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SI: TRAUMA-INFORMED PRACTICE IN BEHAVIOR ANALYSIS

Are Function-Based Interventions for Students with Emotional/Behavioral Disorders Trauma Informed? A Systematic Review

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Abstract

Students with emotional/behavioral disorders (EBD) commonly engage in both externalizing and internalizing behaviors—a behavioral profile that has been connected to childhood trauma. Although the efficacy of function-based interventions for students with EBD has been documented, the extent to which these interventions align with principles of trauma-informed care (TIC) is unknown. We conducted a systematic review of function-based intervention studies for students with EBD to evaluate whether and how these interventions incorporated critical elements of TIC. We identified 56 articles that met the eligibility criteria and used an iterative process to identify intervention practices consistent with each of six pillars of TIC, then evaluated the extent to which interventions in the study sample incorporated these practices. Despite identifying 45 function-based intervention practices aligned with pillars of TIC, we found most of these practices were absent in most interventions. We identified *teaching skills*, *building healthy relationships*, and *including family, culture, and community* as three pillars of TIC that warrant more attention when developing function-based interventions for students with EBD. For pillars of TIC that lack a strong empirical foundation in behavior analysis, we point to related literatures and disciplines with potential to inform next steps in behavior analytic research and practice.

Keywords emotional/behavioral disorders · trauma-informed care · function-based interventions · school

Introduction

Pooled prevalence estimates suggest approximately 10% of youth have an emotional/behavioral disorder (EBD; Williams et al., 2018). Broadly defined, EBD includes emotional, behavioral, or psychiatric disorders, excluding autism and other intellectual and developmental disabilities. The extent to which students with EBD receive formal psychiatric diagnoses or special education services varies (Lloyd, Bruhn, et al., 2019; Scardamalia et al., 2019). However, most students with EBD share a common behavioral profile, in that they engage in behaviors that interfere with their ability to participate meaningfully in instruction or establish positive interpersonal relationships in school (Individuals with Disabilities Education Improvement Act, 2004; Lambert et al., 2021).

Interfering behaviors displayed by students with EBD often include both externalizing (e.g., disruption, aggression, property destruction) and internalizing (e.g., fear, worry, sadness) behaviors. Such behaviors often co-occur with difficulties in other domains, including language and communication (Chow & Wehby, 2018), academics (Mundy et al., 2017), social skills (McDaniel et al., 2017), emotional regulation (Clifford et al., 2020), and mental health (Willner et al., 2016). In turn, these difficulties can worsen behavioral challenges, which can then lead to fewer learning opportunities. Without intervention, students caught in this 'negative reinforcement cycle' (Gunter & Coutinho, 1997) often experience exclusionary discipline and changes in placement to more restrictive learning environments (U.S. Department of Education, Office of Special Education & Rehabilitative Services [OSERS], 2023). In the long term, students with EBD face an increased risk of early high school dropout (U.S. Department of Education, OSERS, Office of Special Education Programs [OSEP], 2023), contact with the juvenile justice system (Mendoza et al., 2020), and unemployment (Mitchell et al., 2019).

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The Relevance of Trauma

The American Psychiatric Association (2013) defines trauma as "exposure to actual or threatened death, serious injury, or sexual violence" through (a) direct experience, (b) witnessing the event, (c) learning about trauma experienced by a close family member or friend, or (d) repeated or extreme description of such events (p. 271). Other groups have defined trauma according to a range of adverse childhood experiences such as abuse (i.e., physical, emotional, or sexual abuse), neglect (i.e., physical or emotional neglect), and household dysfunction (i.e., mental illness, domestic violence, divorce, incarceration of a family member, or substance abuse; Centers for Disease Control & Prevention, 2023; Felitti et al., 1998). Though the precise definition varies across sources, most agree that trauma results from experiencing harmful or life-threatening events or circumstances (Substance Abuse & Mental Health Services Administration [SAMHSA], 2014).

Trauma is an important factor to consider when supporting students with EBD, as research has revealed numerous connections between childhood trauma and the development of both internalizing and externalizing challenges. For example, students who have experienced trauma engage in more internalizing behaviors than students who have not (Farley et al., 2021; Perfect et al., 2016). Moreover, exposure to traumatic events has been linked to the development of various mental health disorders indicative of internalizing challenges, including risk of depressive disorders (Flory & Yehuda, 2015), anxiety disorders (Fernandes & Osório, 2015), and post-traumatic stress disorder (PTSD; Chang et al., 2019). Trauma is also related to the development of externalizing behaviors, including aggression, defiance, and disruption (Rasche et al., 2016; Thompson & Farrell, 2019), as well as corresponding mental health disorders (e.g., conduct disorder [Bernhard et al., 2018], attention deficit/hyperactivity disorder [ADHD; Spencer et al., 2016]). These behaviors can put students at risk for exposure to other potentially traumatic experiences. For example, restraint and/or seclusion are often programmed as emergency response procedures for dangerous behavior that threatens the student's safety or the safety of others (Gage et al., 2022; Gagnon et al., 2017). Though perhaps warranted in extreme cases, these procedures themselves can be traumatizing, leading to injury, traumatic stress, or in extreme cases, death (U.S. Government Accountability Office, 2009). In addition, for students with histories of trauma (particularly for students who have experienced physical abuse and/or neglect), restraint or seclusion could result in retraumatization (Freeman et al., 2023). In light of such evidence, it is important to consider the potential trauma histories of students with EBD when designing school-based supports.

Current models of trauma-informed care (TIC) emphasize the importance of *realizing* the impact of trauma, *recognizing* its signs, *responding* by applying the principles of a TIC approach, and *resisting retraumatization* (SAMHSA, 2014). Given the widespread prevalence of trauma (Carlson et al., 2020), schools have begun incorporating universal TIC practices to support students at the systems level (Overstreet & Chafouleas, 2016). At this foundational, prevention-oriented level, approaches have largely focused on the first two domains of TIC: *realizing* the impact of trauma and *recognizing* its signs (Maynard et al., 2019). For example, schools might offer psychoeducation to help teachers understand trauma and how it affects students (Parker et al., 2019). As another example, schools might use universal screeners to identify students who have been exposed to potentially traumatic events (Eklund et al., 2018). Although school-based supports aligned with TIC might be particularly important for these students, limitations to universal trauma screeners—with respect to implementation, reliability, and validity, for example—preclude the confident identification of all students with histories of trauma (Finkelhor, 2018; Gonzalez et al., 2016). Therefore, the implementation of school-based supports aligned with principles of TIC is warranted—perhaps especially for students with EBD.

In addition to universal supports, individualized interventions to address the internalizing and externalizing challenges experienced by students with EBD should also be trauma informed. These interventions should involve *responding* to individual needs in ways aligned with the principles of TIC, thereby *resisting retraumatization* (SAMHSA, 2014). With respect to internalizing behaviors, schools are increasingly responsible for providing individualized mental health supports to students whose thoughts and emotions interfere with their educational progress (Bipartisan Safer Communities Act, 2022). To address students' internalizing behaviors related to specific traumatic experiences, school mental health specialists might provide one-to-one counseling sessions or even implement trauma-specific interventions (e.g., Cognitive Behavioral Intervention for Trauma in Schools; Jaycox et al., 2012). Less is known, however, about the extent to which practices consistent with TIC are incorporated into individualized interventions that target externalizing behaviors.

