

Understanding and addressing pseudoscientific practices in the treatment of neurodevelopmental disorders: Considerations for applied behavior analysis practitioners

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Abstract

Pseudoscientific practices are commonly used and promoted in the field of developmental disabilities. Behavior analysts should anticipate encountering such treatments in practice and understand their ethical obligations with regard to these practices. Thoughts on why pseudoscientific practices are frequently sought are presented for context in understanding this complex issue. This discussion will serve to prepare behavior analysts for how to address situations in which clients may ask behavior analysts to use pseudoscientific practices. Additionally, this discussion covers arguments for the dangers of using pseudoscientific practices, a guide to resources for information on evidence-based practice and ethics, and ideas on how to handle a situation in which a parent or caregiver asks the behavior analyst to integrate a pseudoscientific approach into the treatment of a child with a neurodevelopmental disorder.

KEYWORDS

ethics, fad therapy, intervention, neurodevelopmental disorders, pseudoscience, pseudoscientific practice

1 | INTRODUCTION

Unfortunately, the promotion and use of pseudoscientific, unvalidated treatments are common occurrences in modern times, especially for the treatment of children with autism spectrum disorder (ASD) and other neurodevelopmental disorders (Kornack; Persicke, Cervantes, Jang, & Dixon, 2014; McDonald & DiGennaro Reed, 2018; Reed et al., 2017; Zane, Davis, & Rosswurm, 2008). Pseudoscientific approaches to treatment might use methods

that resemble valid, accepted methods of scientific inquiry and methodology, provide little to no objective data to support claims, rely on evidence forms such as testimonials and anecdotal evidence, and may also reject established empirical methods (G. Green, 1996; Normand, 2008; Vyse, 2016). Such treatments have endured over time, even though in many cases, ample evidence demonstrating their ineffectiveness exists (J. W. Jacobson, Foxx, & Mulick, 2016; Kezuka, 2002; Mostert, 2001; Sherry, 2016).

As there has been increased demand for services for individuals with developmental disabilities, especially ASD, the use of pseudoscientific treatments has also increased (Metz, Mulick, & Butter, 2016), and many behavior analysts in practice are likely to encounter the use of such treatments with their clients. For example, as reported through a survey administered to Board Certified Behavior Analysts[®], pseudoscientific practices, such as facilitated communication, auditory integration training, sensory processing or integration therapy, and gentle teaching, are implemented by behavior analysts in their own treatment of children with neurodevelopmental disorders (Schreck, Karunaratne, Zane, & Wilford, 2016; Schreck & Mazur, 2008). Many of these pseudoscientific practices start out as fads, then gain popularity to the degree that they seemingly become part of a standard and unquestioned treatment protocol to meet the behavioral needs of individuals with neurodevelopmental disorders. Currently, one of the most popular pseudoscientific practices is sensory integration therapy, which many families report using to treat their child with ASD (V. A. Green et al., 2006; Lang et al., 2012). Other popular pseudoscientific practices include Auditory Integration Training, Facilitated Communication/Rapid Prompting, Gentle Teaching, animal assisted therapies, aromatherapy, attachment therapy, and the gluten-free, casein-free diet (J. W. Jacobson et al., 2016). Readers are also directed to Schreck and Mazur (2008) for further review.

Evidence-based practice (EBP) is the standard by which treatments are judged in the field of applied behavior analysis (ABA). Even within the field, however, how this term has been interpreted is subject to debate (Slocum et al., 2014; Smith, 2013; Wilczynski, 2017). A definition of this standard is provided by Slocum et al. (2014) where the authors argue that EBP in the field integrates the best available evidence, the clinician's expertise, and the values and context of the client. EBP is broader than the empirical support for interventions. Those interventions that have demonstrated empirical support are generally referred to as "empirically supported treatments" (Slocum et al., 2014; Wilczynski, 2017). Thus, simply selecting a treatment from a list of approved or validated practices is insufficient to follow EBP; the clinician's professional judgment in applying that practice to the individual client and evaluating its outcome is a necessary component of EBP (Wilczynski, 2017). Likewise, the reliance on empirical and clinical evidence is an essential component of following EBP. Evidence base, in terms of empirical evidence and data analysis, drives treatment decisions in ABA. Conversely, pseudoscientific practices may use little to no objective data collection or measurement, and instead focus on addressing some hypothesized imbalance in some aspect of the body's functions, natural or organic interventions, or removal of hypothesized toxins from the body. These interventions also tend to have a standardized, or fixed approach to treatment, rather than an individualized approach tailored to a specific issue or need.

It should be noted that there are several treatments for ASD and other developmental disabilities which have little empirical support at the moment, and this may be due to little research being done on these approaches, or that research that has been conducted is not considered to be of high quality. The National Autism Center in its National Standards Report (NAC, 2015), categorizes these interventions as "Emerging." Included in this category are many promising approaches that might be eventually considered to be empirically validated. These approaches, while not the focus of this discussion, should be regarded cautiously, using methods of EBP (particularly clinical judgment) to evaluate their effectiveness for an individual client.

Behavior analysts receive training in the identification, utilization, and evaluation of evidence-based treatments within their education programs. However, many of the clients that behavior analysts serve may not have this foundational knowledge base and may be enticed and lured by the purported potential of pseudoscientific practices. As a result, they may continue to request and pursue these strategies even when their goals and outcomes are contrary to typical areas of treatment when ABA treatment is followed. Even more concerning is that some behavior analysts have reported they were persuaded to use pseudoscientific interventions by clients' families

(Schreck et al., 2016). Therefore, behavior analysts would benefit from training on how to appropriately and empathetically respond to such requests.

