accompanied by an increase in the number of individuals with severe behavior problems who can be treated effectively in programs based on principles of positive reinforcement. As matters stand today, these principles constitute the foundation of the professional practice of applied behavior analysis, and they are essential to ethically sound and effective treatment programs. Today, CESS is not the standard of care for the treatment of problem behavior. It is used rarely, reserved for the most severe forms of problem behavior, only after reinforcement-based methods have failed. The methods for administering CESS have been refined, and numerous engineering and administrative safeguards ensure that it is applied safely. It is used only as one component of an otherwise reinforcement-based treatment program.

Despite its rarity and refinements in its application, CESS is controversial. The objections to CESS parallel the objections to punishment procedures more generally, and they have been around for a long time. Sentiments expressed by Murray Sidman over 30 years ago remain relevant today:

The public is right to be alarmed. One successful use of a cattle prod will produce more of the same, and nobody, not even the therapist, will know whether he or she is using shock because nothing else will work, or because it has worked before under circumstances that may well have been different. Coercive therapy produces coercive therapists.
(Sidman, 1989, p. 7)

Members of the Association for Behavior Analysis International (ABAI) have raised concerns about the use of CESS in applied behavior analysis and have asked that ABAI issue a position statement against it. The Association's bylaws require official position statements to be ratified by a majority vote of the full members. The practice of the ABAI Executive Council has been to create a task force to study the issue and make a recommendation about whether a position statement is warranted, and possibly assist with drafting a statement for the members' consideration.

Appointments to the task force were completed in February 2022. Since then, our work has included reviews of the literature, government records, and comments received through a web portal for ABAI members and at an open meeting at the ABAI convention in May 2022. The informed opinions of behavior analysts of diverse backgrounds broadened our perspective. In July we visited the only facility in the United States in which CESS is sometimes used, the Judge Rotenberg Educational Center (JRC) in Canton, Massachusetts. There we were granted access to court records, clinical records, clients, and

therapists. We also met with families of clients who receive CESS as part of their treatment. We spent two full days at the Center, allowing time for a deep dive into the JRC's methods of assessment and treatment.

It is important to note that the task force was not assigned to evaluate the JRC as an institution. Still, the JRC is where CESS is incorporated into the treatment of some individuals. To understand the contemporary use of the procedure, we had to study the methods and outcomes there.

The task force also interviewed the leaders of nine behavior analytic treatment facilities (eight via Zoom, one via written correspondence) to learn about how they treat severe problem behavior without CESS.

This report is the culmination of eight months of reading, listening, inspecting, interviewing, discussing, and debating. In the course of our work, we learned much that helped us appreciate the complexity of the issue before us and demanded that we approach the issue from diverse vantage points. The grave concerns that many professionals and members of the public have about CESS motivated us to view the evidence with a critical eye, and led us to a position that we believe is scientifically, clinically, ethically, and socially sound. Our position differs from that taken by some other professional organizations. Whereas these organizations would ban the use of CESS in all cases, our position tolerates the limited use of CESS in special cases under rigorous professional and legal oversight. Our position comes from careful study of the scientific literature, examination of current clinical practices and the results they produce, and review of professional guidelines promulgated by ABAI and the Behavior Analysis Certification Board (BACB).

This report is divided into four parts. First is an account of how CESS is used in contemporary behavior analysis. Our concern is with CESS as a narrowly focused, clinical application of an operant punishment procedure, to be distinguished from other aversive methods such as conventional corporal punishment and conversion therapy which has already been condemned by ABAI. Our attention is focused on current practices. We did not review past problems with cruder methods of applying CESS. The second part is a description of alternatives to CESS, that is, treatment programs that aim to reduce problem behavior using reinforcement-based procedures without recourse to CESS. The third section places CESS within the context of professional guidelines that prescribe ethical conduct of behavior analysts. In the final section, we list our recommendations for restrictions on the use of CESS.

CESS in Contemporary Behavior Analysis

Use of contingent electric skin shock (CESS) to treat problem behavior is not the standard of care in contemporary behavior analysis. This is evident by the following:

- Only one facility serving individuals with developmental disabilities in the United States reports using CESS: the JRC. As of July 2022, 52 clients (aged 26 – 59 years, MDN = 35) out of the total 292 clients (7 – 62 years, MDN = 22) at the JRC had a treatment plan that included the use or potential use of CESS. These cases were managed by three doctoral-level Board Certified Behavior Analysts (BCBA-Ds) and two Licensed Psychologists.
- No CESS device is currently marketed for the treatment of behavior problems in individuals with developmental disabilities. (The JRC uses devices of their own design and manufacture; they are

registered with the Food and Drug Administration, but the JRC is not authorized to make the devices available to other providers).

- No peer-reviewed studies on the therapeutic use of CESS to treat severe behavior disorders in individuals with developmental disabilities have been published in a behavior analytic journal for 20 years; exceptions include six retrospective analyses of data collected at the JRC and a 2004 case study in which the Self-Injurious Behavior Inhibiting System (SIBIS) – a helmet that delivers shocks contingent on certain head movements – was used successfully to treat the self-injury of a 3-year-old child (Salvy et al., 2004). No studies on CESS have been published in the field’s flagship journal (*Journal of Applied Behavior Analysis*) in more than 30 years.
- With the exception of individuals affiliated with the JRC, no researchers or clinicians have presented data on the therapeutic use of CESS at recent behavior analytic conferences.
- No contemporary textbooks used by faculty in undergraduate and graduate applied behavior analysis programs describe the therapeutic use of CESS to treat problem behavior. The most commonly used and cited text (Cooper et al., 2020) states that a punisher such as CESS “no longer meets the standards of least restrictive alternative or best practice” (p. 348). It should be noted, however, that this position is not universally accepted by behavior analysts (for alternative views, see Foxx & Mulick, 2016).
- Several professional associations and organizations have released positions statements against the use of CESS, including the Association of Professional Behavior Analysts, the Massachusetts Association for Behavior Analysis, the California Association for Behavior Analysis, the European Association for Behavior Analysis, and the International Association for the Scientific Study of Intellectual and Developmental Disabilities.
- Regulations in many American states prevent behavior analysts from using CESS in certain settings (e.g., educational) or when receiving funding from certain sources (e.g., Medicaid).

As such, research and practice in applied behavior analysis is largely silent on questions about best practices for implementing CESS, ensuring the safety of clients, and fading CESS out of a treatment plan or removing it altogether.

To address questions about the contemporary use of CESS, the task force read publications on CESS; watched available conference presentations given by JRC clinicians; reviewed the JRC’s policies and procedures and a random sample of JRC client records selected by the task force; and spent two days at the JRC.

Overview of Research on CESS

We searched the literature for papers published since 1980 on the use of electric shock to treat behavior problems of individuals with neurodevelopmental disabilities. A total of 18 papers were identified, six of which were retrospective analyses of clinical data published by staff affiliated with the JRC.

Effects of CESS (Non-JRC Papers)

Of the 12 non-JRC papers, authors presented data for a total of 31 participants, some of whom appeared in multiple papers as part of follow-up evaluations. The majority of papers evaluated the effectiveness of the SIBIS, a helmet that delivers a 3.5 mA shock contingent on head movements that, without the helmet, would produce self-injury. All but one of the 12 papers targeted self-injury. The remaining paper targeted aggression. All but one paper either examined or reported the maintenance of treatment effects under CESS.

CESS can be effective in suppressing problem behavior for up to 5 years after its initial application. Overall, studies reported continued suppression that lasted from 2 weeks to 5 years. For example, in Linscheid et al.'s (1990) study, treatment effects maintained for three of the four participants who continued to receive treatment with SIBIS for up to 5 years. For one participant, treatment effects dissipated after 32 months. Another study using a stronger intensity of CESS (40 mA) reported that treatment effects failed under CESS for a participant after 6 months (Williams et al., 1993). Finally, one study reported continued suppression for 7 of 12 participants based on amount of physical restraint needed up to 47 months after the initial start of treatment with CESS (Duker & Syes, 1996).

No studies evaluated strategies to fade the CESS, and just two studies anecdotally described attempts to fade CESS by reducing the amount of time wearing the device; both were unsuccessful in fully fading the device after 5 years (Linscheid et al., 1993, 2002). Two studies (Salvy et al., 2004; Williams et al., 1994) reported outcomes after removing CESS but included no information on fading. Both reported continued suppression of self-injury from 7 months to 14 months after the removal of CESS.

Finally, four of the non-JRC papers presented data on collateral changes in responding (desirable and undesirable side effects) for a total of just five participants (Linscheid et al., 1990, 1994, 2002; Ricketts et al., 1993). All reported either an increase or no change in positive responses (e.g., smiling, laughing, behaviors indicating relaxation) and a decrease or no change in negative responses (e.g., crying) during treatment with CESS compared to treatment without CESS. Two reported collateral decreases in other typographies of self-injury that were not exposed to CESS (Linscheid et al., 1990; 1994).

In summary, non-JRC research indicates that responding typically remains suppressed under CESS over the long run although instances of breakdown have been reported. Few studies have reported success in either removing or fading the CESS. The few studies presenting data on the side effects of CESS have reported only positive collateral changes in responding.

Effects of CESS (JRC papers)

Among the six JRC papers, authors presented data for up to 173 participants. The actual number is difficult to determine: This is the maximum number reported in a single paper; it is not clear how many participants were included in more than one publication. All of the papers described outcomes using two intensities of CESS (15 mA or 41 mA). The authors reported that CESS was used to treat a variety of problem behaviors, including self-injurious behavior, aggression, disruption, property destruction, pica, and noncompliance. Several papers described strategies for fading CESS by reducing the amount of time wearing the device and the number of different behaviors targeted by CESS. Retrospective data from 173 clients at the JRC across 15- to 20-year periods indicated that CESS is effective in suppressing problem behavior among those who continue to receive the treatment (Blenkush & O'Neill, 2020; Yadollahikhales et al. 2021).

CESS has not been successfully faded for the majority of the JRC's clients. Yadollahikholes et al. (2021) reported that clinicians successfully faded CESS with 27% of their clients, partially faded CESS with 20% of clients, and achieved no fading with 35% of clients. The remaining 18% of clients had CESS terminated for other reasons. The authors also noted that all clients required at least 5 to 10 years of CESS to maintain the benefits of treatment. In our site visit at the JRC, Clinical Director Nathan Blenkush indicated that in most cases CESS is prosthetic rather than curative. Even though applications of CESS may be relatively rare, he said, the CESS contingency must remain part of the client's environment to maintain the problem behavior at low levels.

Data presented by authors affiliated with the JRC are consistent with those published by other research groups in that responding typically remains suppressed under CESS over the long run and that strategies to fade CESS completely are not successful for a large portion of individuals. Compared to research on CESS published since 1980, the JRC reports using a stronger intensity of CESS and applying CESS to a larger variety of behavioral topographies (beyond self-injury and aggression). In addition, the JRC papers involve retrospective analyses of clinical data and, thus, do not utilize controlled experimental designs or include measures of reliability or procedural integrity.

Zarcone et al.'s (2020) Review

Organizations that have called for a ban on CESS have cited Zarcone et al.'s (2020) review paper as providing strong evidence against the long-term effectiveness of CESS and, especially, evidence of negative side effects. With regard to the latter point, for example, the Association for Professional Behavior Analysts (2022) states that "(a) electrical skin stimulation can be uncomfortable, even painful, and can cause tissue damage, and (b) CESS can produce negative behavioral side effects, such as avoidance, crying, increases in other challenging behaviors, and fearful responses." In a similar vein, the California Association for Behavior Analysis cites the paper as providing "evidence that [treatments with CESS] have the potential for long-term harmful physical and emotional effects."