Functional Behavior Assessment and Intervention for Students with EBD

Functional behavior assessment (FBA) and intervention remains among the most evidence-based approaches for proactively addressing severe and persistent externalizing behavior in schools (Collins & Zirkel, 2017). The goal of the FBA is to develop a hypothesis about when and why targeted behaviors occur by examining the relation between student

behavior and the school environment (Bambara & Kern, 2021). Then, the support team uses the hypothesis to develop a function-based intervention, the purpose of which is to (a) modify the environment to prevent the targeted behavior, (b) teach skills to replace the targeted behavior, and (c) differentially reinforce skills to increase their likelihood over externalizing behaviors (Liaupsin & Cooper, 2017).

Procedures commonly used in function-based interventions were originally developed to address severe externalizing behaviors for individuals with autism and other intellectual and developmental disabilities (Heath et al., 2015). However, there is growing evidence to support their efficacy in reducing targeted externalizing behaviors for students with EBD. Outcomes from a meta-analysis suggested function-based interventions reduced targeted externalizing behaviors by over 70% for students with and at risk for EBD across 69 studies (Gage et al., 2012). Similarly, McKenna et al. (2016) identified function-based interventions focused on social skill acquisition as a promising practice for addressing externalizing behavior for students with and at risk for EBD. To date, however, little attention has been paid to whether function-based interventions for this population incorporate procedures consistent with TIC, nor the possibility of adverse side effects of function-based interventions, especially with respect to traumatization or retraumatization. Ensuring such alignment seems especially relevant for students with EBD, given the multifaceted and interrelated challenges they face.

Principles of TIC for Function-Based Interventions

One of the recommendations from the National Child Traumatic Stress Network (NCTSN, 2017) is that schools develop and implement trauma-informed individualized behavior intervention plans. However, they provide no specific guidelines on how to do so. In the absence of explicit guidance, established principles of TIC can serve as a starting point to inform alignment. In 2014, SAMHSA proposed the following principles of TIC: (a) safety; (b) trustworthiness and transparency; (c) peer support; (d) collaboration and mutuality; (e) empowerment, voice, and choice; and (f) cultural, historical, and gender issues. Since then, several other reputable mental health organizations have proposed similar sets of principles, with a noteworthy addition of *teaching core skills* (Center on the Developing Child at Harvard University, 2021; NCTSN, 2017). As with earlier frameworks, these principles are defined broadly without concrete examples of how they might be applied in the context of individualized behavior interventions.

Fortunately, discussions of TIC in relation to behavior analytic service delivery have become more prevalent in recent years (e.g., Bishop, 2021; Hanley, 2021; Kolu, 2020), with Rajaraman, Austin, et al. (2022) presenting a case for integrating TIC into behavior analytic service delivery. In addition to a core commitment to acknowledging trauma and its impact, they identified three additional commitments of TIC that are especially relevant to assessment and intervention for externalizing behavior: (a) ensuring safety and trust, (b) promoting choice and shared governance, and (c) emphasizing skill building. Although these principles overlap with those proposed by trauma-focused organizations (e.g., SAMHSA, 2014; NCTSN, 2017), Rajaraman, Austin, et al. (2022) described each principle through a behavior analytic lens and proposed operational definitions that clarify how each principle already is—or could be—integrated into behavior analytic service delivery. For example, they identified skill building as a "cornerstone of applied behavior analysis" (p. 51), citing decades of research focused on teaching skills to replace externalizing behavior. As another example, they described how ensuring predictable environments promotes psychological safety by reducing uncertainty.

Further specification of other TIC principles is warranted when considering intensive, school-based behavior interventions for students with EBD. First, consistent with SAMHSA's (2014) collaboration principle, interprofessional collaboration among support providers with expertise in different domains (e.g., behavior analysis, mental health, special education) is important for students with EBD given their behavioral profiles and co-occurring skill deficits (LaFrance et al., 2019; Pollack et al., in press). Second, in addition to the importance of acting transparently to build trust (SAMHSA, 2014; Rajaraman, Austin, et al., 2022), interventions for students with EBD should support relationships that are responsive, safe, and consistent. This is important because students with EBD often struggle with relationships at school (Granger et al., 2021), yet establishing high-quality relationships has been identified as a protective factor for externalizing behavior (Cadima et al., 2016). Third, related to cultural and historical issues (SAMHSA, 2014), incorporating students' families, cultures, and/or communities in the design and implementation of function-based intervention is essential. Establishing and maintaining school-family partnerships can set the stage for engaging in culturally responsive practices (Jimenez-Gomez & Beaulieu, 2022). This aspect may be particularly critical for students with EBD—a group marked by overrepresentation of Black and Latine students and disproportionately high rates of exclusionary discipline (U.S. Department of Education, 2021).

Study Purpose

Given the associations between common characteristics of students with EBD and trauma, an exploration of TIC in the context of function-based interventions is needed. In the