This discussion will explore the use of pseudoscientific, unvalidated practices for children with autism spectrum disorder and other neurodevelopmental disorders, and offer readers considerations for addressing these approaches in treatment, especially when their use is requested by caregivers and the approach is in opposition to the therapist's theoretical orientation, training, and violates the therapist's professional and ethical code of conduct. Explanations of the popularity of pseudoscientific practices are provided. Understanding these reasons can assist the behavior analyst in approaching the family's concerns about the pseudoscientific practice in an empathic and professional manner and communicating more effectively in order to develop more socially valid treatment. Furthermore, direction is given on how to approach the situation in which a caregiver asks a behavior analyst to implement a pseudoscientific practice. We share a bias with others (Vyse, 2016) that scientific, empirically derived evidence should be valued over other kinds of evidence, and that the treatment that a behavior analyst provides should be based on established, EBPs.

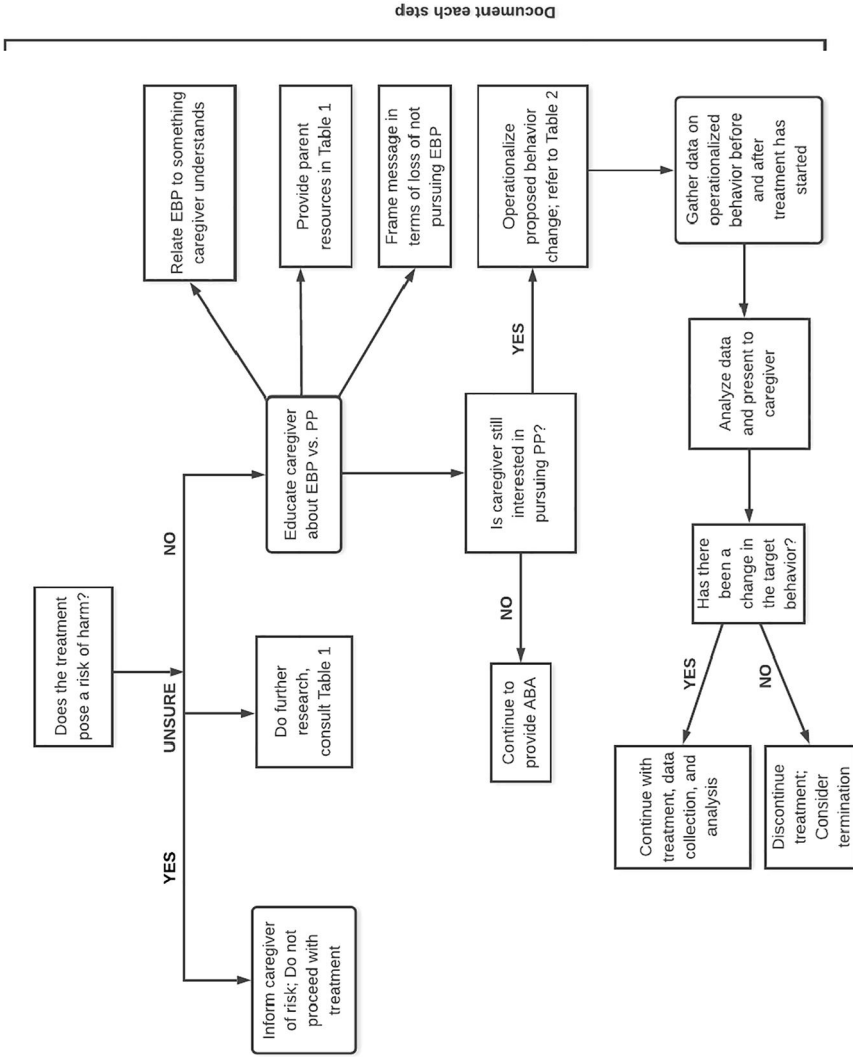
It does matter that children with neurodevelopmental disorders receive the most effective interventions to meet their needs and address their challenges. Given that many practicing behavior analysts will undoubtedly be presented with families and other practitioners who may be interested in pursuing pseudoscientific practices, we offer some direction for the behavior analyst on responding to a family's request for, or inquiry on, a pseudoscientific approach. A summary of the following discussion and suggestions can be found under Figure 1.

2 | EVALUATE RISK OF HARM

The behavior analyst should first consider the potential risk for harm to the client, as some pseudoscientific practices have had devastating consequences. There has been at least one confirmed death from metal chelation therapy in a 5-year-old child with ASD (Centers for Disease Control, 2006). Facilitated communication has resulted in several well-documented cases of false allegations of sexual abuse by family members (J. W. Jacobson et al., 2016; Lilienfeld, Marshall, Todd, & Shane, 2014) and has also resulted in false consent to sexual activity for a man with a severe developmental disability, resulting in sexual abuse of this man (Sherry, 2016). Thus, pseudoscientific practices can present significant harm, as well as interfere with the effectiveness of evidence-based interventions. Therefore, the behavior analyst must determine if a proposed pseudoscientific intervention might pose risk of harm to the client. If this is the case, this information, rightly, must be presented to the caregiver to hopefully prevent involvement in the intervention. If the behavior analyst is unsure of the potential risk for harm of a proposed treatment, he or she should do further research on the proposed intervention.

3 | CONDUCT FURTHER RESEARCH

It would benefit the behavior analyst to research the evidence base (or lack thereof) for a proposed treatment (Leaf et al., 2016). Fortunately, the Behavior Analyst Certification Board® (BACB) provides some help in this area. Current BACB® certificants can access the *Journal of Applied Behavior Analysis*, the *Journal of the Experimental Analysis of Behavior*, as well as the ERIC searchable database by logging into their online accounts. Reviewing the vast literature available allows the behavior analyst to share this content with the family and relate it to their unique circumstance. In addition, Brodhead (2015) has created an instrument; the Checklist for Analyzing Proposed Treatments, to guide a behavior analyst through a decision-making model when evaluating a proposed, yet unfamiliar treatment. The paper provides suggestions for behavior analysts to have respectful discussions with other professionals who suggest a potential non-EBP. In addition, behavior analysts are encouraged to gather sufficient information on the proposed treatment so they can properly educate their clients about it (Brodhead, 2015).