In contrast, our review leads us to conclude that CESS can be an effective component of an otherwise reinforcement-based treatment program, and that research to date does not provide strong evidence that CESS is associated with negative side effects.

We found that studies on long-term effectiveness showed that CESS continued to suppress problem behavior for up to 5 years for the majority of participants.

In terms of side effects, Zarcone et al. (2020) acknowledged that most reports of negative side effects in the studies they reviewed were "made anecdotally" (p. 294). For example, they listed "panic, extreme anxiety, and 'freezing' or suppression of all behavior" (p. 294) as outcomes of a study by Duker and Seys (1996). We note that Duker and Seys said that these effects were temporary, subsiding for five participants in the second treatment session. Among studies reporting data on collateral behaviors, Zarcone et al. stated that Linscheid et al. (1994) and van Oorsouw et al. (2008) reported crying and negative vocalizations by their participants when CESS was applied. However, neither paper reported this. To the contrary, they reported decreases in these behaviors during treatment with CESS compared to treatment without CESS. In fact, the few studies presenting data on the side effects of CESS have reported only positive collateral changes in responding.

An important aspect of Zarcone et al.'s (2020) paper is their critique of the methods used in the punishment studies they reviewed. It is true that the scope and quality of the research on CESS is

limited. However, most of their criticisms were directed towards the retrospective analyses of clinical cases reported in the JRC papers, which lacked the controls and methodological refinements (e.g., interrater reliability) that would be expected in analogue laboratory studies. We are puzzled, however, by Zarcone et al.'s criticism of clinical studies (Israel et al., 2008, 2010) that

examined the effectiveness of CESS by reporting levels of challenging behavior prior to and following CESS implementation using a simple AB design with 60 individuals where the start of treatment was staggered. Unfortunately, this design does not provide repeated demonstration of the effects of the treatment with the individual, and thus does not provide evidence for experimental control ... (p. 293)

The authors are describing a multiple-baseline-across-participants design. This design is widely accepted within applied behavior analysis, and our understanding of behavior would be impoverished if we had to reject evidence obtained within the design. Moreover, we note that this design is commonly recommended when evaluating treatments that, if effective, would be unethical to withdraw.

Our purpose in making these points is to explain how the task force arrived at different conclusions about the efficacy and side effects of treatments that incorporate CESS in conjunction with reinforcement-based procedures. We should emphasize that we share many of Zarcone et al.'s concerns about CESS. We too look forward to a day when "function-based treatments ... replace the need for CESS" (295). At this time, however, our assessment of the evidence – in the literature and in the clinical records we reviewed at the JRC (described below) – does not support a wholesale ban of the procedure.

Practices at the JRC

Because the JRC is the only facility using CESS, a description of their practices is needed to understand how CESS is used in contemporary behavior analysis, including steps taken to fade the use of CESS and to use CESS safely with clients. Some of this information was reported in the JRC publications described previously. However, the information contained in this section of the report was compiled from interviews, record reviews, and observations at the JRC by members of the task force. At the JRC, we met with the chief executive officer, the clinical director, three BCBA-Ds, two licensed psychologists, the JRC's consulting psychiatrist, the JRC's physician, and the parents of four clients who are receiving CESS.

Admission and Assessment

The JRC reports that the vast majority of their clients, and all of their clients whose problem behavior includes severe self-injurious behavior or violent aggression, come to the JRC after unsuccessful treatment in other programs. When a client is admitted to the JRC, they receive a treatment plan consisting of positive reinforcement, along with possible extinction and response-cost components. Under the direction of the psychiatrist, any psychotropic medications are gradually reduced and eliminated if clinically indicated. For the vast majority of clients, psychotropic medication is discontinued. The treatments are individualized and based on record reviews of treatments administered before admission to the JRC and functional behavioral assessments.

Most functional assessments are conducted via indirect assessment, record review, and observation (documenting antecedents and consequences). Analogue functional analyses (FAs) are rarely conducted; the JRC may not conduct them if (a) patient records indicate that other professionals (unaffiliated with the JRC) have already conducted FAs, (b) the behavior occurs at very low frequency, or (c) the behavior

is so dangerous that a risk/benefit analysis suggests it is too risky to do so. JRC clinicians have concluded that nearly all of those who are receiving CESS engage in problem behavior that is maintained by automatic and multiple social reinforcers; their client behaviors often acquire new functions over time. As such, most treatments involve withholding all social consequences for problem behavior to the extent possible, teaching alternative ways to receive social consequences, and modifying potentially relevant antecedents (e.g., reducing demands).

Authorization to Use CESS

After at least one year, if these treatments are not found to effectively reduce problem behavior, the JRC may recommend the use of CESS to the client's parents or guardians. CESS is added to a treatment program only after written informed consent has been obtained from the parent or guardian; medical doctors have certified the absence of physical conditions that would contraindicate the use of CESS with the client; an institutional peer-review committee has approved the treatment plan; a community-based human rights committee has approved the plan; and a probate court judge has approved the plan after a hearing in which the client is represented by an independent court-appointed attorney. The attorney hires their own expert to review the plan; the expert is typically a psychologist or a psychiatrist, not a behavior analyst.

The court reviews each client's case at least once per year and decides whether to continue authorization of CESS. The JRC must obtain court approval for increases in the intensity of CESS. They need not return to the court when they add or remove topographies of problem behavior to be included as target behaviors for which CESS is delivered. However, these changes, and an account of all applications of CESS, are reported quarterly to the court and reviewed by the judge at least annually. Treatment plans also are reviewed by the JRC human rights committee (which includes parents of clients at the JRC as well as an attorney, a BCBA-D, and a nurse, among others), and by the JRC peer review committee.

CESS Procedures and Safeguards

Only doctoral-level professionals may supervise cases approved for CESS. Currently, this includes one licensed psychologist who is also a BCBA-D, two other BCBA-Ds, and two other licensed psychologists (one full time and one part time). The caseload is typically 15 to 17 cases. One BCBA-D reported a caseload of 17 CESS clients plus supervision of a masters-level clinician with a caseload of six clients not on CESS

The JRC reported that they had initially used SIBIS (3.5 mA) but found it ineffective for the majority of their clients. Thus, they now use devices with greater CESS intensities, the GED-3 (15 mA) and the GED-4 (41 mA). Both devices are designed to deliver a safe localized stimulus to the surface of the skin. The stimulus is series of electrical pulses lasting 2 s. The duty cycle is 25%, meaning that the electrical current is transmitted for a total 0.5 s during each application. Because the current passes only through the skin, it does not cause neuromuscular incapacitation, nor does it affect heart or brain function. In these respects, the GED-3 and GED-4 devices differ greatly from the electrical current applied by a Taser, which is designed to incapacitate coordinated muscular activity, electroconvulsive therapy, which is designed to induce a brain seizure, and defibrillators, which are designed to affect heart rhythm.

Clinicians usually start treatment by evaluating the effectiveness of the GED-3; in rare cases they immediately use the GED-4 if behavior is very high risk. With court approval, a client will be moved from

the GED-3 to the GED-4 if the GED-3 does not reduce the behavior sufficiently or if the client's behavior begins to show habituation to the GED-3. Depending on the topography of the behavior to be reduced, up to five electrodes are strapped to the arms, legs, torso, and/or feet simultaneously. CESS is only given from a single electrode at a time and all electrodes are rotated every hour or after they have been discharged.

No more than 10 applications of CESS may be delivered to a client in a 24-hour period without approval of the clinician. Approval is typically given if they are in the early stages of treating a new topography or if review of historical records indicates that they sometimes require more than 10 applications in a 24-hour period to achieve a successful outcome.

The JRC video records and monitors the clients as much as possible at the school and their residences. Closed-circuit cameras are mounted in hallways, classrooms, and in the homes such that all client/staff interactions are recorded and can be reviewed at any time. Further, television screens showing live video from the closed-circuit cameras are monitored at all times by JRC staff, who watch for occurrences of target behavior and how staff intervene. Videos of all CESS applications are reviewed to ensure that the treatment protocol was followed correctly.

When CESS is added to a treatment plan, a specially trained, dedicated staff member monitors the client's behavior and administers the CESS immediately upon its occurrence. After the problem behavior is reduced to an acceptable level, a verification procedure is implemented. When a client engages in a targeted behavior, two staff members must agree that the observed behavior is targeted for CESS and the staff member is carrying the correct transmitters and recording sheet. All clinicians are notified when CESS has been delivered and can review the recorded event. Video records of all deliveries of CESS are reviewed to ensure that the treatment plan was implemented correctly. CESS will not be administered if monitoring/recording/verification is not in place; when this occurs, it is usually in the residences due to the absence of a specially trained in-house monitor who supervises the staff using the GED. One clinician reported that, for his clients, CESS is rarely delivered in the residence due to the lack of required monitoring.

When the verification procedure is underway, CESS may be delayed up to 2 min, after which an alternative consequence (verbal reprimand) must be applied instead. Some clients are approved for up to a 30-min delay to CESS if results of standard cognitive/intelligence tests indicate that they are able to connect the behavior to the consequence. Delays may occur when staff are completing the verification process, targeting covert behaviors, or managing escalations in behavior, including client attempts to remove the electrodes. Treatment plans may indicate that CESS may still be delivered if the client follows a directive prior to receiving the CESS. The treatment plans of some clients permit a pre-verification process if a 2-min delay undermines the efficacy of CESS. This process allows a designated staff member to immediately administer the CESS. The designated staff member renews the pre-verification with a second staff member every hour.

CESS is used to treat aggression, self-injurious behavior, other behavior the JRC deems as "health dangerous" (e.g., smearing feces; calling in bomb threats), property destruction or attempts to destroy property, disruptive behaviors (yelling, verbal threats), stealing, noncompliance, and attempts to remove the GED. CESS may be applied to less intense but topographically identical forms of the severe target behavior, to less severe behavior that occurs prior to the target behavior, and to behavior that appears to be in the same response class as the target behavior. The JRC's clinical records indicate that the more severe behaviors sometimes emerge when less dangerous behaviors are not followed by CESS.

Court-approved treatment plans indicate that some seemingly minor behaviors are followed by CESS because they interfere with educational or social development (e.g., noncompliance) or because they could be harmful under certain situations (e.g., urinating outside of the toilet). Among the programs of current clients reviewed by the task force or described by JRC staff, behavior followed by CESS includes raising an arm up near the head (for a patient who blinded herself by striking herself in the head), yelling, noncompliance, urinating outside of the toilet and defecating in pants (for a continent client who smeared feces, ate feces, drank urine, stored feces behind the ear, etc.).

If a client’s behavior habituates to the GED-4, or if the GED-4 is not effective, a “holster program” may be introduced to decrease problem behavior. Currently, four clients have this in their plan. The holster program is implemented as follows: Starting with 1-min sessions (gradually increased to 10 min), the client receives continuous access to preferred videos, television shows, music, etc. for keeping their hands in the holsters. Contingent on removing their hands, the reinforcement stops and they receive a CESS. Once they have been successful in 10-min sessions, they continue to receive these sessions on a regular basis as “practice sessions” to maintain the effectiveness of holster-wearing to decrease problem behavior throughout the remainder of the day. Clients do not need to have their hands in the holsters throughout the day, but they do wear them throughout the day. When the holster is on the client’s body, CESS is applied after a targeted problem behavior, and the client is then immediately exposed to a 10-min holster session (contingent reinforcement and avoidance of CESS for keeping hands in holster).