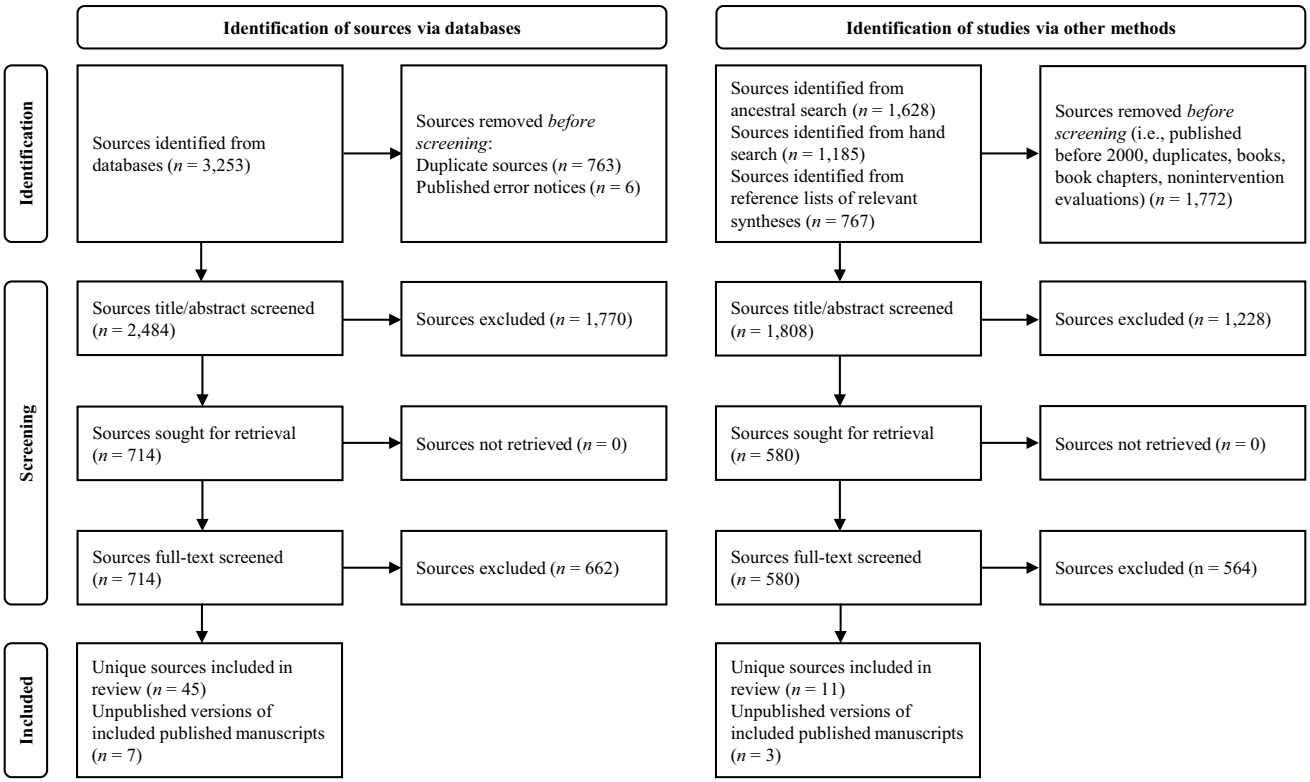

Fig. 1 PRISMA Flow Diagram

current study, we used an iterative process to evaluate the extent to which relevant principles of TIC were incorporated into function-based interventions for students with EBD. Using the SAMHSA (2014) principles as a starting point, and additional sources across behavior analytic, special education, and TIC literatures—as well as federal and expert white papers—we identified six pillars that represent ways to align function-based interventions and TIC for students with EBD: (1) ensure safety; (2) empower students through voice and choice; (3) teach skills; (4) prioritize interprofessional collaboration; (5) build healthy relationships; and (6) include family, or otherwise incorporate culture and/or community. We conducted a systematic literature review to identify studies that evaluated effects of function-based interventions for elementary students with EBD over the last 20 years. As part of this literature review, we iteratively developed a framework to identify function-based intervention practices aligned with each of the six pillars of TIC. To contextualize our findings, we described the student characteristics and assessment and intervention procedures represented in this literature. We then addressed the primary research question: To what extent do function-based interventions for elementary students with EBD incorporate practices consistent with TIC? We explored patterns by pillar to identify aspects of TIC that warrant more attention with respect to function-based intervention for students with EBD.

Method

We used the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA; Page et al., 2021) guidelines to systematically identify relevant peer-reviewed and unpublished literature for inclusion in this review (see Figure 1). Per contemporary guidelines for systematic reviews in applied behavior analysis and special education, we included gray literature (e.g., unpublished doctoral dissertations) to minimize the impact of publication bias on our findings (Cumming et al., 2023; Tincani & Travers, 2019).

Eligibility Criteria

Studies were required to meet eight criteria to be included in this review. First, studies included at least one student with EBD. Given the variability in criteria used to identify and describe students with EBD (Mitchell et al., 2019), we defined a student with EBD as one who (a) receives special education services based on an educational classification characteristic of EBD (i.e., emotional disturbance, other health impairment related to an attentional disorder, developmental delay with a documented history of externalizing behavior), and/or (b) has a psychiatric diagnosis consistent with EBD (e.g., ADHD, PTSD, conduct disorder, oppositional defiant disorder, anxiety disorders, depressive

disorders). Second, at least one student who met the first criterion was enrolled in kindergarten through fifth grade (i.e., elementary-age students). We excluded studies that provided insufficient information to link intervention descriptions and data sets to the students who met these criteria. For example, we excluded (a) studies that included multiple participants (only some of whom met inclusion criteria) but did not clarify the interventions and/or data sets that corresponded to each participant, and (b) studies in which only aggregate outcomes were reported. Third, studies implemented a function-based intervention informed by an FBA. To qualify, interventions designed to reduce externalizing behavior were conducted following at least one indirect, descriptive, or experimental FBA strategy, including broad references to FBA or functional assessment implementation. Fourth, studies occurred in a school setting (e.g., public, private, alternative, residential schools). Fifth, studies were written in English. Sixth, studies were published during or after 2000, as this was the year in which the first pieces of federal legislation were passed emphasizing the importance of a trauma-informed approach for children (e.g., Children's Health Act, 2000). Seventh, studies used a single-case design to evaluate intervention effects. Such within-participant designs permitted student-level evaluations of individualized function-based interventions, rather than average behavior change across groups of students. The inclusion of only single-case designs also increased the likelihood that procedures were reported in sufficient detail to adequately code function-based intervention practices to answer our research question. Eighth, studies used systematic direct observation to measure targeted externalizing behavior, either directly or as the inverse of appropriate behavior (e.g., on task, engagement). These final two criteria were included to facilitate meta-analyses of outcomes (reported in a separate manuscript).

Search and Screening

Database Search

We began by conducting a search across five electronic databases: PsycINFO, ProQuest Education, ProQuest Psychology, ProQuest Dissertations & Theses Global, and Social Sciences Premium Education Collection. We ran the search in January 2022 using search terms that corresponded to the eligibility criteria (see PICOS Criteria and Search Terms). After removing duplicates and published error notices (n = 769), the database search yielded 2,484 studies. Next, two graduate research assistants independently screened the title and abstract of each study using an online platform (Rayyan; Ouzzani et al., 2016). We excluded studies (n = 1,770) if both screeners agreed studies were ineligible based on the following subset of eligibility criteria, (a) published before 2000, (b) only included participants without EBD and/or students who were not elementary-aged, (c) did not use a single-case design, (d) did not measure externalizing behavior (or its inverse), and (e) did not occur in a school setting (see Title & Abstract Screening Manual). Then, we used all eligibility criteria to screen the full text of remaining studies (n = 714). To evaluate the reliability of the team's eligibility decisions during full-text screening, a second screener made independent eligibility decisions for 34.9% of studies. We calculated interrater agreement (IRA) by dividing the number of studies for which both screeners agreed about eligibility by the total number of studies screened and obtained an agreement index of 95.0%.

Supplemental Searches

After completing full-text screening, we conducted three additional searches (and subsequent title/abstract and full-text screening). First, we searched the reference lists of 35 systematic reviews and meta-analyses of function-based interventions for related student populations and settings published in or after 2000 (see List of Reviews and Meta-Analyses Screened). Second, we hand searched five journals with the highest number of eligible studies identified in the database search: *Behavioral Disorders*, *Journal of Applied Behavior Analysis*, *Journal of Emotional and Behavioral Disorders*, *School Psychology Review*, and *Education and Treatment of Children*. Third, we conducted ancestral searches of included studies using Web of Science. Studies that were not indexed in Web of Science were forward searched in Google Scholar and backward searched manually by reviewing the reference list. For unpublished dissertations and theses, we conducted manual backward searches only. The supplemental searches yielded 3,580 additional studies, at least 33.3% of which were double screened. IRA was 97.8%, 98.4%, and 94.8% for the review, hand, and ancestral searches, respectively.

