

Episodic Severity

An Overlooked Dependent Variable in the Application of Behavior Analysis to Challenging Behavior

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Abstract: Although applied behavior analysis has made a significant contribution in the area of challenging behavior, to date, researchers have not systematically investigated the episodic severity of behavior as a dependent variable. *Episodic severity* is defined as the measure of intensity or gravity of a behavioral incident. Research up to now has investigated changes in behavior over time, but not the degree to or speed with which a behavioral incident can be safely resolved. As a result, practitioners have had to look beyond applied behavior analysis to emergency management systems such as Mandt, Nappi, CPI, and the like, which have not been empirically tested. This article proposes including episodic severity as an additional dependent variable to enhance the social validity of behavioral plans and discusses the resulting implications for new terms and strategies.

Applied behavior analysis (ABA) involves the application of the principles and procedures of behavioral psychology to human behavior in all settings (Vollmer et al., 2000). Based largely on Skinner's operant paradigm (1953), ABA is characterized by objectively and reliably measured changes in a person's behavior (dependent variables) as a result of equally clearly defined procedures (independent variables; Sidman, 1960). One area in which ABA has made a significant contribution is that of challenging behavior, particularly when working with people who have a developmental disability (Iwata et al., 1996). This contribution has included the introduction and development of approaches that use empirically supported positive strategies to address challenging behavior, leading to a reduction in the reliance on punishment and other aversive strategies and to an emphasis on changes in quality of life and on social validity as important outcome measures (Carr et al., 1999). *Social validity* refers to the acceptability of the goals, methods, and outcomes obtained to primary and secondary consumers (Kazdin, 1977; Wolf, 1978).

Nevertheless, in keeping with the traditions of ABA, not withstanding this refreshing focus on socially valid, quality-of-life outcomes, the dependent variables in a large majority of studies involving challenging behavior have understandably included changes in the target behavior

over time. The rate of challenging behavior (Ferster & Skinner, 1957) is perhaps the most commonly tracked dependent variable evident in the behavioral literature (e.g., Deitz & Repp, 1973; Deitz et al., 1978; Kahng, Iwata, Thompson, & Hanley, 2000; Luce, Delquadri, & Hall, 1980; Vollmer, 1993). Using a variety of sophisticated investigative methodologies, researchers investigate the procedure (i.e., independent variable) to determine whether it reliably produces a change in the rate of the challenging behavior (i.e., dependent variable) over time. The duration of challenging behavior (i.e., the amount of time a person engages in a challenging behavior; e.g., 4.5 hr a week) is another example of a dependent variable used to measure the effect of the independent variable on behavior over time (e.g., Jason & Liotta, 1982; Leitenberg, Agrad, Thompson, & Wright, 1968; Williams, 1959).

Episodic Severity as a Dependent Variable

To date, researchers have not systematically investigated the episodic severity (ES) of behavior as a dependent variable. ES is defined here as a measure of the gravity or intensity of a behavioral incident. In this usage, the word *episodic* does not mean *intermittent* but, rather, means "with respect to an episode." Therefore, episodic severity

would not be measured over time (e.g., 4.5 hr total duration a week, or five trips to the hospital per month for medical treatment due to self-injury) but, rather, within the cycle of a behavioral incident (e.g., an average duration of 1 hr per episode, with a range of 5 min to 2 hr per episode, or an average severity rating of 3.2 for episodes of self-injury, with a rating range of 2 to 5, using a 5-point scale of severity, with level 5 representing the need to go to the hospital for medical treatment as a result of the episode). The cycle of a behavioral incident would be circumscribed by its defined onset and offset (Johnston & Pennypacker, 1993; Sulzer-Azaroff & Mayer, 1991), or “boundaries” (Hawkins & Dobes, 1977).