Document each step

FIGURE 1 A guide for responding to a request to use a pseudoscientific practice. ABA, applied behavior analysis; EBP, evidence-based practice; PP, pseudoscientific practice

Schreck (2014) has created a flowchart to assist making decisions about pursuing treatments that were recommended through anecdotal recommendations. Walmsley and Baker (2019) recommended conducting an online search through research databases, and carefully discussing how a scientific literature search is different from a Google search. More resources to assist the behavior analyst and caregivers to make well-informed decisions are available under Table 1. These resources were found in peer-reviewed and often-cited sources in applied behavior analysis journals.

Similarly, many families like to access information themselves from online sources. It can be helpful to provide reputable sources of information for parents and caregivers, since many websites about treatments for developmental disabilities contain information about pseudoscientific practices (Reichow, et al., 2012). Fortunately, there are a few high-quality, reputable websites that behavior analysts can provide for families, which are presented in Table 1. Unfortunately, there are many cases in which providing education about pseudoscientific practice is insufficient to dissuade a caregiver from pursuing these treatments, some have noted that empirical evidence about treatment is not of importance to parents when choosing treatments for their children with neurodevelopmental disorders (Bowker, D'Angelo, Hicks, & Wells, 2011). In that case, we offer some other options.

A challenging situation arises when a caregiver asks the behavior analyst to incorporate a pseudoscientific approach into ABA treatment. It is important to keep in mind that the Professional and Ethical Compliance Code for Behavior Analysts (hereto referred as the code; Behavior Analyst Certification Board®, 2014) provides some guidance relevant to this situation. The Code states that behavior analysts cannot incorporate pseudoscientific practices into their treatment and must uphold the principles of behavior analysis above any other training or experience they may have (BACB, 2014). However, simply telling a caregiver “no” to his or her request for pseudoscientific approach may be insufficient to change the interest in pursuing such an approach. Therefore, it is actually beneficial to the client and caregiver to explore their interest in a pseudoscientific practice.

4 | DISSEMINATION AND ADVERTISEMENT

How caregivers first become interested in and decide to try out a pseudoscientific practice should be explored. Their interest may begin with the manner in which pseudoscientific practices are advertised and disseminated, likely leading to their widespread popularity and appeal. One survey of parents of children with ASD discovered that parents learned of different treatments through health professionals other than behavior analysts, other parents, and nontechnical publications (Miller, Schreck, Muller, & Butter, 2012; Shepherd, Csako, Landon, Goedeke, & Ty, 2018; Smith & Antolovich, 2000). Many families seek out information online (McDonald, Pace, Blue, & Schwartz, 2012; Reichow et al., 2012). Parents who sought out recommendations from nonprofessional sources, such as social contacts, were more likely to be directed to pseudoscientific practices (Pickard & Ingersoll, 2015). This apparent availability of easy access to information on pseudoscientific approaches underscores the need for professionals to discuss the use and implications of evidence-based treatment options with caregivers. It would also be prudent for clinicians to investigate these treatment options that caregivers present to them and search the empirical literature for further information and possible contraindications to such treatments.

Although widespread attention was paid to ABA therapy after the publication of Lovaas' (1987) groundbreaking study, ABA is still not well-covered by the mass media when discussing neurodevelopmental disorders, and when it is, there is often negative coverage (Freedman, 2016). The advertising and dissemination practices of pseudoscientific practices must be effective as some researchers have noted that parents of children with ASD are more familiar with pseudoscientific practices than with EBPs (Fleury, Trevors, & Kendeou, 2019). Many pseudoscientific interventions do not have a scientific foundation nor solid, objective data to support their claims, so they tend to rely on other forms of evidence, such as the use of testimonials and anecdotal evidence (Tuzikow & Holburn, 2011), which can trigger an emotional response to engage in continued participation. These emotional appeals are often placed into stark contrast with objective, scientific evidence. Daniels (2007) presents a possible explanation for such

TABLE 1 Resources for ethics in behavior analysis and evidence-based practices

Resource	Where to access	Description
ABA ethics hotline	ABAethicshotline.com	Website dedicated to helping behavior analysts understand and apply the code and provide guidance on ethical matters. Email the hotline website and receive a response, usually within 24 h.
APBA	www.apbahome.net	Access for current APBA members. Newsletters often contain ethical dilemmas with guidance provided
Institute for Educational Sciences' what works clearing house	https://ies.ed.gov/ncee/wcc/	Gathers information on evidence-based practices in education; results can be filtered by age, grade level, subject, or for youth with developmental disabilities
Journal of Applied Behavior Analysis, Journal of the Experimental Analysis of Behavior, account, www.bacb.com ; Behavioral interventions	Behavior Analyst Certification Board log into Certification Gateway account, click on "resources" tab	At no-cost access to peer-reviewed journals, provided to BACB® certificants. Also provides access to Pro-Quest database, to search for scientific publications
National Professional Development Center on ASD	https://autismpdc.fpg.unc.edu/national-professional-development-center-autism-spectrum-disorder	Provides information on evidence-based treatments for ASD, some online trainings in evidence-based practices
National Standards Project, Phases 1 and 2	www.nationalautismcenter.org , click on "National standards"	Thorough review of research literature conducted by National Autism Center, reviewed and graded studies on outcome and scientific merit, categorizes intervention research into three categories: Established, emerging, and unestablished. Provide a valid email address to download a no-cost copy of the report.
Association for science in autism treatment summaries of scientific research on interventions on autism	https://asatonline.org/for-parents/learn-more-about-specific-treatments/	Brief summaries of research on effectiveness of various ASD treatments

Abbreviations: APBA, association of professional behavior analysts; ASD, autism spectrum disorder.

a response describing it as a "fear" of the scientific approach, which for some appears to lack freedom and emotion or feeling. The fear Daniels speaks of might serve to persuade some through the emotional appeal of testimonials, rather than the systematic and rigorous approaches presented by traditional evidence-based interventions.