Fading plans are completely individualized and involve removing topographies from the CESS contingency, reducing the number of devices worn simultaneously, and decreasing the amount of time that the client wears the GED devices. Even if a client is fully faded from the device (i.e., does not wear it), use of CESS is not removed from the approved treatment plan to ensure that the clinician can reintroduce it if targeted behaviors appear to emerge. As a result, clients have approved treatment plans for long durations of time, some as many as 15 to 20 years.

The JRC provided demographic data for all adult students enrolled at the JRC and those currently approved for CESS. None of the largest racial/ethnic groups appear to be over-represented among those receiving CESS.

Category	Enrolled at the JRC		Approved for CESS		
	Number	% of Category	Number	% of Category	% of CESS Clients
Caucasian	73	46	26	36	50
African American	41	26	15	37	29
Hispanic	21	13	6	29	12
Other	22	14	5	23	10
Totals	157		52		

During our brief tour of the classrooms, we did not observe any CESS. To our knowledge, there were no occurrences of severe problem behavior among those wearing the GED. Clients greeted and often initiated interactions with the JRC’s Clinical Director and Chief Executive Officer who led the tour. These interactions were largely positive and appropriate. We did not observe crying, avoidance behavior, or aggression toward the Director, CEO, or direct-care staff from individuals who were wearing the GED. (We did observe some problem behaviors from individuals who were not wearing the GED. In these cases, blocking and sometimes physical restraint, the use of protective equipment, and time out were being implemented.)

Interviews with Clients

Clients treated with CESS range from those with no or mild intellectual disabilities to those with profound disabilities. Assent is not obtained from clients for the use of CESS. The task force interviewed four clients with no or mild intellectual disabilities: an African American female, an African American male, and two Caucasian males. Each client was interviewed individually, without the presence of a JRC employee, for about 10 minutes. All had CESS as part of their treatment plans, but only Client 1 was receiving CESS at the time of our visit. Client 1, unsolicited and without prompting, asked the task force members to remove them from the JRC because they didn't want CESS. The remaining clients only spoke about CESS in response to questions from the task force. Client 2 stated that they would have preferred medication or restraint to CESS, and that CESS did not help. Client 3 stated that they did not like the JRC or CESS and didn't think that CESS helped. Client 4, who had no intellectual disabilities, stated that CESS saved them from blinding themselves and that they approved of their treatment plan. They described being traumatized by a stay at a psychiatric hospital about 20 years before their placement at the JRC and began to cry while recalling their experience there. Although Client 4 had been completely faded off the GED device, they had to have it reimplemented for a week approximately two months before our visit because of a resurgence of eye-related problem behavior. The device had now been faded again. Client 4 said they did not like wearing the GED, but felt it was occasionally necessary to help maintain low levels of problem behavior. They felt the device saved their life. All of the clients we interviewed said the device was painful. Three task force members received a shock from the GED-3 and can attest that it is indeed painful.

Effectiveness of CESS

Review of records indicate that CESS can be highly effective in suppressing targeted behaviors. Combining the results for all of the clients receiving CESS, the JRC reports that it administers CESS a total of seven times per day. However, review of records indicates substantial variability from client to client. For example, among four cases most recently started with the GED (from 5 months to 3.5 years ago), two are receiving very few administrations, one is receiving a mean of six administrations per week, and the fourth is receiving a mean of 17 per week (range 0-52). Of seven additional randomly selected cases, four are receiving no more than one CESS administration per month, two are receiving an average of one to three administration per week, and one is receiving an average of one administration per day.

Interviews with Parents

We had individual meetings of 20 to 30 min each with parents of four clients who had CESS in their treatment plans: an African American father, a Caucasian father, a Caucasian mother, and a Caucasian couple consisting of a mother and father. No JRC employee was present during the meetings. All of these parents described difficulties finding facilities that would care for their children due to the severity of their behavior. They stated that the JRC was their best option at the time they sought residential services. All reported that before coming to the JRC, their children were on multiple psychotropic medications, and now they were on none. They described CESS as a "miracle" treatment that saved their children's lives. They said their children liked the JRC and had a good quality of life. They asked that we not remove CESS as a treatment option. The parents were quite emotional about the improvements their children had experienced with CESS as part of their treatment, reporting that their children finally had personalities (something they never realized their children had). Parents reported they could now have their children visit their homes, most of the time without staff accompanying them, and that they enjoyed having their children visit.

Summary and Conclusions

The contemporary use of CESS to treat severe behavior disorders is controversial and exceedingly rare. Although CESS can be remarkably effective at suppressing behavior to low levels, research and practice provide little guidance on best practices for using CESS and fading it out of treatment. It is clear that few trained specialists are willing to employ CESS and that those who do must invest substantial amounts of time and money to ensure clients have legal access to this procedure. A serious shortage of high-quality behavior analytic services for those with the most severe behavior disorders also restrict families' ability to choose from potentially effective alternatives to CESS.

The contemporary use of CESS includes a number of important safeguards. In particular, clients are continuously video recorded at the day treatment center. Staff cannot deliver CESS more than 10 times in a 24-hour period without approval from the clinician, and normally a second observer must independently verify that a client engaged in a targeted response before a CESS can be delivered. Videos of all CESS administrations are reviewed for treatment integrity, and data on CESS administrations are submitted to the probate court on a quarterly basis. All treatment plans must be reviewed and approved by the court at least once each year.

Nonetheless, the contemporary use of CESS also raises significant concerns about the practical and ethical use of this procedure. An overarching issue is whether it is appropriate and ethical to apply CESS to a large variety of behavioral topographies, many of which may not have a clear link to dangerous behavior (e.g., yelling, noncompliance). This is a concern because some might argue if CESS is to be used, it should only be used for the most serious and life-threatening behaviors. Whether CESS should be delivered for milder behaviors, even if those behaviors are precursors to more serious problem behaviors, is a serious ethical concern that deserves consideration.

Review of the literature suggests that when CESS is used, most clients will need to receive treatment for lengthy periods of time (5-20 years). That is, this does not appear to be a treatment that can be effectively faded or discontinued quickly, even if CESS produces rapid suppression of problem behavior. In some cases, the intensity of the shock must be increased to improve and/or maintain its efficacy. After the initial reduction of problem behavior by immediate delivery of CESS by a specially trained, dedicated staff member, the procedure is modified such that a staff member must check a protocol and verify with another staff member before delivering CESS. As a result of this safeguard, the delivery of CESS is often delayed or applied intermittently. Furthermore, delays may occur when staff are managing escalations in behavior, including client attempts to remove the electrodes. The JRC's clinical records indicate that reduction of problem behavior is maintained in spite of these deviations from immediate delivery of CESS after each instance of the target behavior. One may wonder whether the procedure would be more effective if these deviations could be avoided. More concerning, delays to CESS delivery may result in shocks occurring contiguous to appropriate behavior (e.g., following directives).

Although the court-mandated process to protect clients includes expert external review of treatment plans and data, these reviews are currently completed by individuals who are not behavior analysts. We suggest best practice should include external review by behavior analysts who have specific expertise in the contemporary treatment of severe self-injurious behavior and violent aggression.

Finally, according to the *Ethics Code for Behavior Analysts* (BACB, 2020), behavior analysts are responsible for obtaining assent from clients when appropriate. Presently, client preference or assent

does not appear to be considered when selecting CESS, even among those with the capacity to make their preferences known.

Alternatives to CESS

As used today, CESS is a component of treatment programs to reduce what is described as severe problem behavior. The term “severe problem behavior” (or variants such as “severe behavior disorder” or simply “severe behavior”) is difficult to define. There is no agreed-upon operational definition of the term and no clear diagnostic criteria. The term generally is applied to self-injury, aggression, and property destruction. But these problematic activities can vary widely in their intensity and frequency. For example, “self-injury” could refer to persistent scratching or slapping, or it could refer to poking one’s own eyes, chewing on one’s own lips, or biting one’s own fingers – behavior that could result in blindness, disfigurement, or amputation.

Because of such variation in severe problem behavior, it is difficult to compare the effectiveness of treatments. For example, treatment provided in intensive day programs may successfully rely on various reinforcement-based treatments to reduce severe problem behavior. These clients spend about six hours per day in the program and the rest of the day in their family homes. It is unknown whether (and perhaps unlikely that) the intensity of these clients’ problem behavior matches that of the clients who live in residential treatment facilities because their behavior cannot be managed in their family home.

Here we review state-of-the-art reinforcement-based procedures most often used to reduce problem behavior. Although these procedures have been successful with many kinds of severe problem behavior, the current state of the literature does not allow us to ascertain with certainty that the procedures will be successful across the full range of intensity of such behavior. It is not known which interventions will be successful for which specific target behaviors in any specific context. Some treatment providers (such as the JRC) refer to “treatment refractory” problem behaviors. This is a term rarely used by behavior analysts, but it is commonly used by other health professionals. “Treatment refractory” refers to a condition that fails to respond adequately to a competently administered treatment. Some severe problem behavior is difficult to treat successfully.

A further complication concerns the role of psychotropic medication in the treatment of severe problem behavior. Our interviews with leaders of various conventional behavior analytic treatment facilities indicate that psychotropic medication is commonly used to manage the most intensive forms of severe problem behavior. This observation is also supported by the literature. The medication status of participants in evaluations of behavior analytic procedures is often unclear or unreported. Because the JRC’s practice is to eliminate psychotropic medicine to the maximum extent possible, when comparing CESS to alternatives, it is important to remember that treatment programs with CESS rarely involve psychotropic medication whereas the alternative programs may. (Psychotropic medication is discussed in more detail below.)

Functional Analysis of Problem Behavior as a Prerequisite to Treatment of Problem Behavior

In 1989, the U.S. National Institutes of Health (NIH) held a consensus conference to evaluate the nature, extent and consequences of destructive behavior in individuals with developmental disabilities, and to identify approaches to treatment, the risks and benefits of these treatments, and what research is still needed, among other topics. One of the conclusions of this consensus panel was that treatments for

destructive behavior should be based on and guided by an analysis of the biological and environmental conditions that maintain an individual's destructive behaviors. Specifically, an analysis of medical and psychiatric conditions that may contribute to the problems should be considered in tandem with environmental conditions that may evoke and maintain the destructive behavior. In addition, skill deficits that may be related to the problem behavior should be considered.

The panel advised that the most successful treatments should include multiple elements. This is important to note because, since 1989, the use of functional analysis procedures (Iwata et al., 1982/1994) has been identified as an evidence-based assessment strategy for determining the environmental conditions that may evoke and maintain the destructive behaviors. Although not a treatment in and of itself, functional analysis strategies should be used to guide all treatment of severe problem behavior (termed "destructive behavior" by the NIH). Functional analysis is considered the "gold standard" assessment strategy that should precede any treatment for severe problem behavior in the majority of situations.

An almost unlimited number of treatments can be employed following a functional analysis of problem behavior. Horner et al. (2002) provide a synthesis of research on alternative treatments for problem behavior based on functional analyses. Much of the research further supporting the findings of Horner et al.'s review has been published in the last 20 years. It is nearly impossible to effectively summarize the literature on these alternative interventions here because of the breadth and depth of research on these procedures and the almost endless variations and combinations of the procedures. Readers are referred to excellent resources on these strategies such as the *Handbook of Applied Behavior Analysis* (Fisher et al., 2021), *Functional Communication Training for Problem Behavior* (Reichle & Wacker, 2017), and the textbook *Applied Behavior Analysis* (Cooper et al., 2020) for a more thorough review of treatments other than CESS. Below is a brief overview of such alternative treatments.