Review Sample

The PRISMA flow diagram in Figure 1 outlines the number of studies that were included and excluded from this review across each stage of the search and screening process. In total, 56 unique studies were included in this review, 45 from the database search and 11 from supplemental searches (see List of Included Studies). From these studies, we screened student participants and interventions to identify those that met criteria for the review and would be coded. The first author screened all 56 studies for eligible students and interventions, at least 50% of which were also independently screened by a graduate research assistant. To evaluate reliability of these eligibility decisions, we averaged the proportion of (a) students and (b) interventions for which both screeners agreed about eligibility across studies. IRA

was 96.0% for student eligibility and 87.4% for intervention eligibility. All disagreements were subject to discrepancy discussions during which screeners reached consensus on eligibility decisions.

Descriptive Coding

We used a researcher-developed manual to code student, FBA, and intervention characteristics for each study (see Study Characteristics Coding Manual). All coders were graduate research assistants in a special education department and were either Board Certified Behavior Analysts or completing coursework and fieldwork pursuant to requirements for board certification. Prior to coding independently, and for each domain (i.e., student, FBA, and intervention characteristics), (1) the first author modeled how to use the coding manual to code one study; (2) coders independently practiced coding studies in sets of three; and (3) coders discussed disagreements and came to consensus. Coders repeated steps (2) and (3) until they reached at least 80% agreement across three consecutive studies and had no more than one disagreement for any variable across those three studies. Studies were coded independently only after these criteria were met. We calculated IRA for each domain by dividing the total number of variables for which coders agreed by the total number of variables coded and multiplying by 100. Then, we averaged agreement percentages across students or interventions, depending on the domain. To evaluate the reliability of the descriptive data, a secondary coder independently coded at least 33.3% of the studies. Mean IRA across eligible students was 94.3% for both student and FBA characteristics. Mean IRA across eligible interventions was 87.9%. Mean agreement exceeded 80.0% on all variables except *prompting* (77.8%). Like eligibility decisions, we held discrepancy discussions and reached consensus on all disagreements.

Student Characteristics

We coded 13 characteristics for each eligible student (n = 97), including grade, gender, race/ethnicity, special education eligibility status (and category), psychiatric diagnostic status (and diagnoses), socioeconomic status, trauma history, support services, medication status, the type of classroom in which the student typically received their education, and the type of classroom in which the function-based intervention was implemented.

FBA Characteristics

We coded 10 variables to describe the components and characteristics of the FBA for each eligible student, including (a) whether FBAs included record review, closed-ended indirect assessments (e.g., questionnaire, rating scale, checklist), interview, direct observation, preference assessment, functional analysis, concurrent operant analysis, antecedent analysis; (b) whether and which collaborators' perspectives were considered; and (c) the hypothesized or confirmed function of targeted externalizing behavior.

Intervention Characteristics

We coded 16 intervention variables for each eligible function-based intervention (n = 101), including nine antecedent supports (i.e., visual supports, prompting, opportunities to respond, self-management, contingency reviews, choice, curricular modifications, noncontingent reinforcement, behavioral skills training) and six consequence strategies (i.e., differential reinforcement of alternative behavior, differential reinforcement of other behavior, extinction, redirection, punishment, safety/crisis planning). We also coded whether alternative skills or replacement behaviors were taught (and if they were, coders noted the skill/behavior).

Trauma-Informed Function-Based Intervention (TI-FBI) Framework Development

We used an iterative process to develop and refine a framework outlining function-based intervention practices that are consistent with principles of TIC. Because there is no single agreed-upon set of TIC principles (Thomas et al., 2019), we consulted a range of sources to identify pillars of TIC that were highly applicable to function-based interventions for students with EBD in schools. As a starting point, we reviewed the SAMHSA (2014) principles, as well as related federal policy and white papers (Center on the Developing Child at Harvard University, 2021; NCTSN, 2017). We also reviewed peer-reviewed journal articles focused on intersections among trauma, applied behavior analysis, mental health, special education, child development, and EBD (e.g., Bath, 2008; Cavanaugh, 2016; Hurless & Young Kong, 2021; Giboney Wall, 2021; Morris et al., 2021; Rajaraman, Austin, et al., 2022). We looked for overlap among the consulted resources and identified six pillars of TIC, each of which were supported by multiple sources (see supporting sources for each pillar in the TI-FBI Framework). We defined a trauma-informed function-based intervention as one that (a) *builds healthy* (i.e., responsive, safe, consistent) *relationships* between the student and one or more adult or peer at school; (b) *includes* the student's *family* in the development or implementation of the intervention, or otherwise incorporates elements of their *culture* and/or *community*; (c) *prioritizes interprofessional collaboration* among providers representing different support domains (e.g., behavior, academics/instruction, mental health, medical, psychiatric); (d) *teaches* and/or strengthens core *skills*; (e) *empowers* the

student and promotes their autonomy by giving them a *voice* and opportunities for *choice*; and (f) *ensures* a sense of *safety* by minimizing or reducing potential stressors. We abbreviated labels for each pillar (italicized above) to facilitate coding.

We then used a multistep process to generate examples of function-based intervention practices that are consistent with each pillar of TIC (i.e., trauma-informed practices; TIPs). Although we acknowledge that TIPs may vary by student based on their unique trauma histories, we sought to follow a "universal approach" (Rajaraman, Austin, et al., 2022, p. 46) in identifying trauma-informed function-based intervention practices that are generally applicable for students with EBD. In the first step of the process, the first and second authors generated preliminary lists of TIPs by pillar. Although pillars of TIC were informed from literature both within and beyond behavior analysis, all intervention practices were drawn from the behavior analytic literature, then assigned to the closest-aligned pillar. For example, we identified *teaching and/or strengthening communication skills* as a TIP under the *teaching skills* pillar; *programming choice-making opportunities* as a TIP under the *empowering students through voice and choice* pillar; and *using noncontingent reinforcement* as a TIP under the *ensuring safety* pillar. Second, we sought and incorporated input from a doctoral student who was a Board Certified Behavior Analyst with a background in mental health and 6 years of experience supporting youth with trauma histories (third author). This team member cross-checked the practices we identified with the pillars of TIC.

Third, we coded the studies included in this review to expand and refine the lists of TIPs for each pillar of TIC. At least two coders (combinations of the first three authors) read the method and results sections of each study independently and for each unique function-based intervention noted any (a) TIPs present in the intervention and already included in the framework, (b) TIPs present in the intervention that were missing from the framework, and (c) TIPs present in the intervention and in the framework that needed further clarification or refinement. Then, we met to discuss codes, come to consensus on disagreements, and update the framework as applicable. Throughout the coding process, we added five TIPs. For example, we added *selecting or designing intervention setting to maximize student safety* as a TIP under the *ensuring safety* pillar after reviewing two dissertations in which research teams decided to begin intervention sessions in a pull-out setting to minimize risks to the participant and others (Burt, 2017; Wilbourn, 2008). We also refined several TIPs by clarifying the definition or adding examples or nonexamples.