Although these emotional forms of evidence are considered unscientific and with little merit by the larger scientific community, their presentation can be enticing, appealing, and welcoming to some caregivers. Many researchers have addressed the trend of pseudoscientific practices using emotional appeals to interest and entice parents and caregivers, as their treatment results are often described as cures or a relief (McDonald et al., 2012; Smith, 2016). Behavior analysts rightfully cannot and do not use such terms and statements in describing their evidence-based treatments, as they are intentionally misleading and in fact, imprecise and imperfect. However, the

behavior analyst could be left at a disadvantage when describing the results of behavior analytic treatment as compared to the descriptions provided by pseudoscientific practices, which are unlikely to have such rigorous oversight into their claims and advertisements as compared to other EBP. Many of these treatments, as well, include the term “therapy” in their name which appears to legitimize and validate the practice (Celiberti & Lorelli, 2019) and suggests that a credentialed professional has designed and implemented the treatment (McDonald et al., 2012). In many cases, these factors could not be further from the truth.

Despite the empirical evidence of its effectiveness, ABA therapy is extremely time-consuming, with many studies documenting a minimum of 25–40 h of therapy per week, for 2–3 years to produce appreciable outcomes, such as substantive gains in intellectual functioning, adaptive, and communication skills (Eikeseth, 2009; McEachin, Smith, & Lovaas, 1993; National Autism Center, 2015). In addition to the significant time requirements for treatment of neurodevelopmental disorders, ABA practitioners have to compete with pseudoscientific practices that promise greater results with far less of a time commitment (Matson & Williams, 2015; Shepherd et al., 2018) and effort.

When encountering families that propose pursuing a pseudoscientific approach and the dissemination and advertisement of the approach appears to be influencing them, the behavior analyst should pay careful attention to the message he or she provides about ABA. This is because the manner in which messages (Nazlan, Tanford, & Montgomery, 2018) and specifically, about the importance of EBP is related can be impactful as well (Purnell, Thompson, Kreuter, & McBride, 2015). The framing of a message appears to have influence on patients' health decisions (Gornick & Zikmund-Fisher, 2019; Roberto & Kawachi, 2014), especially when that message is framed in terms of a loss rather than a gain (Banks et al., 1995; Brock & Wartman, 1990; Cameron & Chan, 2008), perhaps due to people valuing negative over positive information (Taylor, 1991). Framing this message in terms of what the client stands to lose by not participating in evidence-based therapy rather than what they can gain through a pseudoscientific practice may be more persuasive. For example, by not participating in an evidence-based intervention, the child could stand to lose developmental ground that may never be recovered, rather than the child gaining some potential benefit of a pseudoscientific intervention that is not established, or enjoying participation in an intervention that does not result in measurable improvement in skill levels.

It would also serve the behavior analyst well to be sensitive to the emotional needs and preference of the families he or she serves (Taylor, LeBlanc, & Nosik, 2018). Just as a behavior analyst should respectfully interact with other providers who suggest a nonbehavioral and perhaps pseudoscientific practice (Brodhead, 2015), they should also respectfully investigate the caregivers' interest in a such an approach. Despite a behavioral approach to reasoning on the motivating operations that set the occasion for the use of pseudoscientific approach and the reinforcers that maintain its continued use, it would serve the behavior analyst well to practice cultural humility (Wright, 2019) as a basis for understanding the decisions that caregivers make. Cultural humility is a process and construct that requires one to be introspective of his or her practice, engaging in self-reflection and self-critique (Tervalon & Murray-Garcia, 1998) rather than being the omniscient practitioner.

Cultural humility recognizes that the behavior analyst would acknowledge the caregiver's and client's role as being a partner in, rather than a recipient of, services, and that the behavior analyst would demonstrate respect for the client's choices and avoid displaying an air of superiority over the client's choices and decisions (Hook, Davis, Owen, Worthington, & Utsey, 2013). A host of variables contribute to a caregiver's decision to pursue any treatment. Such variables might include one's personal values, personal preferences, personal history, and personal boundaries. Other considerations include a caregiver's individual repertoires, reinforcement histories, and comfort zones. It would behoove behavior analysts to be attentive to these matters with caregivers and families, as well as to their own personal biases toward a caregiver's and family's belief sets. Many behavior analysts, due to their extensive training in data analysis and empirical evidence, will present with a bias toward evidence-based interventions; these authors included. It will be important for behavior analysts to recognize and acknowledge this bias and how it may impact the interactions they have with the client and/or family, and subsequent progress with treatment. For further suggestions on how to establish and cultivate collaborative and compassionate relationships with caregivers, see Taylor et al. (2018).

5 | RAPID ABUNDANCE OF INFORMATION

Further complicating matters from a caregiver's access to information, they also receive conflicting views on which therapies to pursue for treatment of neurodevelopmental disorders (Metz et al., 2016); receiving an abundance of treatment information can be overwhelming to many (Kienhues, Stadtler, & Bromme, 2011; Schreck, 2014). The mass media's coverage of autism treatments may play a role in this confusion, as many pseudoscientific interventions receive widespread coverage (Schreck, Russell, & Vargas, 2013) and users of social media can share inaccurate information about causes of ASD (Jang, Mckeever, Mckeever, & Kim, 2019; Donzelli et al., 2018), as well as inaccurate information about pseudoscientific health practices (Delgado-Lopez & Corrales-Garcia, 2018).