Treatment Approaches Based on Differential Reinforcement and Skill-based Instruction

Standard 2.14 of the *Ethics Code for Behavior Analysts* (BACB, 2020), states that:

Behavior analysts select, design, and implement behavior-change interventions that: (1) are conceptually consistent with behavioral principles; (2) are based on scientific evidence; (3) are based on assessment results; (4) prioritize positive reinforcement procedures; and (5) best meet the diverse needs, context, and resources of the client and stakeholders. Behavior analysts also consider relevant factors (e.g., risks, benefits, and side effects; client and stakeholder preference; implementation efficiency; cost effectiveness) and design and implement behavior-change interventions to produce outcomes likely to maintain under naturalistic conditions. They summarize the behavior-change intervention procedures in writing (e.g., a behavior plan).

As seen here, positive reinforcement procedures are prioritized as alternatives to CESS. Alternatives based on negative reinforcement (i.e., "escape-maintained problem behavior") are also frequently used. Taken together, these procedures are commonly called "reinforcement-based treatment of problem behavior." The procedures are typically based on differential reinforcement strategies, including reinforcement of replacement, alternative, incompatible, or other behaviors and extinction (when possible) of the target problem behavior.

Functional analyses are used to guide treatment of problem behavior in the sense that treatments should match the function of problem behavior. One of the first illustrations of this was by Carr and Durand (1985), who conducted analyses of severe problem behavior for four children with developmental disabilities. Some of the children's behavior was occasioned by low levels of attention (and hypothesized to be maintained by access to adult attention), while others were occasioned by difficult tasks being presented (and hypothesized to be maintained by access to assistance to reduce task demands). The children were taught to request attention and help. The children's problem behavior was reduced only in conditions where they could make requests that matched the context that occasioned their problem behavior. For example, if problem behavior was occasioned by demands, problem behavior was reduced only when children could ask for help and not when they requested and received social attention. Thus, researchers have suggested that intervention for problem behavior should match the function of the problem behavior (e.g., Filter & Horner, 2009).

Quite often, treatments for problem behavior are focused on teaching new repertoires, often termed "replacement behaviors," to allow the client to access the same reinforcers as the problem behavior but through more appropriate and habilitative means.

Examples include:

- *Differential reinforcement of alternative behavior*, such as task completion or toy play. In this case, the reinforcer identified via the functional analysis is provided contingent on an alternate, more appropriate (sometimes incompatible) and habilitative behavior, while the reinforcer is withheld contingent on problem behavior. At times this is combined with other strategies, such as stimulus/demand/task fading to slowly increase the requirements of the alternative response (e.g., Ringdahl et al., 2002).
- *Functional communication training*. A variation of differential reinforcement of alternative behavior, where the alternative response is communicative in nature, such as a request for attention, breaks, or preferred items (cf. Brown et al., 2000; Carr & Durand, 1985; Derby et al. 1997; Greer et al, 2016; Hagopian et al., 2011; Lindgren et al., 2020; Shirley et al., 1997; Suess et al., 2015; Tiger et al., 2008).
- *Differential reinforcement of other behavior*, where the functional reinforcer is provided contingent on any behavior other than the target problem behavior but is withheld contingent on the occurrence of the target behavior (e.g., Cowdery et al., 1990).
- *Differential reinforcement of low-rate behavior*, where the functional reinforcer is provided contingent on a lower rate of the target behavior but is withheld if the target behavior exceeds a specified rate (e.g., Austin & Bevan, 2011).

These intervention strategies have been shown to be highly effective in treating many types of severe problem behavior, particularly behavior maintained by social reinforcers (e.g., Greer et al., 2016). This is why the BACB's (2020) ethics code prioritizes these interventions. However, treatments based solely on reinforcement may not always be effective in reducing problem behavior to an acceptable level (e.g., Grace, Kahng, & Fisher, 1994; Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998; Wacker et al., 1990). This is particularly the case when behavior is maintained by automatic or unknown sources of reinforcement (LeBlanc et al., 2000; Vollmer et al., 1994).

Treatment Approaches Based on Extinction

It is possible to use extinction alone as a treatment for severe problem behavior. This procedure involves withholding the functional reinforcer that previously maintained the problem behavior, and it has been shown to be effective (e.g., Anderson & Long, 2002; Kennedy & Souza, 1995; Williams, 1959). Again, it is important that the selected extinction procedures match the function of the target problem behavior (Iwata et al., 1994). In some cases (such as when the problem behavior is maintained by automatic reinforcement), this may involve response blocking. In other cases, it may involve modifying the environment (such as padding a table to avoid objects making noise when spinning on the table) or using protective equipment (such as placing gloves on an individual's hands so they do not experience physical sensations from twirling or picking, or placing goggles on an individual to prevent sensory stimulation from eye poking).

It is rarely recommended that extinction be used in isolation (Vollmer & Athens, 2011; Vollmer et al., 1998). When used alone, extinction can have several negative side effects, such as extinction bursts (Goh & Iwata, 1994; Lerman, Iwata, & Wallace, 1999), induced response variation (e.g., Vollmer & Athens, 2011), and emotional outbursts (Vollmer & Athens, 2011). Furthermore, extinction in isolation does not proactively teach new repertoires of appropriate behaviors, which is thought to be a key element of effective treatment for severe problem behavior.

In some cases, it is difficult if not impossible to implement extinction because of safety concerns for the client, their care providers, or the environment. In these cases, the severe problem behavior is reinforced as well as an appropriate alternative response. In these cases, the intervention is conceptualized as a "concurrent operant," meaning that multiple responses will receive the functional reinforcer. The interventionist typically attempts to bias responding in favor of the more desirable, appropriate, and habilitative response by increasing the frequency, duration, quality, or immediacy of reinforcement for the appropriate response and/or making the appropriate response less effortful than the target problem behavior (e.g., Horner & Day, 1991; Peck et al., 1996). This approach to treatment has been shown to have efficacy when extinction is either not possible or an undesirable strategy (i.e., because care providers do not want to implement it or implementation of extinction would require additional strategies, such as physical restraint, that are nonpreferred or in violation of a treatment center's policies).

Antecedent-Based Treatment of Problem Behavior

Another treatment approach for problem behavior involves the use of antecedent-based procedures. These procedures are used prior to and independent of the behavior's occurrence, usually in an effort to prevent the occurrence of problem behavior. The strategy is typically to either remove environmental stimuli that evoke problem behavior and/or abolish the motivation for problem behavior. Research also indicates that these interventions can be highly effective in reducing severe problem behavior. Examples of these strategies are:

- *Fixed- or variable-time delivery of reinforcement* (e.g., Lalli et al., 1997; Phillips et al., 2017; Van Camp et al., 2000), where the identified reinforcer is delivered on a set schedule before problem behavior occurs in an effort to decrease the motivation for the individual to engage in problem behavior.

- *Behavioral momentum*, such as a high-probability request sequence in which a series of easy-to-follow instructions is followed by an instruction that has been less likely to be followed (e.g., Normand, Kestner, & Jessel, 2010, Axelrod & Zank, 2012, Ewry & Fryling, 2016).
- *Enriched environment procedures provide noncontingent access to preferred items and other sources of reinforcement* to decrease the motivation for problem behavior by increasing alternative sources of stimulation for the client (e.g., Horner, 1980; Vollmer et al., 1994).
- *Proactively increasing opportunities for choice* making throughout the day has also been shown to improve problem behavior (e.g., Dunlap et al., 1994; Dyer et al., 1990; Kern et al., 1998).
- *Restraint* is a procedure used to physically limit the individual's ability to engage in the target problem behavior. This may include protective equipment (e.g., helmets, arm splints), personal restraint (e.g., physical restraint), and self-restraint (e.g., the client with problem behavior applies restraints to themselves). (See ABAI's [2010] position statement on the use of restraint and seclusion for restrictions on these procedures).

These procedures are not always effective in reducing problem behavior (e.g., Phillips et al., 2017). Further, some of these treatments, such as fixed- and variable-time reinforcement or removing the stimuli that evoke problem behavior, are criticized because they do not teach new, more adaptive responses. Thus, whether treatment effects can be maintained when the individual is performing in a different context is questioned. In some cases, such as when problem behavior is maintained by automatic reinforcement, treatments based on procedures like restraint may be presumed to work because they disrupt the behavior-consequence contingency. That is, because the behavior does not occur, the reinforcer is not provided. However, some have speculated that these procedures could function as punishment instead (Lerman & Vorndran, 2002). (See below for further discussion of punishment.)

Psychotropic Medications

Psychotropic drugs have been widely prescribed for people with developmental disabilities over the past 50 years (Weeden, Ehrhardt, & Poling, 2010). They are prescribed by psychiatrists, not behavior analysts. Nonetheless, behavior-analytic treatment without CESS is often provided in the context of simultaneous, ongoing psychotropic treatment.

It is estimated that approximately 40 to 50% of individuals with autism receive at least one psychotropic medication (Aman, Lam, & Collier-Crespin, 2003; Green et al., 2006; Goin-Kochel, Myers, & Mackintosh, 2007; Gringras, 2000; Langworthy-Lam, Aman, & Van Bourgondien, 2002; Witwer & Lecavalier, 2005). Vohra et al. (2016) found that psychotropic polypharmacy was significantly more common for adults with autism spectrum disorder (ASD) than for adults without ASD. In fact, they found that half of adults with ASD were prescribed six or more drug classes in a year and 20% of them used at least three drug classes in a mere 90 days. Individuals with ASD were also prescribed more non-psychotropic drugs than their non-ASD peers.

Most of these drugs are being used "off-label," meaning the drug is prescribed for a purpose other than that for which the FDA has approved its use (Vohra, 2016; Weeden et al., 2010). There is reason to doubt that the use of these drugs is evidence-based, due to the difficulties in conducting methodologically sound studies of this intervention for problem behavior (Weeden et al., 2010).

However, a few behavior analytic studies of drug effects have been conducted (e.g., Crosland et al., 2003; Garcia & Smith, 1999; Valdovinos, Ellringer, & Alexander, 2007; Valdovinos et al., 2002; Zarccone et al., 2001, 2004). Weeden et al. (2010) reviewed several published articles on the use of psychotropic drugs as treatment for severe problem behavior and concluded:

1. *Several different drugs may be of value in reducing challenging behavior in people with autism...*
2. *Individual differences in response to a given drug are common...and the factors responsible for variability are unknown...*
3. *Side effects, the nature and severity of which differ across drugs and individual, sometimes appear and limit a drug's clinical value. (p. 6)*

These authors agreed with Thompson, who noted, “Medications can be helpful, harmful, or inconsequential, depending on the specific circumstance” (2007, p. 172). As with behavior analytic treatments, the effects of medications are likely individualized, and data-based decisions regarding whether they are useful must be made on an individual basis. Li and Poling (2018) found that although many behavior analysts reported working with individuals with ASD who were taking psychotropic medications, few felt they had adequate training regarding such medications. These behavior analysts also reported they lacked experience working with interdisciplinary teams and that often medications were prescribed before behavior-analytic interventions were attempted.

Some behavior analysts recommend a “biobehavioral” or “neurobehavioral” approach to treatment of problem behavior. Such an approach recognizes that there are likely multiple determinants of problem behavior, including psychiatric conditions, genetic abnormalities, and neurological dysfunction in addition to environmental causes (Hagopian & Frank-Crawford, 2018; Newcomb & Hagopian, 2018). This requires a transdisciplinary approach to treatment of severe problem behavior. Behavior analysts are not trained or equipped to conduct assessments of medical causes of problem behavior, which should be considered prior to implementing treatment for problem behavior (Li & Poling, 2007). Further, an integrated, transdisciplinary approach allows for comprehensive treatment of the complex needs of many individuals with intellectual disabilities, including behavior problems resulting from social and environmental contingencies that maintain problem behavior and deficits in skill repertoires as well as the neuropsychiatric dysfunction and other medical issues that the individual may not be able to describe as a result of communication deficits.