ES would be measured in various ways, depending on the problem behavior. For example, the ES of a temper tantrum might be measured by the duration of the specific incident, the ES of property destruction might be measured by the cost of repair and replacement resulting from the incident, and the ES of aggression or self-injury might be measured by the scaled degree of harm or injury resulting from the incident. In fact, although not yet used for that purpose, existing scales may also be useful in measuring the ES of self-injurious behavior (Iwata, Pace, Kissel, Nau, & Farber, 1990) and aggression (Nijman et al., 1999). Other measures of ES might include the number or kind of topographies occurring during the behavioral incident, the social outcomes resulting from the incident, or any other objective measure of the gravity or intensity of an incident. These results could be reported in terms of the mean severity rating of behavioral incidents during baseline and subsequent treatment phases and the range of those severity ratings.

The distinction between the measurement of change over time, for example, in the rate or duration of behavior, and the measurement of changes in the ES of behavior is illustrated in a case study reported by Campbell and Lutzker (1993), in which the target was tantrum behavior (i.e., crying and screaming behaviors). This study reported a baseline rate of 18 episodes of the behavior per week, for an average total duration of 4.5 hr a week. By the end of Phase 2 of the study, the rate had been reduced to an average of 3.6 episodes per week, for an average total weekly duration of 55.7 min for the week, through the use of communication (functional equivalence) training. These results showed a reduction in both the rate and the duration of the behavior over time. However, although not formally investigated as a dependent variable in this study, the authors inferred from the data that there was no reduction in the ES of the behavior as measured by the average duration of an incident. During baseline, the average duration per incident was 15 min, and by the end of Phase 2, the average duration per incident was 15.5 min. The range in duration was not reported.

A focus on episodic severity has the potential to increase social validity, an important goal of positive behav-

ioral supports (PBS; Carr et al., 1999). For example, in the Campbell and Lutzker (1993) study, the traditional focus on the rate and duration of tantrums over time would define success solely as a decrease in the level of those two variables. In contrast, measures of ES would provide additional success criteria. For example, if the weekly rate of behavior had remained unchanged but the average duration of each tantrum (ES) had been dramatically reduced, would the family have defined this as at least partial success? Would some families find it easier to deal with one tantrum a week that lasts for 30 min (low rate/high ES) and others with 30 min spread over six tantrums a week, with a 5-min average (high rate/low ES)? It seems very likely that the social validity of a behavioral support plan can be enhanced by measuring and reducing the ES of challenging behavior, in addition to improving quality of life, to reducing the rate and severity of the behavior over time, and to ensuring the durability and generalization of results.

There have been no studies within the field of applied behavior analysis in which a strategy or procedure (independent variable) has been systematically investigated for its effects on ES (dependent variable), although the importance of ES has been recognized (e.g., Albin, O'Brien, & Horner, 1995). However, ES, as a dependent variable, may be helpful in attempts to analyze and distinguish between strategies that contribute to changes in behavior within a cycle as distinct from and in addition to changes in behavior over time.

As suggested by Albin et al. (1995), those working with people who exhibit serious challenging behavior have a critical need for strategies that can quickly eliminate or minimize escalation (i.e., minimize ES) so that the important goals of long-term mitigation and improved quality of life can be safely pursued with socially valid PBS. Such strategies include ones that can be used effectively for situational management, which may be called *reactive strategies*. A reactive strategy may therefore be defined as one that has the purpose of bringing about the rapid or safe resolution of a behavioral incident. The term *reactive strategies* is preferable to the terms *consequence* or *contingency* because their effects would be measured by changes in ES, in contrast to the latter terms, whose effects are measured in terms of future behavior.

Effective reactive strategies may be needed for various reasons. These may include, but would not be limited to, the need to reduce injuries directly caused by aggressive behavior aimed at peers, staff, or others; to reduce injuries resulting from self-injurious behavior; or to reduce injuries to staff or the people they support as a result of staff's attempts to physically manage problem behavior. There may also be the need to reduce the disruption in services or service effectiveness resulting from the ES of behavioral incidents. Furthermore, there may be a need to reduce the costs (e.g., worker's compensation claims) and

other risks and liabilities that may be associated with ES. The need for effective reactive strategies exists not only for high-rate behaviors but also for low-rate behaviors that have significant levels of ES, a set of behaviors for which there appears to be little, if any, research.