Similarly, although to a much more urgent degree, misinformation about the COVID-19 pandemic spread rapidly, especially through social media (Depoux et al., 2020; Dong & Zheng, 2020), with much information about the pandemic on the internet being of poor scientific quality (Cuan-Baltazar, Muñoz-Perez, Robledo-Vega, Pérez-Zepeda, & Soto-Vega, 2020). This led some to warn that in addition to treating the pandemic of the disease, there was also an "infodemic" that needed to be addressed in which inaccurate information about the disease, its progression, and potential treatments was widely shared (Zaracostas, 2020), which may have led some people to try dangerous pseudoscientific practices, with disastrous results (Krouse, 2020). As with treatments for ASD, there was suddenly an abundance of information about COVID-19, as well as many people feeling a loss of control and uncertainty about their future (Finset, Bosworth, Butow, 2020) which can make it difficult for many to distinguish valid, scientific information from unreliable and incorrect information (Bavel et al., 2020). Likewise, caregivers of a child with a neurodevelopmental disorder are faced with an uncertain situation. Their child is diagnosed with a condition, that like COVID-19, has no known cure, and they receive an overwhelming amount of often conflicting information on treatments to pursue. With the mass media presenting information about pseudoscientific interventions, a trend which appears to be increasing in recent years (Schrek & Ramirez, 2016), we should anticipate caregivers having difficulty sifting through this information about what is effective treatment for neurodevelopmental disorders. This inexhaustible amount of confusing and conflicting information further reinforces the importance for behavior analysts to provide caregivers with information that differentiates between pseudoscientific and EBPs.

Beyond the abundance of information are also the inadequacies of evidence-based approaches. Hebert (2014) and Vyse (2016) propose that some caregivers of children with neurodevelopmental disorders seek out pseudoscientific practices since currently available evidence-based treatments are incomplete; that is, they address some diagnostic criteria of neurodevelopmental disorders, but do not offer full remediation of symptoms or challenges. Treatments for neurodevelopmental disorders may be analogous to the treatment of COVID-19, which is a highly infectious, rapidly spreading illness with no known cure or established course of treatment. In these cases, due to desperation to take action and find relief, many people and healthcare practitioners have resorted to pseudoscientific practices that could harm the COVID-19 patient (Abena et al., 2020; Soong, Born, & Levinson, 2020). Similarly, ASD is a neurodevelopmental disorder with alarming rates of increase over the last 20 years (Maenner, Shaw, & Baio, et al., 2020), no known cause, no cure, and with a plethora of established and unestablished suggestions for courses of treatment. These factors may contribute to families seeking pseudoscientific practices for treatment.

Due in part to the abundance of information available about treatments for ASD, many caregivers will be interested in trying multiple treatments. This could lead to the potentially damaging conventional wisdom to try a new therapy, even in the face of no scientific evidence, because of the small possibility that it might work (Smith, 2016). Seemingly, many pseudoscientific approaches are non-aversive, facilitate mutual engagement between the child and the therapist, and may even be enjoyable, eliciting not often seen, or even novel responses from the child. As a guiding principle of our field, behavior analysts have long argued that clients not only have a right to treatment, but a right to effective behavioral treatment (Van Houten et al., 1988). Many families opt to combine involvement in ABA with a combination of other pseudoscientific practices, otherwise known as an eclectic approach to

treatment (Lerman et al., 2008). Although it might seem like trying multiple therapies should produce some sort of meaningful improvement and additive effect, research results have shown otherwise. In comparisons of intensive ABA therapy versus an eclectic approach, those children that were involved in intensive ABA showed significantly more improvement in adaptive and intellectual functioning, and reduction in ASD symptoms, as compared to children receiving an eclectic approach (Eikeseth, Smith, Jahr, & Eldevik, 2002; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Howard, Stanislaw, Green, Sparkman, & Cohen, 2014). Furthermore, the addition of other pseudoscientific practices, with their added time and effort, may actually serve to dilute the impact of ABA treatment (Leaf et al., 2016). If the child is involved in several therapies, there may be insufficient time to participate in the necessary intensity of ABA; in some situations, engagement with pseudoscientific interventions may be contraindicated with a given child's proposed ABA treatment.

It will be important to remind caregivers that resources, such as time and money, are also limited for most. Participation in ABA does not guarantee that one will achieve a predetermined level of functioning. It is not simply receiving ABA therapy that makes it effective, but rather, receiving a minimum amount, much like a medication dosage, that makes it effective. The recommended intensity, for young children, ranges from 25–40 h per week spent in therapy, for an average of 2–3 years (Eikeseth, 2009; National Autism Center, 2015). For most families then, time spent in pseudoscientific practices means time spent away from other scientifically validated, effective therapies, such as ABA. This diversion is problematic because it could lead to children receiving less than the scientifically supported amounts of ABA, possibly rendering it ineffective, which could then reinforce the private event (thought) that ABA is an ineffective treatment. Although some families do report having discontinued therapies that have not produced results, this approach could represent significant time wasted which could have otherwise been spent on empirically supported therapies (Shepherd et al., 2018; Worley, Fodstad, & Neal, 2014) that resulted in greater and improved gains in functioning. Given the need for early intervention, the effects of wasted time might not be reversible.

To counter the problem of the overwhelming abundance of information available to caregivers, we suggest that in cases where there is not an imminent risk of harm, it may be worthwhile for the behavior analyst to educate the caregivers about evidence-based and pseudoscientific practices, as this may reduce their involvement in the pseudoscientific practices. Many consumers of health services look to practitioners for assistance with clinical decision-making and evaluating treatment options (Melnik & Fineout-Overholt, 2006). Thus, many families are seeking information about EBPs and the treatment recommendations of health care providers. Educating clients about EBP is an ethical requirement of the code, where behavior analysts are required to advocate for families and educate them on the effectiveness of pseudoscientific practices (BACB, 2014). Families may be receptive and interested in such information, as one study found that consumers of mental health services reported they would like information on proposed services to be presented to their level of understanding and to be given assistance in interpreting and understanding scientific information (Bielavitz, Wisdom, & Pollack, 2011).