Enthusiasm for treatment programs that incorporate psychotropic medications should be tempered by the lack of strong evidence for the effectiveness of the medications with clients with ASD. Especially scarce is evidence of effectiveness in adult populations (Vohra et al., 2016). Research is still needed on the long-term use of psychotropic medication, both in terms of its effectiveness and its adverse side effects (Poling et al., 2017). Vohra et al. (2016) listed side effects associated with risperidone and aripiprazole, two widely prescribed drugs: “It is well known that risperidone therapy is associated with adverse events such as sedation, obesity, tardive dyskinesia, and side effects such as increased appetite, fatigue, drowsiness, dizziness, and drooling. Aripiprazole use is also known to cause adverse effects such as significant weight gain, sedation, and sialorrhea” (p. 410).

Punishment

Punishment occurs when a stimulus is removed or provided, contingent on a target response, that decreases the future probability of that response. Punishment may be a required part of the treatment for problem behavior when the maintaining variables cannot be identified or are not under the clinician's control (Lerman & Vorndran, 2002). In fact, a review of 368 studies on punishment published between 1967 and 2013 indicated that behavior maintained by automatic reinforcement was much more likely to be treated with punishment than was behavior maintained by social reinforcement (Lydon et al., 2015).

Iwata (1988) suggested that the use of punishment should be considered a “default technology,” meaning it is an intervention borne out of failure of previous interventions. He noted:

...aversive contingencies are called into play when we have failed to find or to establish a positive reinforcer, when we have failed to deliver that reinforcer in an effective manner, when we have failed to find a suitable response to displace the target, when we have failed to examine the stimulus conditions that contribute to the problem, and when we have failed to generate the resources necessary to maintain a successful program. (p. 152)

Iwata (1988) stated that in an ideal world, we would not have treatment failures. However, in the real world, we do, leaving us with difficult choices between continued occurrence of problem behavior, drugs that sedate a person and thereby decrease problem behavior, or the use of punishment contingencies.

Punishment procedures other than CESS can take many forms, including:

- Response blocking
- Response interruption and redirection
- Contingent exercise
- Overcorrection
- Response cost
- Time out from positive reinforcement
- Contingent presentation of aversive stimuli

Reviews of basic and applied research on punishment indicate that these procedures are highly effective in reducing problem behavior (e.g., Lerman and Vorndran, 2002; Lydon et al., 2015; Matson & Taras, 1989). Nonetheless, experimenters have reported a wide range of effectiveness across all types of punishment procedures (e.g., Lydon et al., 2015). This has led to numerous calls for further research in this area.

Punishment can have several negative side effects. Individuals may cry, become aggressive, avoid interaction with the punishing agent, or engage in behavior to escape the punishment contingency. Some behavior analysts are concerned that the use of punishment models undesirable behavior. Also problematic is that the use of punishment can be reinforcing to the punisher because it can be so effective, creating conditions in which punishment might be overused or abused (Cooper et al., 2020). Because of these concerns, section 2.15 of the *Code of Ethics for Behavior Analysts* (BACB, 2020)

requires that behavior analysts recommend punishment procedures only after less-intrusive interventions have failed or when a risk-benefit analysis shows that the risk of harm from the punishment procedures is outweighed by the risk of harm from the problem behavior. Section 2.15 also notes that review by a human rights committee may be required when this type of intervention is used. We should note that the use of certain punishment procedures (such as contingent presentation of aversive stimuli) may be illegal in some jurisdictions.

It is difficult to assess the reports of negative side effects of punishment, in part because the empirical basis of the reports is uneven. Van Houten (1983), Carr and Lovaas (1983), and Newsom et al (1983) considered several potential effects, including emotional reactions, aggression, escape or avoidance of the punishing agent, response substitution, general suppression of desirable behavior, and disruption of social relationships. They concluded that such effects are minimal or short-lived, at least in properly arranged therapeutic environments. Newsom et al. (1983) reviewed studies that reported negative side effects. Their overall impression was:

...mild surprise that serious side effects are seen so infrequently. ...Conspicuously absent from these studies is convincing evidence of serious, lasting harm to the recipients of punishment, despite the warnings of numerous authorities of various theoretical persuasions. Most of the undesirable side effects described lasted only for a few minutes or days, were quickly responsive to treatment if they did not disappear spontaneously, and constituted a relatively small and ethically justified price to pay in return for the elimination of much more detrimental behaviors. ...[And,] it seems that the most serious side effects reported were partly a function of inadequate treatment programming. They tended to occur in situations where insufficient attention was given to the necessity of providing intensive training in adaptive behavior along with the punishment regimen. (pp. 300-301)

As suggested by Newsom et al. (1983), punishment is more likely to be effective if it is paired with complementary interventions, specifically reinforcement-based interventions (Cooper et al., 2020). Indeed, it is difficult to find contemporary research that solely uses punishment to treat problem behavior. Most often, studies that contain a punishment procedure include reinforcement-based treatments at the same time.

Some studies have analyzed whether the punishment procedure was a necessary component of the treatment or whether the reinforcement procedures in the treatment package were sufficient to produce durable behavior change. For example, Hagopian et al. (1998) evaluated the use of functional communication training (FCT) with and without punishment and extinction. They found that FCT with extinction produced at least a 90% reduction in problem behavior in 44% of cases. When punishment was part of the FCT package, treatment reduced problem behavior by at least 90% in every application.

More recent studies of reinforcement-based treatments have reported better outcomes in the absence of punishment. For example, Rooker et al. (2013) reported that FCT combined with other reinforcement procedures reduced problem behavior by at least 90% in 71% of cases. When FCT alone did not produce at least a 90% reduction in problem behavior, the addition of punishment was effective for 55% of those cases. Finally, Greer et al. (2016) examined the effectiveness of FCT in reducing problem behavior during reinforcement schedule thinning and found that only 1 in 25 applications required punishment to reduce problem behavior by 90%.

Despite improvements in reinforcement-based treatments, these findings suggest that punishment may be needed in at least some cases. It also should be noted that these studies focused on behavior with identified social functions. Recent research on automatically-reinforced self-injury has identified at least one subtype that appears to be particularly insensitive to reinforcement-based treatments (Hagopian et al., 2017).

Hanley et al. (2005) implemented FCT with and without punishment for two children with developmental disabilities and severe problem behavior. Similar to Hagopian et al. (1998), Hanley et al. (2005) found that FCT with punishment was more effective than FCT without punishment. Next, Hanley and colleagues (2005) conducted a preference assessment with the children, using a concurrent chains procedure, to identify which treatment they preferred. In both cases, the children chose the treatment that contained a punishment procedure rather than the treatment that was solely reinforcement-based. These results are interesting in that they suggest individuals receiving behavioral treatment may actually prefer treatments that contain punishment components, perhaps because they are more effective in reducing their problem behavior, thus allowing them more access to the reinforcement contingencies in the treatment program. Another reason this study is interesting is that it provides a potential technology for identifying client preferences for treatment and, perhaps, even assent for specific treatments.

Interviews with Providers

We interviewed clinical directors at nine facilities across the United States that treat problem behavior in individuals with developmental disabilities and that do not use CESS. One interview was conducted via email correspondence; the others were conducted in a series of Zoom interviews, one for each facility. Here is what we learned from these providers.

Two of the facilities provide long-term residential care without an upper age limit, one provides residential care to clients through their 21st year (“children”), two provide short-term residential care to children, and four provide day programs to children. The goal of these interviews was to identify the strategies they employ and the success of those strategies. Generally speaking, we asked about:

- the severity of the behavior they treat,
- what factors affect their decision to accept or reject a client for treatment at their facility,
- their policies on various treatment modalities (reinforcement, reductive procedures, psychotropic drugs, physical restraints), and
- the reasons they would discontinue services for a client (besides a successful outcome).

The reports we received from these providers were relatively consistent with each other. Most of the providers reported that they treated severe problem behavior, including self-injury, aggression, and property destruction, but there appeared to be limited capacity for clients with such problems at their facilities. One long-term residential provider said they had to limit the number of “high-profile” cases. Another residential provider reported a capacity for 28 clients in “intensive care.” A short-term residential provider reported a limit of “1 or 2 severe cases” and a day program provider reported that they could accommodate 2 or 3 clients with SIB or aggression. Two providers, one with a long-term residential program and the other with a day program, said that they did not have a severe behavior program or that they “may have a few severe cases.”

The interviewed providers who did treat severe problem behavior noted that some instances were intensive enough to cause permanent tissue damage, permanent disfigurement, calcifications, infections, tooth loss, sensory loss, loss of function, concussions in staff, breaking staff bones and/or skin, and so on. In many cases, psychotropic drugs prescribed by a psychiatrist were incorporated into the treatment plans. These providers noted that their clients with the most serious problem behavior came to their facilities after being discharged from schools, group homes, or other community settings. Most stated they did not reject prospective clients due to the severity of their problem behavior, but they also acknowledged that they had limited capacity for the most serious cases. They also said they had long wait lists and sometimes they could not do an intake for a specific client because they already had too many other clients with very severe problem behavior. In some cases, clients were not accepted for extended periods of time because getting insurance clearance was difficult, often requiring several appeals before insurance approval was granted. In particular, providers noted that it was very difficult to get funding for services for clients above the age of 22 years. Some clients remained on the wait list for longer periods of time because the provider needed to discharge other clients before they would have sufficient staff to accept a new client with severe problem behavior. Most providers reported they did not discharge clients due to the severity of their behavior.

A primary factor in deciding whether to accept or reject a client among these interviewed providers is staff availability. Thus, an important question that arose was the staffing ratios and caseloads of behavior analysts. The Council of Autism Service Providers (CASP) has best practice guidelines (CASP, 2020) that suggest a BCBA's caseload for focused treatment should be 10 to 15 clients in the absence of assistance from technicians such as Board Certified Associate Behavior Analysts (BCaBAs). However, the complexity of the clients' needs and the treatment hours of service all need to be taken into account when determining caseloads. Further, CASP notes that focused treatment for severe problem behavior is complex and, thus, requires considerably greater levels of case supervision. This necessitates much smaller caseloads. Consistent with these guidelines, providers reported having a high technician-to-client ratio, typically around two to three technicians per client. Further, cases were typically overseen by a BCBA-D with a typical caseload of two to four cases if the clients attended the center on a full-day basis or four to six if the clients attended the center on a half-day basis.

All of the interviewed providers reported the use of functional analysis technologies to determine the function(s) of severe problem behavior and to guide treatment selection. If a functional analysis is deemed too dangerous, modified functional analyses, such as latency-based assessments, precursor behavior assessments, and the like are used. As a general rule, the providers reported they use mostly reinforcement-based treatment strategies, in combination with extinction and antecedent-based strategies. When necessary, protective equipment and restraints are used to keep individuals safe. Some providers stated they did not view restraints as "treatment." Rather, restraints were used for safety purposes only. These restraints are typically successfully faded over time.

The providers reported using function-based punishment procedures occasionally. For example, sometimes a treatment might include overcorrection, nonexclusionary time out, or a response-cost procedure such as removing a preferred tangible contingent on problem behavior. This was reported rarely, and providers reported success in fading these contingencies from the treatment plan. Providers reported that they rarely use physical restraint, such as a basket hold procedure. Many reported that regulations in their state restricted such procedures to emergency situations. None reported the use of painful aversive stimuli.

All of the interviewed providers reported that a high percentage of their clients received multiple psychotropic and other medications in combination with the behavior analytic treatments they were receiving. Generally speaking, these providers also reported collaborating closely with psychiatrists and prescribing physicians to systematically analyze the effects of medications on target behavior. Some providers reported state-of-the-art assessments to evaluate the effects of medications on specific classes of behavior that appeared to be maintained by automatic reinforcement and were related to psychiatric or other health conditions. Following effective treatment of these topographies of problem behavior, further functional analyses identified operant functions of problem behavior, which could then be treated with behavior analytic technologies.