Without research on ES as a dependent variable, for either high-rate or low-rate behaviors, professionals who support people who manifest challenging behaviors have had to look beyond the empirical research for reactive (i.e., situational management) strategies to reduce or minimize ES. Thousands of staff are trained each year in one or more emergency or crisis management systems that have not been objectively evaluated for their effects on ES. Examples of these other approaches include The Mandt System (<http://www.mandtsystem.com/>), the Non-Abusive Psychological & Physical Intervention (<http://www.nappitraining.com/home.html>), and the Crisis Prevention Institute (<http://www.crisisprevention.com/>).

It is our belief that ABA can make a major contribution to this important outcome area. The exploration of ES as a dependent variable may lead to a needed evolution of an evidenced-based technology for reactive strategies (i.e., a validated technology for crisis management). However, as a prelude to this research, defining some additional terms may be useful.

Implications

Although specific wording and terminology varies among authors (e.g., Catania, 1992; Malott, Whaley, & Malott, 1997; Sulzer-Azaroff & Mayer, 1991), the field of ABA uses such basic terms as *positive* and *negative reinforcement*, *Type I and Type II punishment*, *extinction*, and *recovery after punishment*. As indicated in Sidebar 1, these basic terms are defined by their effect on the future probability of the behavior.

In contrast, when considering ES as an additional dependent variable, terms may be needed that are defined by their situational effect (i.e., by their effect on the immediate probability of the behavior or its escalation). As such, Sidebar 2 offers six new terms that might serve as a conceptually systematic context (Baer, Wolf, & Risley, 1968) for studying reactive strategies to reduce ES: *positive resolution*, *negative resolution*, *Type I escalation*, *Type II escalation*, *escalation after resolution*, and *resolution after escalation*.

Figure 1 provides summary matrices of the terms defined in Sidebars 1 and 2 and shows the parallel form between the operations that affect future behavior, in contrast to those that produce a situational effect; that is, an effect within the cycle of a behavioral incident. As indicated, the future probability of behavior may be either increased or decreased through the *presentation* of a stimulus or event (S), the *withdrawal* of a stimulus or event (\bar{S}), or through the *withholding* of a previously available stimulus

or event (O). Similarly, the immediate probability of behavior (or its escalation) may be either increased or decreased through the same three operations. These latter terms are defined by their situational effect and have obvious implications for ES. Once developed and empirically validated, resolving events can be included and escalating events can be avoided in a behavioral support plan, resulting in an immediate improvement in ES—by definition. This would also increase the social validity of PBS plans aimed primarily at long-term improvements in quality of life and reductions in the future rate and severity of challenging behavior.

Sidebar 3 illustrates each of the six defined situational effects, with concrete examples drawn from our clinical practice. Although there is no direct research with ES as an explicitly and reliably measured dependent variable, research has identified a number of strategies that might serve as resolving or escalating events. These might serve as starting points for research in this new area.

For example, Azrin (1958) found that the sudden introduction or withdrawal of a functionally unrelated stimulus could disrupt responding. Azrin concluded that this event did not have to be aversive to produce this effect but could be attributed to the phenomenon of stimulus change. Accordingly, stimulus change may be an example

Sidebar 1. Basic terms in applied behavior analysis and their definitions: Future effects.

1. *Positive Reinforcement*. A process by which the contingent presentation of a stimulus or event results in an increase in the future probability of the response.
2. *Negative Reinforcement*. A process by which the contingent withdrawal of a stimulus or event results in an increase in the future probability of the response.
3. *Type I Punishment*. A process by which the contingent presentation of a stimulus or event results in a decrease in the future probability of the response.
4. *Type II Punishment*. A process by which the contingent withdrawal of a stimulus or event results in a decrease in the future probability of the response.
5. *Extinction*. A process in which the previously presented stimulus or event is withheld, resulting in a decrease in the future probability of the response.
6. *Recovery After Punishment*. A process in which the previously presented stimulus or event is withheld, resulting in an increase in the future probability of the response.