However, in some cases, educating families about evidence-based and pseudoscientific practices may prove challenging. In these cases, the authors of this discussion have found it worthwhile to relate the notion of evidence-based practice to a concept that is familiar to the families. For example, many people would agree that they would not take a medication that had not been rigorously tested and vetted for safety, despite ringing endorsements from many people. For example, even though there has been some public panic around COVID-19, a recent Pew Research poll suggests that nearly two thirds of Americans polled support doing rigorous clinical trials of any proposed medications or vaccine, even though this might delay public access (Thigpen & Funk, 2020). Doing so would be analogous to trying an intervention that has either not been thoroughly tested, withstood the rigors of research, nor shown any measurable change in one's neurodevelopmental disorder or challenging behaviors.

Similarly, there is some evidence that people are more persuaded by scientific arguments that are presented in easy to understand language rather than using complicated explanations or jargon (Scharrer, Bromme, Britt, & Stadtler, 2012). A way to apply this approach in relating the difference between evidence-based and pseudoscientific practice might be to explain the vast difference in the number of research studies that support applied

behavior analysis versus a pseudoscientific approach. For example, applied behavior analysis has thousands of research studies demonstrating its effectiveness in reducing unwanted behaviors and in teaching new skills (Foxy, 2008), compared to two studies showing potential effectiveness of Ayres' Sensory Integration Therapy in treating behavioral problems (Parham, Clark, Watling, & Schaaf, 2019).

Some people may be aware of EBPs, but reject the notion of them anyway, such as by stating that the use of EBP ignores clinical expertise, minimizes the personal characteristics of the clients served, or uses a one size fits all approach to treatment. In these cases, further education about what EBP means, including the need to use clinical judgment to apply practices in an effective manner, incorporating clients' preferences, and choices into treatment, and individualizing approaches based on EBPs might be useful (Gibbs & Gambrill, 2002). Others may indicate that they are not interested in how a pseudoscientific approach affects most children, but instead are interested in how this approach will affect their child (Lerman et al., 2008). In this case, behavior analysts are well-prepared to investigate this interest.

6 | COGNITIVE BIASES AND DISTORTIONS

Parents and other treating professionals may resist the child's involvement in ABA due to their perceptions of the causes of the child's behavioral challenges and delays (Schreck, 2014). Dominant therapeutic approaches tend to advocate a mentalistic approach in which some hypothetical internal dimension exists that can explain the child's difficulties; thus, the cause of the difficulties is the diagnosis itself. This is not a new challenge, as Skinner (1953) noted:

The field of psychotherapy is rich in explanatory fictions. Behavior itself has not been accepted as a subject matter in its own right, but only as an indication of something wrong somewhere else. The task of therapy is said to be to remedy an inner illness of which the behavioral manifestations are merely "symptoms" (p. 373).

A behavioral approach, rather, examines the relationship between the occurrence and nonoccurrence of behavior and the environment. The presence of others and their own behavior is a significant component of that environment; thus, a behavioral approach undoubtedly involves a deliberate change in the behavior of family members, teachers, and caregivers in order to change the client's behavior. Extended further, some people resist the notion that they may play a role in the development and continuation of the behavioral challenges present. Skinner (1953) further states "such therapy is obviously directed toward a supposed underlying condition rather than toward the behavior itself or the manipulable variables outside the organism to which the behavior may be traced" (p. 374). Thus, the idea that one may have to alter his or her own behavior, or aspects of one's environment, in order to affect the behavior of the child with neurodevelopmental disorders may challenge the notions of the origin of the child's behavioral difficulties. Indeed, many families pursue pseudoscientific practices for neurodevelopmental disorders to pursue remedy of what they perceive as the underlying cause of the disorder (Bowker, D'Angelo, Hicks, & Wells, 2011; Levy & Hyman, 2005).

How one thinks about the nature of ASD appears to have importance in the decision of which treatments to pursue, both for caregivers and practitioners. There is some evidence that caregivers' perceptions of the causal factors and course of ASD is associated with their choice of treatment to pursue (Al Anbar, Dardennes, Prado-Netto, Kaye, & Contejean, 2010; Bowker et al., 2011; Dardennes et al., 2011; Mire, Gealy; Kubiszyn; BurrIDGE, & Goin-Kochel, 2017). In addition to beliefs about the causes or origin of ASD, how one thinks about information in general can help the behavior analyst to understand the choice of or interest in a pseudoscientific intervention.

Rather than being logical decision-makers, people are fallible to certain cognitive biases and errors when making many decisions (Montibeller & von Winterfeldt, 2015). For example, these biases may be evident in decisions related to health care, such as the refusal to vaccinate children against common diseases (R. M. Jacobson, St. Sauver, & Finney Rutten, 2015). Cognitive-based theories can assist practitioners with understanding how these biases occur. More specifically, cognitive theories and heuristics explore why parents and caregivers might choose

and continue their involvement with pseudoscientific treatments for neurodevelopmental disorders, especially in the face of little confirming scientific evidence of their effectiveness. These theories are worth exploring as understanding these theories and the basis for a caregiver's pursuit, selection, and continuation with pseudoscientific approaches may help prepare the practitioner to assist families with making a health-related decision (Swindell, McGuire, & Halpern, 2010). To explore this issue, the fields of social and cognitive psychology can provide some explanations.

Cognitive and social theories of psychology and behaviorism have been traditionally categorized as separate and distinct fields of study, and even contradictory, but they share many similarities (Slocum & Butterfield, 1994), making an understanding of the former theories useful to behavior analysts. Both fields focus on the same variable for change; the behavior of living organisms, although they are described using different terms (Schlinger, 2018). Cognitions are behaviors, and operate by the same principles as overt behaviors, so it is important for behavior analysts to understand the cognitions of the clients they serve.