The providers noted the importance of considering underlying medical issues and carefully analyzing problem behavior in this context. One provider described their reservations about using punishment-based interventions (and even some antecedent-based interventions, such as environmental enrichment) because doing so could suppress challenging behavior in a way that masks an underlying medical condition.

The providers described extensive protocols for parent and other care-provider training, as well as extensive follow-up and “step-down” procedures to ensure effective transition to less-restrictive settings. Some even reported following children until they “aged out” of the system—being available for consultation and ongoing training until that point.

The providers reported successful outcomes in the majority of their cases. Most said that parents and school personnel were able to successfully manage the clients after discharge from services. Most said that only a small percentage of their clients need residential care following treatment; some of these providers noted that it is the clients with the most severe problem behavior who most often need residential care. Two providers of residential programs for children noted that they must discharge their clients by the end of the 21st year. They expressed concern about the scarcity of residential programs for adults, and they described great difficulty in finding placements for their clients with the most severe problem behavior. One of these providers explained that their clients’ problem behavior generally returns to unacceptable levels after they leave the therapeutic environment of their treatment facility, and this makes it especially difficult to find a facility that will accept them. Unfortunately, the provider said, many of these clients will be placed in psychiatric institutions where their problem behavior is managed with psychotropic medication.

Summary and Conclusions

There are many alternatives to CESS available for treating severe problem behavior. All of the clinical directors at well-respected treatment facilities we interviewed rely solely on these alternatives to CESS and reported successful outcomes. The treatment process typically begins with a functional behavior assessment, including a formal functional analysis (Iwata et al., 1982/1994). The functional analysis is considered the “gold standard” approach to conducting functional assessments of problem behavior. The results of this assessment should guide treatment selection in that interventions for problem behavior should be based on the function(s) of the severe problem behavior. Alternatives to CESS range from differential reinforcement/skill instruction, antecedent-based interventions, and to a much lesser extent extinction, punishment, and restraint. Often, treatment involves some combination of these procedures.

Psychotropic medication is frequently used as treatment for severe problem behavior, with many individuals receiving multiple psychotropic medications. These medications are not prescribed by behavior analysts, but rather psychiatrists. A transdisciplinary approach to treatment of problem behavior, including professionals from the medical field, is important, given the complex needs of most individuals displaying problem behavior. Behavior analysts we interviewed routinely collaborate with medical professionals to rule out medical causes for problem behavior and to ensure that biobehavioral interactions are considered and appropriately treated. Side effects of psychotropic medication should be carefully monitored.

Differential reinforcement (including extinction) and antecedent-based interventions have shown robust effects in both the research literature and in clinical practice, effectively reducing severe problem behavior in many situations. Occasionally, reinforcement- and antecedent-based interventions are not sufficient to decrease severe problem behavior to acceptable levels. In some situations, punishment contingencies and restraint must be added to reduce problem behavior to acceptable levels and/or to keep the client and caregivers safe. A cost associated with punishment procedures is that they can produce negative side effects, as can psychotropic medications. In addition, they might be overused because they are so effective at reducing problem behavior. Some research suggests that clients may actually prefer treatments that include punishment contingencies. Finally, another cost to these alternative treatments is that they are labor intensive and often require relatively high technician-to-client ratios and small caseloads.

Lerman and Vorndran (2002) noted that studies of effective treatments are more likely to be published than studies of ineffective treatments. Thus, it is difficult to know how often treatments actually succeed or fail or the conditions that may affect when treatments succeed or fail. The field would benefit from a greater willingness to publish treatment failures or treatments that produce undesired outcomes (such as negative side effects). This could lead to more effective recommendations for practice because the parameters of treatment success and failure would be better understood. This recommendation is relevant because repeated treatment failures may increase the likelihood that clinicians will rely on default technologies, such as CESS or other punishment contingencies.

Ethical Considerations

Some critics of CESS contend that it is immoral and unethical. The task force cannot render a judgment about morality. The question of ethics can be answered by prevailing standards within the profession of applied behavior analysis as codified in formally established policies and positions of ABAI and the *Ethics Code for Behavior Analysts* (BACB, 2020). Our review of these sources supports the conclusion that CESS can be part of an ethically sound treatment program. The following standards inform and guide our judgment:

1. The welfare of the individual is paramount, and clinical decisions must be made in the individual's best interests. Controversy surrounding a therapeutic procedure does not, in itself, disqualify its use.

According to ABAI's *Statement on Restraint and Seclusion* (ABAI, 2010), the individual's interests "must take precedence over the broader agendas of institutions or organizations that would prohibit certain procedures regardless of the individual's needs."

2. Individuals and their parents or guardians have a right to choose. According to the *Statement on Restraint and Seclusion* (ABAI, 2010), "Organizations and institutions should not limit the professional

judgment or rights of those legally responsible for an individual to choose interventions that are necessary, safe, and effective. If an individual is unable to give legal informed consent, the *Ethics Codes for Behavior Analysts* (BACB, 2020) states the behavior analysts “are responsible for obtaining assent from clients when applicable.” Because of the special nature of CESS, diligent efforts should be made to evaluate the individual’s assent to the treatment program to the extent possible.

3. *The fact that a procedure has been used irresponsibly does not disqualify the procedure or prohibit its responsible use.* According to the *Statement on Restraint and Seclusion* (ABAI, 2010), “The irresponsible use of certain procedures by unqualified or incompetent people should not result in policies that limit the rights of those duly qualified and responsible for an individual through the process of making informed choices.”

4. *Judgments about the restrictiveness of a procedure must consider the individual’s overall environment and potential behavioral repertoire.* According to ABAI’s policy on the right to effective behavioral treatment, “Decisions on the use of potentially restrictive treatment are based on consideration of its absolute and relative level of restrictiveness, the amount of time required to produce a clinically significant outcome, and the consequences that would result from delayed intervention.” According to the policy on restraint and seclusion, “a non-intrusive intervention that permits dangerous behavior to continue while limiting participation in learning activities and community life, or results in a more restrictive placement, may be considered more restrictive than a more intensive intervention that is effective and enhances quality of life.”

5. *Both professional oversight and community oversight are required in certain cases.* According to ABAI’s *Statement on the Right to Effective Behavioral Treatment* (ABAI, 1989), “In cases where withholding or implementing treatment involves potential risk and the client does not have the capacity to provide consent, individual welfare is protected through two mechanisms: Peer Review Committees, imposing professional standards, determine the clinical propriety of treatment programs; Human Rights Committees, imposing community standards, determine the acceptability of treatment programs and the degree to which they may compromise an individual’s rights.”

6. *Punishment may be a component of an ethical treatment program if certain conditions are met.* The punitive component must be necessary, comply with oversight requirements, and its effects must be monitored and documented to justify its continuation. According to Standard 2.15 of the *Ethics Code for Behavior Analysts*:

Behavior analysts select, design, and implement behavior-change interventions (including the selection and use of consequences) with a focus on minimizing risk of harm to the client and stakeholders. They recommend and implement restrictive or punishment-based procedures only after demonstrating that desired results have not been obtained using less intrusive means, or when it is determined by an existing intervention team that the risk of harm to the client outweighs the risk associated with the behavior-change intervention. When recommending and implementing restrictive or punishment-based procedures, behavior analysts comply with any required review processes (e.g., a human rights review committee). Behavior analysts must continually evaluate and document the effectiveness of restrictive or punishment-based procedures and modify or discontinue the behavior-change intervention in a timely manner if it is ineffective.

There is nothing intrinsic to CESS that prevents a provider from fulfilling the requirements of this standard.

Recommendations

Although CESS is not the standard of care for the treatment of problem behavior, the task force recognizes that some individuals may choose a treatment program that incorporates CESS for themselves or those in their care when an effective alternative for treating severe, life-threatening behavior cannot be found. Under rare circumstances, CESS may be one component of an otherwise reinforcement-based program.

Support for an individual's right to choose such a program must be evaluated within the context of clinical, ethical, and social challenges that accompany the use of CESS. In light of these considerations and the findings described in this report, we recommend that the use of CESS be highly restricted as follows:

1. The primary treatment strategies for severe problem behavior are reinforcement-based and matched to the identified function(s) of the behavior. Most instances of severe problem behavior are successfully treated without CESS when the treatments are based on the results of a functional analysis. Therefore, CESS may be considered only after competently implemented, state-of-the-art, reinforcement-based programs without CESS have been proven unsuccessful. This judgment must be affirmed by at least one doctoral-level behavior analyst who is independent of the CESS provider and has expertise in the contemporary treatment of severe behavior disorders. The affirmation must be documented and include the behavior analyst's review and evaluation of the availability and effectiveness of alternative treatments for the individual. This restriction is intended to ensure that (a) the individual has access to evidence- and function-based treatment before entering a program that includes a painful stimulus, and (b) the individual or the individual's guardian has a meaningful, informed choice between CESS and other less-restrictive treatment options.
2. Treatment programs involving CESS may be implemented only after a medical professional has assessed and treated physical conditions that might be related to the problem behavior, ruling them out as significant factors in the continuation of the behavior.
3. Treatment programs involving CESS may be implemented only after legal informed consent has been obtained from the individual or the individual's legal guardian. The consent procedure must include information about the potential benefits and risks of CESS, along with the benefits and risks of alternative procedures. Among the risks that must be explained is the likelihood that the CESS procedure cannot be faded, and that instead it may be a chronic component of the individual's environment. The system for obtaining consent is considered part of the treatment plan and, as such, is subject to approval and periodic review as described in Restrictions 6 and 8 below.
4. If the individual is unable to give informed consent, diligent efforts should be made to evaluate the individual's assent to the treatment program to the extent possible. The "Ethics Code for Behavior Analysts," as updated by the Behavior Analysis Certification Board in March 2022, defines "assent" as: "Vocal or nonvocal verbal behavior that can be taken to indicate willingness to participate in research or behavioral services by individuals who cannot provide informed consent (e.g., because of age or

intellectual impairments). Assent may be required by a research review committee or a service organization. In such instances, those entities will provide parameters for assessing assent.” Throughout treatment, the provider should monitor behavior that may indicate continuation or withdrawal of assent. The system for assessing assent and its withdrawal is considered part of the treatment plan and, as such, is subject to approval and periodic review as described in Restrictions 6 and 8 below.

5. CESS must be a component of a reinforcement-based program that is designed and supervised by a doctoral-level behavior analyst. As should be the case with all behavior analytic treatment, steps must be taken to ensure that (a) the interventions are delivered as designed (treatment integrity) and (b) negative physical and behavioral side effects are monitored and recorded.

6. Treatment programs involving CESS, including procedures related to consent and assent, must be approved and periodically reviewed by a peer review committee and a human rights committee, and the judgments of these committees must be documented.

7. CESS must be applied to behavior that poses clear and convincing risk of bodily harm to the individual or others (i.e., self-injury and aggression), as judged by the CESS provider, a medical professional, and at least one doctoral-level behavior analyst who is independent of the CESS provider and has expertise in the contemporary treatment of severe behavior disorders. This restriction is intended to ensure that CESS is applied only to severe, life-threatening behavior.

8. Treatment programs involving CESS, including procedures related to obtain consent and assent, must be approved and periodically reviewed by at least one doctoral-level behavior analyst who is independent of the CESS provider and has expertise in the contemporary treatment of severe behavior disorders. The behavior analyst’s judgments must be documented. This requirement is intended to (a) provide an independent expert assessment of the ongoing effectiveness of CESS as a treatment component, (b) promote timely discontinuation of CESS if it is not effective or if negative side effects outweigh treatment gains, (c) prevent the overuse of CESS through the addition of other topographies of severe problem behavior to the treatment plan unless appropriate and necessary, and (d) promote fading of CESS whenever possible.