Sidebar 2. Proposed terms for applied behavior analysis and their definitions: Situational effects.

1. *Positive Resolution.* A process by which the reactive presentation of a stimulus or event results in a decrease in the immediate probability of response continuation or escalation.
2. *Negative Resolution.* A process by which the reactive withdrawal of a stimulus or event results in a decrease in the immediate probability of response continuation or escalation.
3. *Type I Escalation.* A process by which the reactive presentation of a stimulus or event results in an increase in the immediate probability of response escalation.
4. *Type II Escalation.* A process by which the reactive withdrawal of a stimulus or event results in an increase in the immediate probability of response escalation.
5. *Escalation After Resolution.* A process in which the previously presented stimulus or event is withheld, resulting in an increase in the immediate probability of response escalation.
6. *Resolution After Escalation.* A process in which the previously presented stimulus or event is withheld, resulting in a decrease in the immediate probability of response escalation.

of a resolving event that could be used as part of a plan for crisis management to minimize ES (LaVigna & Donnellan, 1986).

It is well established that certain verbal consequences (e.g., reprimands) can suppress future responding (e.g., O’Leary, Kaufman, Kass, & Drabman, 1970; Van Houten, Nau, MacKenzie-Keating, Sameoto, & Colavecchia, 1982; Van Houten & Rolider, 1989). It is also very likely that the introduction of certain verbal reactions during a behavioral episode may resolve a serious behavioral event. For example, reflecting back to the person the message underlying the behavior (i.e., Active Listening; Gordon, 1970) may act to resolve an escalating situation. There is a compelling logic to the potential effectiveness of Active Listening as a resolving event, given the recognized communicative role of “aberrant” behavior (e.g., Carr & Durand, 1985; Durand, 1990). There are a number of other verbal reactions that, when presented, might also resolve a behavioral episode. These include redirection and the introduction of humorous comments. What is needed is empirical research designed to demonstrate the effects of different verbal reactions on ES.

Perhaps the most provocative and counterintuitive resolving strategies are those events that may otherwise serve as reinforcing events (LaVigna & Willis, 2003), depending on the establishing operations (Catania, 1992) or the conditions under which they are used. That is, introducing certain events such as access to desired food, activities, people, and so on, or terminating or withdrawing unwanted demands, activities, settings, and so forth, may resolve a behavioral incident, resulting in a decrease in ES. For example, distracting a child with her doll and a bottle and asking her to feed “Suzy” when the child is having a tantrum in the supermarket because she wants a lollipop, may cause the tantrum to stop (through positive resolution), as withdrawing the demand that a child turn off the television and clean his room would be likely to cause him to stop his tantrum under those circumstances (through negative resolution).

The obvious question is whether such events can be used effectively as reactive strategies without producing the countertherapeutic effect of reinforcing tantrum behavior. When ES is treated as a dependent variable (i.e., as a main effect) in its own right, increases in the future likelihood of a behavior as a function of a specific resolving event would be evidence of a negative side effect of that specific reactive strategy (Catania, 1992). This is an obvious concern. However, there are a number of strategies that might act as establishing operations that can be explored for their ability to prevent such negative side effects. Included among these are time-based schedules or manipulation of general levels of reinforcement or reinforcement density (Cautela, 1984). For example, in the former, independent, time-based delivery of an event (Poling & Normand, 1999; Tucker, Sigafos, & Bushell, 1998) could be