Based on the identified TIPs, we assigned six binary scores to each intervention (one for each pillar) to quantify whether or not it incorporated any practices aligned with TIC. We scored a 0 if the intervention did not include any TIPs for a given pillar. We scored a 1 if the intervention included one or more TIPs for a given pillar. At least two coders (a subset of the first, second, and third authors) independently scored and consensus coded all interventions. That is, both coders reached consensus on TIPs and binary scores for each TIC pillar across all interventions. In addition to consensus coding, we evaluated the extent to which decisions about binary scores could be made reliably across two independent coders by calculating an overall percentage of agreement on binary scores within each pillar across 100% of interventions. For each pillar and each intervention, we coded an agreement if coders' scores matched and a disagreement if they differed. For each pillar, we divided the number of interventions for which coders agreed by the total number of interventions scored and multiplied by 100. Mean agreement on each TIC pillar was at or above 90%, ranging from 90.1% (*including family, culture, community*) to 100% (*prioritizing interprofessional collaboration* and *empowering students through voice and choice*). Coders worked collaboratively to reach consensus for all disagreements (the final dataset included consensus-coded scores).

The fourth and final TI-FBI framework[1] included 45 TIPs across six pillars of TIC. All TIPs have been used or recommended in the behavior analytic literature and are listed by pillar in Table 1. For *building healthy relationships*, we identified nine TIPs (e.g., pairing or rapport-building at the start of intervention; conducting informal interactive exchange/check-in between adult and student). For *including family, culture, community*, we identified five TIPs (e.g., seeking input from caregivers on any aspect of the intervention; meaningfully involving caregivers in intervention implementation). For *prioritizing interprofessional collaboration*, we identified five TIPs, including collecting social validity measures from school team members at the outset of and/or during intervention to inform intervention, and teaming with or among school staff to design, plan, or implement intervention. For *teaching skills,* we identified seven TIPs (e.g., teaching and/or strengthening communication skills via differential reinforcement or another more explicit teaching strategy). For *empowering students through voice and choice*, we identified eight TIPs (e.g., transparently involving the student in the identification of intervention goals and/or procedures). The *ensuring safety* pillar included 11 TIPs (e.g., providing the student a continuous option to leave intervention and/or take a break). Unless otherwise noted, TIPs were applied regardless of who implemented the practice (or whether the implementer was specified).

[1] The full TI-FBI framework, including examples, nonexamples, and supporting citations for each practice is available here.

Table 1 Number (and Percentage) of Function-Based Interventions Incorporating Trauma-Informed Practices by Pillar

Trauma-Informed Practice	*n* (%)
Prioritize Interprofessional Collaboration	
Interviewing or administering a questionnaire, rating scale, or checklist to at least one member of school team to learn about student behavior	93 (92.1%)
Teaming with or among school staff (e.g., research team members, teachers, mental health professionals) to design, plan, or implement intervention	39 (38.6%)
Collecting social validity measures (i.e., soliciting input about acceptability) from at least one school team member at outset of and/or during intervention to inform intervention	15 (14.9%)
Sharing responsibility for intervention implementation among multiple school support providers	5 (5.0%)
Embedding aspects of mental health intervention into behavior intervention (or vice versa)	0 (0.0%)
Empower Students through Voice and Choice	
Programming opportunities for choice making	44 (43.6%)
Interviewing the student	43 (42.6%)
Obtaining student assent to participate in intervention or research study that involves intervention	28 (27.7%)
Conducting a preference assessment with the student	20 (19.8%)
Transparently involving student in the identification of treatment goals or procedures (student must contribute or student opinions must be solicited)	18 (17.8%)
Providing the student an explicit rationale for behavior change programming	2 (2.0%)
Programming recurring opportunities for student assent	1 (1.0%)
Programming recurring opportunities for student preference assessments	0 (0.0%)
Ensure Safety	
Programming consistent and predictable routines and expectations	72 (71.3%)
Modifying curriculum or other aspects of instruction delivery to align with student's instructional level	17 (16.8%)
Using noncontingent reinforcement	13 (12.9%)
Ensuring a safety plan/crisis response plan is in place	7 (6.9%)
Providing student with continuous option to leave and/or take a break	6 (5.9%)
Selecting or designing intervention setting to maximize student safety	4 (4.0%)
Gradually introducing establishing operations	3 (3.0%)
Synthesizing reinforcers to safely turn targeted externalizing behavior off (must include rationale related to safety)	2 (2.0%)
Conducting an abbreviated return to baseline phase in treatment evaluations (must include rationale related to safety)	2 (2.0%)
Reinforcing precursors (i.e., behaviors that precede or co-occur with targeted externalizing behavior)	1 (1.0%)
Continuously monitoring student stress responses	1 (1.0%)
Teach Skills	
Teaching and/or strengthening (either via differential reinforcement or another more explicit teaching strategy) . . .	
. . . contextually appropriate behavior (i.e., doing what is expected at the time)	42 (41.6%)
. . . communication skills	32 (31.7%)
. . . skills that increase personal agency or executive functioning	10 (9.9%)
. . . developmentally appropriate social skills	8 (7.9%)
. . . developmentally appropriate emotional skills	6 (5.9%)
. . . academic skills	4 (4.0%)
. . . leisure skills	0 (0.0%)
Build Healthy Relationships	
Fostering connections or positive interactions between student and adult or peer	38 (37.6%)
Training interventionist(s) to respond to student communication attempts	25 (24.8%)
Engaging in informal interactive exchange (check-in) with student	6 (5.9%)
Training interventionist(s) and student on intervention simultaneously	4 (4.0%)
Pairing or rapport-building at start of intervention	2 (2.0%)
Playing with the student or following their lead during intervention sessions	2 (2.0%)
Teaching or setting appropriate boundaries	2 (2.0%)
Training interventionist on anger management and/or coping strategies for themselves	2 (2.0%)
Selecting interventionist based on degree of positive rapport with student	1 (1.0%)

Table 1 (continued)

Trauma-Informed Practice	*n* (%)
Include Family or Incorporate Elements of Culture and/or Community	
Interviewing or administering a questionnaire, rating scale, or checklist to caregivers to understand how home factors might be influencing student behavior (including attempts)	26 (25.7%)
Seeking input from caregivers on any aspect of the intervention	11 (10.9%)
Meaningfully involving caregivers in implementation of intervention	8 (7.9%)
Conducting a record review to better understand the student's home, family, and/or community history (i.e., past experiences outside of school) to potentially inform intervention	0 (0.0%)
Speaking to the student in their first/primary language (if the student's first/primary language isn't English)	0 (0.0%)