9. The procedure for implementing CESS must be legal.

10. The safety of the CESS procedure must be established, monitored, and documented. Applicable electrical engineering safety standards for the CESS delivery system must be met. The individual’s medical condition must be evaluated to ensure that CESS can be administered without compromising the individual’s physical safety. Such evaluation must be conducted before CESS is used and periodically during the course of treatment with CESS. The evaluations must be documented.

11. All applications of CESS must be documented and reviewed to ensure that the CESS component of the treatment plan is conducted properly. Malfunctions of the CESS delivery system also should be documented and reviewed. Malfunctions include failures to deliver the stimulus and spurious deliveries.

References

- Aman, M. G., Lam, K. S., & Collier-Crespin, A. (2003). Prevalence and patterns of use of psychoactive medicines among individuals with autism in the Autism Society of Ohio. *Journal of Autism and Developmental Disorders, 33*(5), 527-534.
- Anderson, C. M., & Long, E. S. (2002). Use of a structured descriptive assessment methodology to identify variables affecting problem behavior. *Journal of Applied Behavior Analysis, 35*(2), 137-154.
- Association for Behavior Analysis International (1989). *Statement on the right to effective behavioral treatment*. <https://www.abainternational.org/about-us/policies-and-positions/right-to-effective-behavioral-treatment,-1989.aspx>
- Association for Behavior Analysis International (2010). *Statement on restraint and seclusion*. <https://www.abainternational.org/about-us/policies-and-positions/restraint-and-seclusion,-2010.aspx>
- Austin, J. L., & Bevan, D. (2011). Using differential reinforcement of low rates to reduce children's requests for teacher attention. *Journal of Applied Behavior Analysis, 44*(3), 451-461.
- Axelrod, M. I., & Zank, A. J. (2012). Increasing classroom compliance: Using a high-probability command sequence with noncompliant students. *Journal of Behavioral Education, 21*(2), 119-133.
- Behavior Analyst Certification Board. (2020). *Ethics code for behavior analysts*. <https://bacb.com/wp-content/ethics-code-for-behavior-analysts/>
- Blenkush, N.A. & O'Neill, J. (2020). Contingent Skin-Shock Treatment in 173 Cases of Severe Problem Behavior. *International Journal of Psychology & Behavior Analysis, 6*: 167. doi: <https://doi.org/10.15344/2455-3867/2020/167>
- Brown, K. A., Wacker, D. P., Derby, K. M., Peck, S. M., Richman, D. M., Sasso, G. M., Knutson, C., & Harding, J. W. (2000). Evaluating the effects of functional communication training in the presence and absence of establishing operations. *Journal of Applied Behavior Analysis, 33*(1), 53-71.
- Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis, 18*(2), 111-126.
- Carr, E. G., & Lovaas, O. I. (1983). Contingent electric shock as a treatment for severe behavior problems. In S. Axelrod & J. Apsche (Eds.), *The effects of punishment on human behavior* (pp. 221-245). Academic Press.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied behavior analysis (3rd ed)*. Pearson.
- Council of Autism Service Providers (2020). *Applied behavior analysis treatment of autism spectrum disorder: Practice guidelines for healthcare funders and managers*. Author.

- Cowdery, G. E., Iwata, B. A., & Pace, G. M. (1990). Effects and side effects of DRO as treatment for self-injurious behavior. *Journal of Applied Behavior Analysis, 23*(4), 497-506.
- Crosland, K. A., Zarccone, J. R., Lindauer, S. E., Valdovinos, M. G., Zarccone, T. J., Hellings, J. A., & Schroeder, S. R. (2003). Use of functional analysis methodology in the evaluation of medication effects. *Journal of Autism and Developmental Disorders, 33*(3), 271-279.
- Derby, K. M., Wacker, D. P., Berg, W., DeRaad, A., Ulrich, S., Asmus, J., Harding, J., Prouty, A., Laffey, P., & Stoner, E. A. (1997). The long-term effects of functional communication training in home settings. *Journal of Applied Behavior Analysis, 30*(3), 507-531.
- Duker, P.C. & Seys, D.M. (1996). Long-term use of electrical aversion treatment with self-injurious behaviors. *Research in Developmental Disabilities, 17*, 293-301.
- Duker, P.C. & Seys, D.M. (2000). A quasi-experimental study on the effect of electrical aversion treatment on imposed mechanical restraint for severe self-injurious behavior. *Research in Developmental Disabilities, 21*, 235-242.
- Dunlap, G., DePerczel, M., Clarke, S., Wilson, D., Wright, S., White, R., & Gomez, A. (1994). Choice making to promote adaptive behavior for students with emotional and behavioral challenges. *Journal of Applied Behavior Analysis, 27*(3), 505-518.
- Dyer, K., Dunlap, G., & Winterling, V. (1990). Effects of choice making on the serious problem behaviors of students with severe handicaps. *Journal of Applied Behavior Analysis, 23*(4), 515-524.
- Ewry, D. M., & Fryling, M. J. (2016). Evaluating the high-probability instructional sequence to increase the acceptance of foods with an adolescent with autism. *Behavior Analysis in Practice, 9*(4), 380-383.
- Filter, K. J., & Horner, R. H. (2009). Function-based academic interventions for problem behavior. *Education and Treatment of Children, 32*(1), 1-19.
- Fisher, W. W., Piazza, C. C., & Roane, H. S. (Eds.). (2021). *Handbook of applied behavior analysis* (2nd edd). The Guildford Press.
- Foxx, R. M., McMorrow, M. J., Bittle, R. G., & Bechtel, D. R. (1986). The successful treatment of a dually-diagnosed deaf man's aggression with a program that included contingent electric shock. *Behavior Therapy, 17*, 170-186.
- Foxx, R. M., & Mulick, J. A. (Eds.) (2016). *Controversial therapies for autism and intellectual disabilities: Fad, fashion, and science in professional practice* (2nd ed.). Routledge.
- Garcia, D., & Smith, R. G. (1999). Using analog baselines to assess the effects of naltrexone on self-injurious behavior. *Research in Developmental Disabilities, 20*(1), 1-21.
- Goh, H. L., & Iwata, B. A. (1994). Behavioral persistence and variability during extinction of self-injury maintained by escape. *Journal of Applied Behavior Analysis, 27*(1), 173-174.

- Grace, N. C., Kahng, S. W., & Fisher, W. W. (1994). Balancing social acceptability with treatment effectiveness of an intrusive procedure: A case report. *Journal of Applied Behavior Analysis, 27*(1), 171-172.
- Green, V. A., Pituch, K. A., Itchen, J., Choi, A., O'Reilly, M., & Sigafoos, J. (2006). Internet survey of treatments used by parents of children with autism. *Research in Developmental Disabilities, 27*, 70-84.
- Greer, B. D., Fisher, W. W., Saini, V., Owen, T. M., & Jones, J. K. (2016). Functional communication training during reinforcement schedule thinning: An analysis of 25 applications. *Journal of Applied Behavior Analysis, 49*(1), 105-121.
- Goin-Kochler, R. P., Myers, B. J., & Mackintosh, V. H. (2007). Parental reports on the use of treatments and therapies for children with autism spectrum disorders. *Research in Autism Spectrum Disorders, 1*, 195-209.
- Hagopian, L. P., Boelter, E. W., & Jarmolowicz, D. P. (2011). Reinforcement schedule thinning following functional communication training: Review and recommendations. *Behavior Analysis in Practice, 4*, 4-16. <https://doi.org/10.1007/BF03391770>
- Hagopian, L. P., Fisher, W. W., Sullivan, M. T., Acquisto, J., & LeBlanc, L. A. (1998). Effectiveness of functional communication training with and without extinction and punishment: A summary of 21 inpatient cases. *Journal of Applied Behavior Analysis, 31*(2), 211-235.
- Hagopian, L. P., & Frank-Crawford, M. A. (2018). Classification of self-injurious behaviour across the continuum of relative environmental-biological influence. *Journal of Intellectual Disability Research, 62*(12), 1108-1113.
- Hagopian, L. P., Rooker, G. W., Zarcone, J. R., Bonner, A. C., & Arevalo, A. R. (2017). Further analysis of subtypes of automatically reinforced SIB: A replication and quantitative analysis of published datasets. *Journal of Applied Behavior Analysis, 50*(1), 48-66.
- Hanley, G. P., Piazza, C. C., Fisher, W. W., & Maglieri, K. A. (2005). On the effectiveness of and preference for punishment and extinction components of function-based interventions. *Journal of Applied Behavior Analysis, 38*(1), 51-65.
- Horner, R. D. (1980). The effects of an environmental "enrichment" program on the behavior of institutionalized profoundly retarded children. *Journal of Applied Behavior Analysis, 13*(3), 473-491.
- Horner, R. H., Carr, E. G., Strain, P. S., Todd, A. W., & Reed, H. K. (2002). Problem behavior interventions for young children with autism: A research synthesis. *Journal of Autism and Developmental Disorders, 32*(5), 423-446.
- Horner, R. H., & Day, H. M. (1991). The effects of response efficiency on functionally equivalent competing behaviors. *Journal of Applied Behavior Analysis, 24*(4), 719-732.

- Israel, M.L., Blenkush, N.A., von Heyn, R.E., & Rivera, P.M. (2008). Treatment of aggression with behavioral programming that includes supplementary skin-shock. *Journal of Behavior Analysis of Offender and Victim Treatment and Prevention*, 1 (4), 119-166.
- Israel, M.L., Blenkush, N.A., von Heyn, R.E., and Sands, C.C.: Seven Case Studies of Individuals Expelled from Positive-Only Programs (2010). *Journal of Behavior Analysis of Offender and Victim Treatment and Prevention*, 2 (1), 20-36.
- Iwata, B. A. (1988). The development and adoption of controversial default technologies. *The Behavior Analyst*, 11(2), 149-157.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982/1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis*, 27(2), 197-209.
- Iwata, B. A., Pace, G. M., Cowdery, G. E., & Miltenberger, R. G. (1994). What makes extinction work: An analysis of procedural form and function. *Journal of Applied Behavior Analysis*, 27(1), 131-144.
- Kennedy, C. H., & Souza, G. (1995). Functional analysis and treatment of eye poking. *Journal of Applied Behavior Analysis*, 28(1), 27-37.
- Kern, L., Vorndran, C. M., Hilt, A., Ringdahl, J. E., Adelman, B. E., & Dunlap, G. (1998). Choice as an intervention to improve behavior: A review of the literature. *Journal of Behavioral Education*, 8(2), 151-169.
- Lalli, J. S., Casey, S. D., & Kates, K. (1997). Noncontingent reinforcement as treatment for severe problem behavior: Some procedural variations. *Journal of Applied Behavior Analysis*, 30(1), 127-137.
- Langworthy-Lam, K. S., Aman, M. G., & Van Bourgondien, M. E. (2002). Prevalence and patterns of use of psychoactive medicines in individuals with autism in the Autism Society of North Carolina. *Journal of Child and Adolescent Psychopharmacology*, 12, 311-321.
- LeBlanc, L. A., Patel, M. R., & Carr, J. E. (2000). Recent advances in the assessment of aberrant behavior maintained by automatic reinforcement in individuals with developmental disabilities. *Journal of Behavior Therapy and Experimental Psychiatry*, 31(2), 137-154.
- Lerman, D. C., Iwata, B. A., & Wallace, M. D. (1999). Side effects of extinction: Prevalence of bursting and aggression during the treatment of self-injurious behavior. *Journal of Applied Behavior Analysis*, 32(1), 1-8.
- Lerman, D. C., & Vorndran, C. M. (2002). On the status of knowledge for using punishment: Implications for treating behavior disorders. *Journal of Applied Behavior Analysis*, 35(4), 431-464.
- Li, A., & Poling, A. (2018). Board certified behavior analysts and psychotropic medications: Slipshod training, inconsistent involvement, and reason for hope. *Behavior Analysis in Practice*, 11(4), 350-357.