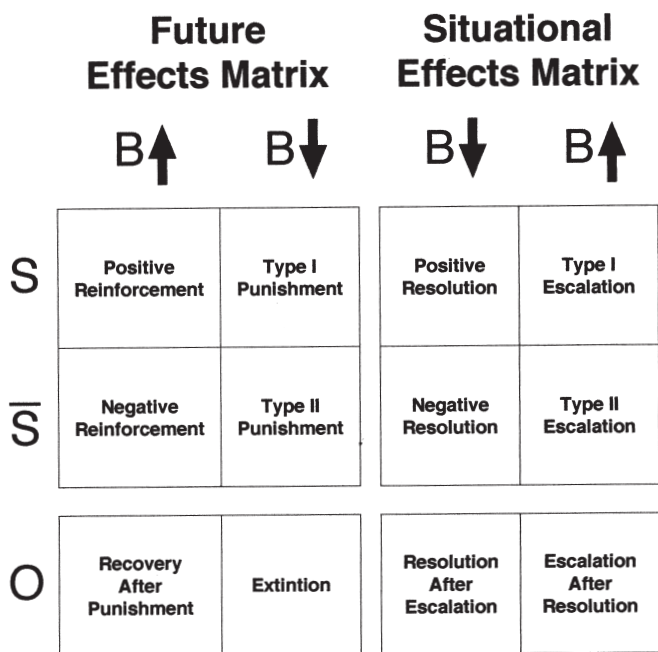


Figure 1. Matrices of basic terms in applied behavior analysis.

proactively used, first, to undermine a possible contingent relationship developing between the event being used reactively and the target behavior and second, to strike a balance between deprivation and satiation, thus preventing reinforcement as a side effect. It may also be possible to avoid the negative side effect by arranging for a rich density of competing reinforcers for alternative appropriate responses (Diorio & Konarski, 1989).

Of course, it is an empirical question whether such negative side effects would develop at all in any specific situation. For example, such effects might not be seen when resolving a behavior that is a function of neurologically based impulse-control deficits or a condition such as Tourette's syndrome. In such cases, the person may be relieved that others were able to resolve the incident. Furthermore, in such cases, it may be possible to teach the person to use such resolving events as a self-control strategy to interrupt his or her own behavior.

Finally, beyond positive and negative resolution, resolution after escalation may be the strategy of choice for reducing ES. This might be possible, given the antecedent/consequence analyses carried out as part of a functional assessment (Horner, 1994; LaVigna & Willis, 1997; O'Neill et al., 1997; Willis, LaVigna, & Donnellan, 1993). Such an assessment may identify a stimulus-response chain (Mallott et al., 1997) in which an event employed as a consequence for a more innocuous topography actually escalates the response to a more serious topography (i.e., increases ES). In such a case, ES could be reduced by discontinuing the use of the planned program consequence.

For example, suppose an assessment identified "outbursts" as a target behavior representing a functional response class of topographies, including noncompliance (not performing the requested activity within the prescribed period of time), verbal refusal (saying "no"), and aggression (hitting others). Suppose further that a functional assessment identified a chained stimulus-response pattern of escalation in which, when the person is "verbally reprimanded" for noncompliance, his behavior escalates to verbal refusal, and when he is then "physically prompted" (i.e., required) to comply, his behavior escalates to aggression. Given these conditions, the support plan may specifically include, among other things, the recommendation that verbal reprimands and physical prompting not be used under these circumstances. This may lead to an immediate reduction in ES. That is, the proportion of episodes of outbursts that escalates to aggression may be reduced. In addition, the plan may simultaneously call for the development of a powerful token reinforcement system to increase compliance and decrease the rate of outbursts, and for the teaching of coping and tolerance of nonpreferred tasks for when the token reinforcement system is ultimately phased out.

To say, however, that the above example represents a reduction in ES depends on how we define our target be-

Sidebar 3. Examples illustrating how each of the six situational effects affects episodic severity.

Positive Resolution: In a school setting, when a 7-year-old girl would run off of the school grounds, her name was called and she was coaxed back by holding up a "Mars Bar," thereby reducing ES (see Note).