Cognitive dissonance is the concept that one's private events (thoughts and beliefs) can shift to align with one's own public behavior, even if forced to behave in ways that the individual privately disagrees with (Festinger, 1957; Festinger & Carlsmith, 1996). The theory posits that individuals experience discomfort (an aversive stimulus) at the disconnect between their private events (thoughts) and public behaviors, and thus alter their private events to align with their public behaviors (Festinger, 1957; Festinger & Carlsmith, 1996). For example, in one of the earliest studies of cognitive dissonance, participants were given a mundane task to complete and were later paid either a smaller incentive (\$1) or a larger incentive (\$20) for their participation. The researchers asked the two groups of participants to recruit other people to join the study by convincing them that the task was interesting. Those participants that received the smaller incentive reported actually enjoying the task more than the participants who received the larger incentive. The authors reasoned that since there was a greater disconnect between private events (thoughts) of the participants with the smaller incentives and their behavior (stating they liked a boring task), without any external incentive (tangible reinforcement) to explain their behavior (only \$1 payment), they altered their private events to coincide with their public behavior (Festinger & Carlsmith, 1959). This theory may explain why families may adhere to pseudoscientific practices despite noting little improvement in their loved one's condition (Beyerstein, 2001). If the families had publicly stated the therapy had positive benefits for their loved one, then they may shift their private events to align with this public behavior.

Extending this concept of cognitive dissonance to the adherence to therapies with little or no scientific support, or even any noticeable or measurable benefit, could be explained by a related phenomenon, effort justification (Aronson & Mills, 1959). Similar to cognitive dissonance, the theory of effort justification is another cognitive adaptation that people make when they expend great effort, time, or resources pursuing a goal with little to no results. In order to justify the effort expended, people change their private events (beliefs) to support the goal, or treatment, despite no difference in the outcome. This theory is in alignment with the process of negative reinforcement, as people adjust (increase) their behaviors (adherence to pseudoscientific approach) to fit their private events (beliefs), to escape possible aversive doubt or guilt over spending time and resources on a treatment without results. Similarly, Skinner (1953) noted:

"The individual manipulates relevant variables in making a decision because the behavior of doing so has certain reinforcing consequences. One of these is simply escape from indecision. Conflicting alternatives lead to an oscillation between incomplete forms of response which, by occupying a good deal of the individual's time, may be strongly aversive. Any behavior which brings this conflict to an end will be positively reinforced" (p. 244).

These concepts may explain why some people adhere strongly to and become vocal advocates of pseudoscientific practices, despite no measurable change or improvement in their child's skills or condition. Thus, their behavior of advocating for pseudoscientific practices produces reinforcement, whether positive or negative, that strengthens the private events and continued adherence to treatment protocols despite no tangible, measurable change.

Further similarities are drawn to the sunk cost fallacy (Fantino, Stolarz-Fantino, & Navarro, 2003), in which individuals continue participation in a task because much time, effort, and/or money have been invested in the task, despite receiving little or no reinforcement for their effort. This effect could be applied to the case of pursuing a pseudoscientific approach for treatment of a neurodevelopmental disorder, despite seeing little measurable change in the child's behavior. In a related experiment (Coleman, 2010), participants invested hypothetical time, money, and effort on a treatment that produced no results. Those participants who invested a great deal of effort appeared to justify their continued participation through cognitive dissonance (sunk cost). The sunk cost effect appears not to be unique to humans, as pigeons have demonstrated behavior that appears to resemble the sunk cost effect in laboratory studies (Macaskill & Hackenberg, 2012a, 2012b).

The principles of behavior analysis would suggest that when extinction follows a response, future instances of that response diminishes and eventually terminate. Similarly, a behavior analyst might predict that a family that pursues a pseudoscientific approach for a neurodevelopmental disorder and does not receive tangible results might discontinue this treatment. Perplexingly, some families exert great effort, time, and expense on pseudoscientific approaches that produce no measurable change in the child's condition. Therefore, it is reasonable to extend the theory of the sunk cost effect to this practice. This framework also exemplifies negative reinforcement whereby families increase their adherence to pseudoscientific approach to avoid or escape private events such as doubt or guilt over investing so much time and effort into these therapies, or perhaps due to the highly variable reinforcement schedule with the promise of a very high quality reinforcer (remediation from a neurodevelopmental disorder). Others postulate that the sunk cost effect is a consequence of inappropriately applying rule-governed behavior (Fantino, 2004). More research is certainly needed to fully understand the parameters of the sunk cost fallacy and its effect on the behavior of organisms.

To counter misperceptions of the child's behavior difficulties, cognitive biases, and cognitive distortions, we suggest that behavior analysts use their unique skills; to operationalize the proposed behavior change, gather, and analyze data.

7 | OPERATIONALIZATION OF PROPOSED BEHAVIOR CHANGES AND DATA GATHERING

First, the behavior analyst should gather more information about what problems the caregiver is attempting to address through the use of the pseudoscientific approach and then operationalize this problem or concept into an observable and measurable behavior. Doing so may prove challenging as many pseudoscientific practices offer vague-sounding benefits, such as "general improvement" or "increased well-being." To begin, it is helpful to ask open-ended questions in order for the caregiver to provide more information to the behavior analyst about what will potentially change through the proposed intervention. With this information in mind, the behavior analyst can then explore measurable dimensions of behavior the proposed treatment might target for change. For example, in the case of a vague benefit such as "improved cognitive organization," the behavior analyst can clarify what this might look like, through asking open-ended questions and moving on to measurable dimensions of behavior. Pursuing clarification may take some skill and perseverance, as many pseudoscientific practices are unlikely to give details on which specific responses could be altered by the treatment. A list of questions the behavior analyst can ask are referenced in Table 2.