Results

Study Characteristics

To provide context for the outcomes, we first summarized characteristics of the 56 studies identified for this review. We coded characteristics across 97 students who met eligibility criteria for inclusion (see Student Characteristics for a summary). Most students (88.7%) were boys. Of the 64 students for whom race/ethnicity was reported, most were White (57.8%) or Black/African American (32.8%). These demographic characteristics reflect common patterns for this student population in the United States (e.g., majority boys, disproportionate representation of Black students; National Center for Education Statistics, 2023; U.S. Department of Education, OSERS, OSEP, 2023). Special education eligibility category was reported for 64 students, 70.3% of whom received special education services under an emotional disturbance eligibility category, or another similar label (e.g., behavioral disorder, EBD). Of the 61 students who were reported to have a psychiatric diagnosis, all but two were diagnosed with ADHD, eight of whom carried a co-occurring oppositional defiant disorder diagnosis. Socioeconomic status indicators and trauma histories were reported for 6 and 16 students, respectively. When reported, indicators of possible traumatic experiences primarily involved home contexts (e.g., separated and/or divorced parents, parent with a mental illness, multiple out-of-home placements). Relatedly, of the 26 students for whom supplemental support services were reported, 25 students received such services, the majority of which were related to social-emotional, mental health, or behavior (most commonly in the form of targeted social skills training). Medication status was reported for 47 students, nearly 75% of whom were prescribed psychotropic medication, the majority of which were stimulants. A relatively equal number of students received instruction in general education classrooms (36.1%), special education classrooms (30.9%), or both types of classrooms (28.9%). Primary educational context was not reported for four students (4.1%). Study interventions were most commonly implemented in general education classrooms (43.3% of students), followed by special education classrooms (33.0% of students), or multiple locations (13.4% of students; e.g., empty classroom and general education classroom). Six students (6.2%) received intervention in a different location (e.g., cafeteria, hallway), and intervention setting was not reported for four students (4.1%).

We coded FBA components for each of the 97 eligible students. Almost all assessments (91.8%) included at least one indirect assessment method (e.g., record review, questionnaire, rating scale, checklist, interview). Classroom teachers were consulted via indirect assessment in all cases, whereas students, caregivers, and other school personnel were consulted in less than half of cases (42.7%, 22.5%, and 6.7%, respectively). Direct assessments—including observations ($n = 85$), and to a lesser degree, experimental analyses ($n = 41$)—were also common components of FBAs. When conducted, experimental analyses included functional analyses ($n = 33$), antecedent analyses ($n = 10$), and concurrent operant analyses ($n = 3$). The hypothesized or confirmed function of externalizing behavior was reported for 85.6% of students. Students' behavior was most commonly maintained by access to attention (41.0%), multiple reinforcers (28.9%), or escape (25.3%).

We coded the intervention strategies included in 101 unique function-based interventions. On average, interventions included 4.8 strategies. The majority of interventions (79.2%) incorporated both antecedent and consequence strategies. Other interventions included only antecedent (15.8%) or consequence (5.0%) strategies. The most commonly programmed antecedent strategies were contingency reviews (45.5%) and visual supports (42.6%). Differential reinforcement of alternative behavior was programmed in 72.3% of interventions. Other consequence strategies designed only for behavior reduction were also used, but not as frequently (e.g., extinction [35.6%], punishment [6.9%]). In most interventions (79.2%), an alternative skill or replacement behavior was taught (e.g., on-task behavior, following school or classroom rules, completing work).

Alignment with Trauma-Informed Care

To address the primary research question, we used the TI-FBI framework to quantify the extent to which function-based interventions in the study sample incorporated practices that were consistent with TIC. Across interventions, the average number of pillars for which we identified one or more TIPs was 4.2 (range, 1–6). Only 18 interventions (17.8%) included one or more TIPs for all six pillars. We also examined the percentage of interventions that included one or more TIPs within each pillar. Percentages by pillar ranged from 29.7% (*including family, culture, community*) to 97.0% (*prioritizing interprofessional collaboration*). The extent to which individual TIPs were present also varied widely within each pillar (see Table 1). In the sections that follow, we describe patterns by pillar of TIC, starting with the pillar most represented across interventions.

Although nearly all function-based interventions included one or more TIPs for the *prioritizing interprofessional collaboration* pillar (97.0%; see Table 1), the representation of individual TIPs varied widely. Most interventions (92.1%) were informed by indirect assessments conducted with at least one member of a school team (most often classroom teachers). However, only 38.6% of interventions involved teaming with or among school staff to design, plan, or implement the intervention. Of these interventions, most ($n = 29$) involved collaborations between teachers and researchers (who often served in a behavior consultant role). Only six interventions involved collaborations with a school mental health specialist (i.e., school counselor [Newcomer & Lewis, 2004]; therapist [Stahr et al., 2006]; school psychologist [Jensen, 2008; Murphy, 2007]). Further, we found no evidence of interdisciplinary collaboration among school staff members with respect to embedding mental health supports into function-based interventions, and minimal evidence (5.0% of interventions) of sharing responsibility for intervention implementation among student support team members. Input about the acceptability of intervention procedures was solicited from school team members at the outset of (or during) the study to inform only about 15% of interventions.

Most function-based interventions (86.1%) included one or more TIPs for the *empowering students through voice and choice* pillar (see Table 1). Although seven of eight possible TIPs were identified in the sample, each TIP was incorporated in fewer than 50% of interventions. The most commonly identified TIPs were (a) programming opportunities for choice-making (43.6%), (b) interviewing the student as part of the FBA (42.6%), and (c) obtaining student assent to participate in the function-based intervention or in a research study that involves the implementation of a function-based intervention (27.7%). Though the evidence of interventionists obtaining student assent to participate is promising, only one intervention programmed recurring opportunities for student assent throughout intervention (Rajaraman, Hanley, et al., 2022). Additionally, only two interventions provided students with an explicit rationale for behavior change programming (Lane et al., 2006; Lo & Cartledge, 2006).

Evidence of one or more TIPs was present in 80.2% of interventions for the *ensuring safety* pillar (see Table 1). Only one TIP (programming consistent and predictable routines and expectations) was incorporated in more than half of the interventions (71.3%). Some interventions used curricular modifications (16.8%) and noncontingent reinforcement (12.9%) to prevent externalizing behavior, but the remaining TIPs appeared minimally across studies. These included intervention practices that are critical for students who engage in dangerous behavior that threatens safety (e.g., ensuring a safety or crisis plan is in place; Romano et al., 2021), as well as those designed to reduce the likelihood of externalizing behavior (e.g., providing student with a continuous option to take a break [Rajaraman, Hanley, et al., 2022]; gradually introducing establishing operations [Andersen & Daly, 2013]).

Nearly 75% of interventions included one or more TIPs within the *teaching skills* pillar (see Table 1). Though most interventions taught an alternative skill (see *Study Characteristics* above), less than a quarter included procedures to teach or strengthen more than one skill. Most commonly, interventions programmed differential reinforcement to teach or strengthen contextually appropriate behavior (e.g., on-task behavior, cooperation with adult instructions), but this was only included in 42.1% of interventions. Only a third of interventions included a procedure to teach or strengthen communication skills (e.g., requesting a break or help). Few interventions incorporated teaching or reinforcement procedures targeting other skills, such as executive functioning (9.9%), social (7.9%), emotional (5.9%), or academic (4.0%) skills.