- Lindgren, S., Wacker, D., Schieltz, K., Suess, A., Pelzel, K., Kopelman, T., ... & O'Brien, M. (2020). A randomized controlled trial of functional communication training via telehealth for young children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *50*(12), 4449-4462.
- Linscheid, T., Hartel, F., & Cooley, N. (1993). Are aversive procedures durable? A five year follow-up of three individuals treated with contingent electric shock. *Child and Adolescent Mental Health Care*, *3*(2), 67-76.
- Linscheid, T. R., Iwata, B., Ricketts, R., Williams, D., & Griffen, J. (1990). Clinical evaluation of the Self-Injurious Behavior Inhibiting System (SIBIS). *Journal of Applied Behavior Analysis*, *23*, 53-78.
- Linscheid, T. R., Pejeau, C., Cohen, S., & Footo-Lenz, M. (1994). Positive side effects in the treatment of SIB using the Self-Injurious Behavior Inhibiting System (SIBIS): Implications for operant and biochemical explanations of SIB. *Research in Developmental Disabilities*, *15*(1), 81-90.
- Linscheid, T.R. & Reichenbach, H. (2002). Multiple factors in the long-term effectiveness of contingent electric shock treatment for self-injurious behavior: A case example. *Research in Developmental Disabilities*, *23*, 161-177.
- Lydon, S., Healy, O., Moran, L., & Foody, C. (2015). A quantitative examination of punishment research. *Research in Developmental Disabilities*, *36*, 470-484.
- Matson, J. L., & Taras, M. E. (1989). A 20 year review of punishment and alternative methods to treat problem behaviors in developmentally delayed persons. *Research in Developmental Disabilities*, *10*(1), 85-104.
- Necomb, E., & Hagopian, L. P. (2018) Treatment of severe problem behaviour in children with autism spectrum disorder and intellectual disabilities. *International Review of Psychiatry*, *30*(1), 96-109, doi: 10.1080/09540261.2018.1435513
- Newsom, C., Favell, j. E., & Rincover, A. (1983). Side effects of punishment. In S. Axelrod & J. Apsche (Eds.), *The effects of punishment on human behavior* (pp. 285-316). Academic Press.
- Normand, M. P., Kestner, K., & Jessel, J. (2010). An analysis of stimuli that influence compliance during the high-probability instruction sequence. *Journal of Applied Behavior Analysis*, *43*(4), 735-738.
- O'Neill, J. & Blenkush, N.A. (2020). Contingent Skin-Shock Treatment and the Reversal of Effects on Severe Problem Behavior. *International Journal of Psychology & Behavior Analysis*, *6*: 168. <https://doi.org/10.15344/2455-3867/2020/168>
- Peck, S. M., Wacker, D. P., Berg, W. K., Cooper, L. J., Brown, K. A., Richman, D., ... & Millard, T. (1996). Choice-making treatment of young children's severe behavior problems. *Journal of Applied Behavior Analysis*, *29*(3), 263-290.
- Phillips, C. L., Iannaccone, J. A., Rooker, G. W., & Hagopian, L. P. (2017). Noncontingent reinforcement for the treatment of severe problem behavior: An analysis of 27 consecutive applications. *Journal of Applied Behavior Analysis*, *50*(2), 357-376.

- Poling, A., Ehrhardt, K., & Li, A. (2017). Psychotropic medications as treatments for people with autism spectrum disorder. In J. L. Matson (Ed), *Handbook of treatments for autism spectrum disorder* (pp. 459-476). Springer.
- Ricketts, R.W., Goza A.B. & Matese, M., (1993). A 4-year follow-up on treatment of self-injury. *Journal of Behavior Therapy and Experimental Psychiatry*, 24, 57-62.
- Reichle, J., & Wacker, D. P. (2017). *Functional communication training for problem behavior*. Guilford Publications.
- Ringdahl, J. E., Kitsukawa, K., Andelman, M. S., Call, N., Winborn, L., Barretto, A., & Reed, G. K. (2002). Differential reinforcement with and without instructional fading. *Journal of Applied Behavior Analysis*, 35(3), 291-294.
- Rooker, G. W., Jessel, J., Kurtz, P. F., & Hagopian, L. P. (2013). Functional communication training with and without alternative reinforcement and punishment: An analysis of 58 applications. *Journal of Applied Behavior Analysis*, 46(4), 708-722.
- Salvy, S., Mulick, J.A, Butter, E., Bartlett, R.K. & Linscheid, T.R. (2004) Contingent electric shock (SIBIS) and a conditioned punisher eliminate severe head banging in a preschool child. *Behavioral Interventions*, 19, 59-72.
- Shirley, M. J., Iwata, B. A., Kahng, S., Mazaleski, J. L., & Lerman, D. C. (1997). Does functional communication training compete with ongoing contingencies of reinforcement? An analysis during response acquisition and maintenance. *Journal of Applied Behavior Analysis*, 30(1), 93-104.
- Sidman, M. (1989). *Coercion and its fallout*. Authors Cooperative.
- Suess, A. N., Schieltz, K. M., Wacker, D. P., Detrick, J., & Podlesnik, C. A. (2020). An evaluation of resurgence following functional communication training conducted in alternative antecedent contexts via telehealth. *Journal of the Experimental Analysis of Behavior*, 113(1), 278-301.
- Thompson, T. (2007). *Making sense of autism*. Brookes.
- Tiger, J. H., Hanley, G. P., & Bruzek, J. (2008). Functional communication training: A review and practical guide. *Behavior Analysis in Practice*, 1(1), 16-23.
- Treatment of Destructive Behaviors in Persons with Developmental Disabilities. NIH Consensus Statement Online 1989 Sep 11-13 [2022 Sep 17];7(9):1-15.
- Valdovinos, M. G., Ellringer, N. P., & Alexander, M. L. (2007). Changes in the rate of problem behavior associated with the discontinuation of the antipsychotic medication quetiapine. *Mental Health Aspects of Developmental Disabilities*, 10(2), 64.
- Valdovinos, M. G., Napolitano, D. A., Zarcone, J. R., Hellings, J. A., Williams, D. C., & Schroeder, S. R. (2002). Multimodal evaluation of risperidone for destructive behavior: Functional analysis, direct observations, rating scales, and psychiatric impressions. *Experimental and Clinical Psychopharmacology*, 10(3), 268.

- Van Camp, C. M., Lerman, D. C., Kelley, M. E., Contrucci, S. A., & Vorndran, C. M. (2000). Variable-time reinforcement schedules in the treatment of socially maintained problem behavior. *Journal of Applied Behavior Analysis, 33*(4), 545-557.
- Van Houten, R. (1983). Punishment: From the animal laboratory to the applied setting. In S. Axelrod & J. Apsche (Eds.), *The effects of punishment on human behavior* (pp. 13-44). Academic Press.
- van Oorsouw, W. M. W. J., Israel, M. L., Von Heyn, R. E., & Duker, P. C. (2008). Side effects of contingent shock treatment. *Research in Developmental Disabilities, 29*, 513–523.
<https://doi.org/10.1016/j.ridd.2007.08.005>
- Vohra, R., Madhavan, S., Sambamoorthi, U., St. Peter, C., Poe, S., Dwibedi, N., & Ajmera, M. (2016). Prescription drug use and polypharmacy among Medicaid-enrolled adults with autism: A retrospective cross-sectional analysis. *Drugs—Real World Outcomes, 3*, 409-425.
- Vollmer, T. R. (1994). The concept of automatic reinforcement: Implications for behavioral research in developmental disabilities. *Research in Developmental Disabilities, 15*(3), 187-207.
- Vollmer, T. R., & Athens, E. (2011). Developing function-based extinction procedures for problem behavior. In W. W. Fisher, C. C. Piazza, & H. S. Roane (Eds.), *Handbook of Applied Behavior Analysis*, 317-334.
- Vollmer, T. R., Marcus, B. A., & LeBlanc, L. (1994). Treatment of self-injury and hand mouthing following inconclusive functional analyses. *Journal of Applied Behavior Analysis, 27*(2), 331-344.
- Vollmer, T. R., Progar, P. R., Lalli, J. S., Van Camp, C. M., Sierp, B. J., Wright, C. S., ... & Eisenschink, K. J. (1998). Fixed-time schedules attenuate extinction-induced phenomena in the treatment of severe aberrant behavior. *Journal of Applied Behavior Analysis, 31*(4), 529-542.
- Wacker, D. P., Steege, M. W., Northup, J., Sasso, G., Berg, W., Reimers, T., Cooper, L., Cigrand, K., & Donn, L. (1990). A component analysis of functional communication training across three topographies of severe behavior problems. *Journal of Applied Behavior Analysis, 23*(4), 417-429.
- Weeden, M., Ehrhardt, K., & Poling, A. (2010). Psychotropic drug treatments for people with autism and other developmental disorders: A primer for practicing behavior analysts. *Behavior Analysis in Practice, 3*(1), 4-12.
- Williams, C. D. (1959). The elimination of tantrum behavior by extinction procedures. *Journal of Abnormal and Social Psychology, 59*(2), 269.
- Williams, D.E., Kirkpatrick-Sanchez, S. & Crocker, W.T. (1994). A long-term follow-up of treatment for severe self-injury. *Research in Developmental Disabilities, 15*(6), 487-501.
- Williams, D. E., Kirkpatrick-Sanchez, S., & Iwata, B. A. (1993). A comparison of shock intensity in the treatment of longstanding and severe self-injurious behavior. *Research in Developmental Disabilities, 14*, 207-219.

- Witwer, A., & Lecavalier, L. (2005). Treatment incidence and patterns in children and adolescents with autism spectrum disorders. *Journal of Child and Adolescent Psychopharmacology*, *15*, 671-681.
- Yadollahikholes, G., Blenkush, N.A., & Cunningham, M. (2021). Four Different Responses to Contingent Skin Shock in Patients with Autism Spectrum Disorder with Severe Problem Behaviors. *BMJ Case Reports*, *14*, e241204. doi:10.1136/bcr-2020-241204
- Zarcone, J. R., Hellings, J. A., Crandall, K., Reese, R. M., Marquis, J., Fleming, K., ... & Schroeder, S. R. (2001). Effects of risperidone on aberrant behavior of persons with developmental disabilities: I. A double-blind crossover study using multiple measures. *American Journal on Mental Retardation*, *106*(6), 525-538.
- Zarcone, J. R., Lindauer, S. E., Morse, P. S., Crosland, K. A., Valdovinos, M. G., McKerchar, T. L., Reese, R. M., Hellings, J. A., & Schroeder, S. R. (2004). Effects of risperidone on destructive behavior of persons with developmental disabilities: III. Functional analysis. *American Journal on Mental Retardation*, *109*(4), 310-321.
- Zarcone, J. R., Mullane, M. P., Langdon, P. E., & Brown, I. (2020). Contingent electric shock as a treatment for challenging behavior for people with intellectual and developmental disabilities: Support for the IASSIDD policy statement opposing its use. *Journal of Policy and Practice in Intellectual Disabilities*, *17*(4), 291-296. doi: 10.1111/jppi.12342