Though the focus on desirable traits is common with pseudoscientific practices, Skinner (1953) cautions against focusing on traits rather than specific responses as traits will not hold up to a scientific analysis. The behavior analyst should keep in mind that once the target behavior has been identified, the most effective treatment to change this behavior, after ruling out any necessary medical intervention, is likely to be based upon the principles of ABA. The behavior analyst can subsequently provide this information to the caregiver, along with a proposal on how this can be incorporated into the existing treatment program, before any pseudoscientific approach is

implemented. Once a proposed behavior change has been operationalized, the behavior analyst can move on to gathering baseline data on this target behavior before the pseudoscientific approach might be implemented (by another practitioner). The gathering of baseline data will be crucial before the pseudoscientific approach will begin so that a comparison can be drawn between the start of the intervention and potential behavior change. For this next step, we will offer the approach presented by Kay (2016), who proposed that the behavior analyst use his or her best trained skill, an experimental analysis, on the effectiveness of the alternative treatment. Through identification of the target behavior the behavior analyst can develop the research design, determine the criteria for successful performance, collect data with integrity, and evaluate the effectiveness of said intervention. Doing so allows the behavior analyst to collaborate tangibly with the caregivers to determine the utility and success of the alternative treatment. With these data, the caregivers are free to make their own decisions on whether or not to continue with treatment.

8 | CONSIDER TERMINATION

Although the above-mentioned approaches may be effective in some cases, a caregiver may still insist on using a pseudoscientific practice. In this case, the behavior analyst must determine if the pseudoscientific approach is contraindicated for the behavior analytic therapy already in place. A guiding principle that the behavior analyst should follow is minimizing the risk of harm to the client, which entails risk to the individual, and to society as a whole for failing to pursue established treatment. In such a situation, the pseudoscientific practice may interfere with implementation of ABA programming directly by reinforcing undesired behaviors, or indirectly by ineffectively using time the client had previously devoted to ABA. In these cases, it may be necessary to suspend the behavior analytic services while the pseudoscientific approach is in place. To help determine if termination is necessary, the behavior analyst should analyze the data on the client's behaviors to determine if a decrease in functioning or stalled progress has occurred. This information should be presented and discussed with the parent or caregiver prior to ending services and developing a termination plan.

In all the above-mentioned options, it is also essential for the behavior analyst to document efforts at each step. This documentation would include conversations with the caregiver, information that was provided to the caregiver, any data that were collected, and the course of action that the caregiver and behavior analyst decided on, whether it was collaborative or separate.

Resources for further examination and reference for behavior analysts are provided in Table 1. A general resource for ethical decision-making is provided by Rosenberg and Schwartz (2018). Their model contains six broad steps, with more specifically defined sub-steps, to guide a behavior analyst when faced with a challenging ethical situation. In addition, readers are directed to Schreck and Miller's (2010) discussion which proposes a model to guide behavior analysts in making ethical treatment decisions for possible use of alternative treatments. They provide guidance on how to evaluate research evidence about alternative treatments for developmental disabilities, along with a decision-making flowchart.

9 | SUMMARY AND CONCLUSION

Despite the behavior analysts' best efforts to gather information, evaluate treatments, and educate clients, parents and guardians may still choose to pursue pseudoscientific practices. In the case where conflicts may arise between behavioral treatments and pseudoscientific practices, the behavior analyst is advised to consider the following factors. As stated earlier, client safety is of paramount consideration. If a treatment poses a risk for harm, this information must be relayed to the parents and treatment team, especially the therapist who is proposing such a treatment. Ensuring that parents and clients are fully informed of the risks and benefits of treatments before they

TABLE 2 Questions to gather information about proposed behavior change with pseudoscientific practice

Open-Ended Questions to Begin With	
What behavior will your child display after the treatment?	
How will the occurrence of the behavior change?	
What will be different about your child after the treatment and how will you know that there is a difference?	
How will you know that the treatment has been successful?	
What changes would you see in your child's development as a result of the treatment?	
How will your child's day to day activities change as a result of the treatment?	
When will you know that it is time to stop the treatment?	
Would anything change for you, as the parent, as a result of the treatment provided to the child?	
Measurable dimension of behavior	Sample question
Frequency	Would your child be doing more or less of the same behavior or a different behavior?
	What would your child be doing more or less of in his/her typical day?
Duration	Would your child be doing something for more or less time?
	Would the treatment help your child to spend more/less time working on an activity?
Topography	What would the effects of treatment look like for your child?
	What types of things does your child start doing when s/he responds to treatment?
	What types of things will your child stop doing when s/he responds to treatment?
	What would your child do differently after receiving this treatment?
Locus/Environment/Context	During what type of typical daily activities would you expect to see improvement in from the treatment?
	Under what types of conditions or situations would you like to see more improvement from the treatment?
Latency	If the treatment were to be successful, would your child begin doing something faster or slower?
	Would your child take more or less time to start an activity or action?
Magnitude	Would the intensity of your child's needs increase or decrease from the treatment?
	What do you think needs to increase/decrease in intensity?

agree to pursue them is also an aspect of informed consent. Behavior analysts must do this with regard to behavioral treatments they propose, and it is also advisable to ensure there is informed consent from other treatment providers as well. Behavior analysts must then also carefully consider when services may need to be terminated, especially if parents choose to pursue pseudoscientific practices to the detriment of behavioral services. It must also be mentioned that parents and guardians always retain the right to end services at any time, including those provided by the behavior analyst.

The topic of how to address the continued use of pseudoscientific practices and specifically, how to handle this issue should parents request the behavior analyst use these, is one that practicing behavior analysts should anticipate. Pseudoscientific practices persist and continue to be promoted, despite an apparent lack of scientific evidence to support their use. Thus, it is strongly recommended that behavior analysts familiarize themselves with the nature of these treatments, investigate their risks and benefits, and develop skills in addressing parents'

requests to use them. With behavior analysts' training in EBPs, data collection, and analysis, the use of pseudo-scientific practices can be prevented or discontinued. The strategies presented in this discussion are supported by similar approaches advocated by others in behavior analytic literature (Lerman et al., 2008; Normand, 2008).

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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