About half of interventions (52.5%) included one or more TIPs for the *building healthy relationships* pillar (see Table 1). Of the 13 possible TIPs included in this pillar, only two were detected in more than 10% of interventions: fostering connections and positive interactions between the student and an adult or peer (37.6%) and training staff to respond to communication attempts (24.8%). Evidence of informal, interactive exchanges between the student and interventionist (5.9%), pairing or rapport-building at the start of intervention (2.0%), or playing with the student and following their lead (2.0%) was largely absent. Only one intervention selected the interventionist based on their rapport with the student (Stahr et al., 2006).

For the *including family, culture, community* pillar, 29.7% of interventions included one or more TIPs (see Table 1). Only a quarter (25.7%) of interventions were informed by

indirect assessments that solicited or attempted to solicit input from caregivers to understand how factors outside of school might be influencing student behavior. Notably this was the most commonly incorporated TIP for this pillar. The other four TIPs were incorporated in about 10% or fewer interventions. None of the interventions reported obtaining information from school record reviews about the student's past experiences outside of school (e.g., home, family, and/or community history), nor incorporating such information into intervention.

Discussion

Calls have been made to incorporate principles of TIC in function-based interventions (NCTSN, 2017; Rajaraman, Austin, et al., 2022). Yet to date, there are no comprehensive frameworks that identify intervention practices that align with principles of TIC. We iteratively developed one such framework with a focus on the needs of students with EBD, in the context of a systematic literature review of function-based interventions for these students. Our focus on students with EBD was motivated by their distinct intervention needs spanning social, emotional, and behavioral domains (Lambert et al., 2022), their heightened likelihood of trauma histories (Offerman et al., 2022), and their vulnerability to retraumatization at school (Mitchell et al., 2019).

Our results suggest only a small subset of possible TIPs are widely represented in the function-based intervention literature for students with EBD. Although we identified many TIPs that were incorporated to varying degrees in function-based interventions, only two were detected in most interventions: soliciting input from a member of the school team about student behavior (*prioritizing interprofessional collaboration*) and programming consistent and predictable routines (*ensuring safety*). Although all TIPs included in the framework had a basis in the behavior analytic literature, differences emerged among pillars with respect to how robust those literatures were. In what follows, we highlight three pillars for which the representation of TIPs for students with EBD was less than expected given the degree of empirical support for these practices in the broader behavior analytic and function-based intervention literatures. These pillars were *teaching skills*; *empowering students through voice and choice*; and *ensuring safety*. Next, we discuss the remaining three pillars, whose empirical basis in the behavior analytic literature is limited. For these three pillars (i.e., *including family, culture, community*; *building healthy relationships*; *prioritizing interprofessional collaboration*), we point to related literatures outside behavior analysis—yet relevant to EBD—with potential to inform next steps.

Teaching Skills, Empowering Students, and Ensuring Safety

We expected function-based interventions would incorporate many TIPs in the *teaching skills* pillar given the longstanding focus on teaching functional skills to replace externalizing behavior (McKenna et al., 2016; Rajaraman, Austin, et al., 2022). Although differential reinforcement was incorporated in most function-based interventions, these contingencies were most often applied to contextually appropriate behaviors (e.g., on-task behavior, cooperation with instruction). We were surprised that a range of skills particularly relevant for students with EBD (e.g., communication skills, social skills, academic skills) were minimally targeted, and that less than a quarter of interventions targeted more than one skill. As an example, only about a third of the interventions in our sample taught functional communication skills. This outcome is consistent with findings from Hollo and Burt (2018), who found only 39% of function-based interventions for students with or at risk for EBD included teaching communication skills. Yet the co-occurrence of language and behavioral challenges for students with EBD is well-established (Chow & Wehby, 2018). In fact, an estimated 81% of students with or at risk for EBD have undetected language delays (Hollo et al., 2014), and trauma can exacerbate such delays (Carr et al., 2020). Taken together, these data suggest a potential missed opportunity to target relevant skill deficits for students with EBD that contribute to their externalizing behavior.

Within the *empowering students through voice and choice* pillar, initial interviews with the student were conducted in less than half of the FBAs informing interventions, despite nearly 90% of FBAs including at least one interview. Decades of research on FBA support the solicitation of student input to help identify environmental factors related to the occurrence of externalizing behavior (e.g., Kern et al., 1994; Reed et al., 1997). Particularly for students with EBD, such input could provide insight on which aspects of their learning environments they find stressful, boring, or otherwise aversive, as well as the unobservable thoughts and feelings (i.e., private events) that could be contributing to their externalizing behavior (Johnson & Carpenter, 2022). In addition to interviewing students as part of the FBA, we found even less evidence of the transparent involvement of students in the selection and design of intervention goals and procedures. Given the well-developed toolbox of function-based intervention procedures (Lloyd, Barton et al., 2019; Walker et al., 2018), student preference should be used to inform the selection of specific procedures over others (Slocum et al., 2014). Incorporating student input supports their autonomy, which is especially important for students with EBD whose independence is often restricted in response to

their chronic—and in some cases dangerous—externalizing behavior.

With respect to *ensuring safety*, many of the TIPs included in the framework were informed by behavior analytic literature—particularly those studies focused on maximizing psychological and physical safety in behavior reduction programming for children with intellectual and developmental disabilities (e.g., Coffey et al., 2020; Hanley et al., 2014; Smith & Churchill, 2002; Taylor et al., 2018). Autistic advocates and behavior analysts alike have raised concerns around the potential harm of coercive intervention procedures (Beaulieu & Jimenez-Gomez, 2022; Sandoval-Norton et al., 2019). These concerns, coupled with the efficacy of function-based interventions that maximize physical and emotional safety (e.g., Staubitz et al., 2022), suggest safety-focused practices should be prioritized for *all* students with behavior support needs. Unfortunately, we found that TIPs focused on ensuring safety were rarely incorporated in function-based interventions for students with EBD.

Including Family/Culture/Community, Building Relationships, and Prioritizing Interprofessional Collaboration

Function-based interventions for students with EBD included few TIPs aligned with (a) *including family, culture, community*; (b) *building healthy relationships*; and (c) *prioritizing interprofessional collaboration*. These pillars of TIC (and related TIPs) are aligned with recent calls to prioritize cultural responsivity (Beaulieu et al., 2019; Behavior Analyst Certification Board, 2020), positive adult-child rapport (Hanley, 2021), and interdisciplinary collaboration (LaFrance et al., 2019) in behavior analytic service delivery. All three of these areas represent critical avenues for future behavior analytic research. Until empirical literatures emerge, however, we can look to related disciplines (e.g., special education, teacher education, early childhood development, interprofessional care) with more robust bodies of evidence on these topics. These adjacent literatures might serve as a useful starting point as behavior analysts work to align function-based intervention procedures with these pillars of TIC.

TIPs related to *including family, culture, community* were poorly represented in the function-based intervention literature for students with EBD. This pattern is consistent with the wide gap in the broader behavior analytic literature around the provision of culturally responsive behavior analytic programming (Beaulieu et al., 2019; Jimenez-Gomez & Beaulieu, 2022). In recent years, behavioral researchers have begun to work towards narrowing this gap, proposing strategies to improve behavior analysts' collaboration with families (e.g., Taylor et al., 2019). Luckily the teacher education literature is ripe with theoretical and empirical resources on culturally relevant/responsive pedagogy, an instructional approach that centers and values students' unique learning histories (e.g., Gay, 2002; Ladson-Billings, 1995; Portes et al., 2017). This related literature could help inform methods for incorporating elements of a student's family, culture, and community into function-based interventions. For example, school teams might need to consider the institutional barriers to successfully soliciting input from families on home and community factors that could contribute to externalizing behavior, as well as their perspectives on intervention goals and procedures (Richards et al., 2007). Given many caregivers of students with EBD face adversities that impact their capacity to regularly communicate with school personnel (Buchanan & Clark, 2017; Morgan et al., 2022), developing new strategies for connecting with these individuals—including offering multiple opportunities and formats to interact with their child's support team—are needed. Ensuring interventions incorporate family perspectives and values is necessary for effects to generalize to other critical life contexts.

We also found little evidence that function-based intervention procedures contribute to *building healthy relationships* between students with EBD and their educators. Despite the limited scope of behavior analytic literature in this area, the early childhood and special education fields offer well-developed literatures focused on strategies to promote positive, supportive interactions between educators and students. For example, Banking Time is an early childhood intervention designed to improve teacher–child relationship quality (Williford & Pianta, 2020). Interestingly several components of Banking Time are consistent with guidelines for child-led time (i.e., synthesized reinforcement) from the skill-based treatment literature (e.g., following the child's lead, refraining from instructing the child on what to do or how to play, allowing the child freedom to move between activities; Staubitz et al., 2022; Williford & Pianta, 2020). As another example, BEST in CLASS is a classroom-based intervention with a subset of strategies designed to support positive teacher–student interactions (e.g., praise, responding to student needs, labeling emotions, showing interest in the student; Sutherland et al., 2018). These relationship-building strategies are targeted for students with or at risk for EBD because their relationships with teachers are often strained and marked by conflict (Sanchez-Fowler et al., 2008). Considering function-based interventions almost always involve adult-child interactions, the lack of focus on relationship-building in these interventions highlights a missed opportunity for students in need of positive, supportive connections at school.

Finally, even though nearly all interventions included one or more TIPs for the *prioritizing interprofessional*

collaboration pillar, the TIPs we identified primarily involved partnerships between the research team (often representing a behavioral consultant role) and the student's teacher. We found just six examples of collaboration involving mental health specialists (e.g., school counselors, therapists, school psychologists). This finding was surprising considering almost 20% of students were reported to receive supplemental social/emotional, behavioral, and/or mental health services in addition to function-based behavior intervention. Such expertise seems particularly useful to address the co-occurring social-emotional and mental health challenges faced by students with EBD. Unfortunately, siloed approaches to behavior-analytic and mental health service delivery are common in both research and practice (Kelly & Tincani, 2013; Short et al., 2018). Although there is limited empirical data on collaboration between behavior analysts and mental health specialists, there are well-established models of multidisciplinary collaboration (e.g., interprofessional care [Donovan et al. 2018], wraparound [Olson et al., 2021]) that could be adapted and applied to this unique partnership.

Limitations

Despite the current study providing a preliminary framework for categorizing trauma-informed intervention practices, there are some limitations to consider. First, the goal of this study was to iteratively develop and pilot a trauma-informed framework through a systematic literature review. However, continued refinement and content validation of the TI-FBI framework is needed. In particular, soliciting and incorporating input from other researchers and expert practitioners who specialize in trauma and function-based interventions—as well as people with EBD and trauma histories—is an important next step for identifying other relevant TIPs to include in the framework. Second, our assessments of IRA represented agreement on binary scores per pillar. We did not assess IRA at the level of individual TIPs because we (a) were generating new TIPs throughout the coding process, and (b) engaged in consensus coding on all TIPs across 100% of interventions. Third, our identification of TIPs was limited to information authors provided in their procedural descriptions. This limitation applies to all systematic literature reviews but seems especially relevant when evaluating aspects of interventions that were not the primary focus of the studies themselves. Put simply, additional aspects of intervention practices might have aligned with TIC but were unreported and thus not captured in our review. Fourth, language proficiencies among our research team required exclusion of studies written in languages other than English. As such, generalizations of findings should be limited to English-speaking communities.

Future Research

Results of this review highlight several areas for future research. First, we need to improve alignment between function-based interventions and TIC for students with EBD. Though all TIPs included in the framework have some precedent in the behavior analytic literature, this literature has largely focused on children with intellectual and developmental disabilities to date (e.g., functional communication training [Gerow et al., 2018]; pairing [Lugo et al., 2017; Shireman et al., 2016]). Although this evidence base serves as a starting point, modifications to goals and procedures for students with EBD will be needed to maximize the relevance and efficacy of their function-based interventions. These adaptations should be informed by related disciplines focused on EBD (e.g., school mental health, early childhood), and might include borrowing from existing literature bases and engaging in interdisciplinary research collaborations. Second, the TI-FBI framework should be further refined for both research and practice purposes. With respect to research, methods to quantify the extent to which function-based interventions align with each pillar of TIC (beyond the dichotomous approach used in this review) are worth exploring. Such scoring systems could be used in meta-analyses to evaluate whether the degree of alignment with TIC predicts critical intervention outcomes for students with EBD. The TI-FBI framework could also be modified for practice, providing practitioners with a menu of options to maximize alignment between their function-based interventions and each pillar of TIC. Third, our field would benefit from experimental evaluations of trauma-informed function-based interventions (or components thereof) on targeted externalizing behaviors, skill acquisition, social validity, and other critical outcomes.

Fourth, in addition to considering aspects of function-based interventions that are aligned with principles of TIC, it is also important to consider whether other practices might be mis-aligned. In fact, recent criticisms from within and outside the field of behavior analysis suggest some function-based intervention procedures might be inconsistent with TIC (Kupferstein, 2018; Rajaraman, Austin, et al., 2022). For example, behavior analytic scholars have advocated for a reduction of "coercive" behavior analytic practices, such as the use of timeout and edible reinforcers (Beaulieu & Jimenez-Gomez, 2022; Hanley, 2021; Thomas & Brodhead, 2022). Similar concerns have been raised by adult members of the Autistic community, many of whom participated in behavior analytic interventions as children (Sandoval-Norton et al., 2019). Thus, within each pillar of TIC, future research should not only focus on intervention practices that uphold that pillar, but those that could contradict it, and even contribute to re-traumatization.

Conclusion

Students with EBD are uniquely vulnerable to poor outcomes, due in part to the potential contribution of trauma. To help prevent these vulnerabilities from becoming a reality, function-based interventions can incorporate practices consistent with the principles of TIC. This review offered a preliminary exploration of the alignment between function-based interventions and TIC—an intersection that is ripe for further investigation to support students with EBD. In addition, the framework we developed offers researchers and practitioners a starting point for incorporating TIPs into function-based interventions. Continued research is needed to better understand whether and how TIPs impact critical student outcomes.

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Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Declarations

Conflicts of interest The authors have no competing interests to declare that are relevant to the content of this article

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