Negative Resolution: In a serious case of "life-threatening" self-injury and aggression, rapid and safe resolution was possible and the need for medical attention was avoided when staff realized that if they left the area at the start of episode, the client would cease exhibiting the target behavior, thereby reducing ES (see Note).

Type I Escalation: Our functional assessments have revealed that physical "prompts" to force performance, as is sometimes done in compliance training programs, can escalate behavior to crisis levels, thereby increasing ES.

Type II Escalation: Our functional assessments have revealed that physically removing a child from a classroom as part of a "time-out" procedure for disruptive classroom behavior, can escalate behavior to crisis levels, thereby increasing ES.

Escalation After Resolution: Our functional assessments have revealed that initiating an escape extinction procedure, for example, for self-injury, can result in increases in ES.

Resolution After Escalation: We have recommended discontinuing the use of physical prompts when they have been associated, through a functional assessment, with an escalation in behavior, resulting in decreases in ES (see Note).

Note. The constructional, nonlinear roots of PBS, including the concepts of alternative sets (Goldiamond, 1974, 1975) can be tapped to prevent the reinforcement of the problem behavior (i.e., the potential counter-therapeutic effects of these strategies).

havior. In this specific example, the target of outburst behavior was defined as described above, with aggression representing the most severe topography within the class. Given this definition, the withholding of verbal reprimands and physical prompting would represent a reactive strategy involving resolution after escalation. If in such a situation we defined our target behavior as "aggression," the withholding of verbal reprimands and physical prompting, even in response to the (now) precursor behaviors of noncompliance and verbal refusal, would represent an antecedent control strategy reducing the rate of aggression, rather than a reactive strategy reducing the ES of outburst behavior.

Even with reactive strategies, situational effects may be more usefully understood in terms of antecedent control rather than in terms of consequences. That is, when the situational effect is resolution, the effect occurs either through the introduction of those antecedents that set the occasion for competing behavior (as might occur when a mother hands her child his or her security blanket and finds that it evokes behavior [such as cooing, gurgling, and thumb in mouth] incompatible with the child's tantrum behaviors that were occurring because of being denied a lollipop) or removes those that set the occasion for the target behavior. When the situational effect is escalation, the effect occurs either through the introduction of those antecedents that set the occasion for the target behavior or removes those that set the occasion for a competing behavior.

More generally, Type I and Type II punishment, as aversive events, may be establishing operations for the higher likelihood of aggression (Malott et al., 1997; Pierce & Epling, 1995) and other escape behaviors (Vargas, 1977). They, therefore, may represent Type I and Type II escalating events, under certain conditions, when aggression and other escape behaviors are indicators of ES. Similarly, "extinction bursts" (Lerman & Iwata, 1995; Lerman, Iwata, & Wallace, 1999) may represent an example of escalation after resolution. The extent to which escalation occurs in providing behavioral support is not clear, as ES has not been explicitly, objectively, or reliably reported in applied research. If such events are shown or known to be escalating events, it may be important to avoid them in situations in which ES is a concern.

In such situations, the suppression, reduction, or elimination of future target behavior might better be sought through positive and proactive strategies, such as antecedent control (e.g., Luiselli & Cameron, 1999), differential schedules of reinforcement (LaVigna & Donnellan, 1986), time-based schedules (Poling & Normand, 1999; Tucker et al., 1998), communication training (e.g., Carr & Durand, 1985; Durand, 1990), coping and tolerance training and other positive programming, and ecological and focused support strategies (i.e., proactive strategies; LaVigna, Willis, & Donnellan, 1989). Reactive strategies can then be reserved solely for the important role of minimizing ES.

Of course, although escalation may be considered as undesirable in the area of challenging behavior, this would not be true in all situations. For example, in the shaping of speech in young children with autism, extinction is explicitly used as a therapeutic strategy to escalate behavior (Lovaas, 1981). This would be an example of escalation after resolution, and it is done to produce behavioral variability and more options for shaping behavior toward speech.

Furthermore, it is important to make the explicit point that in the area of challenging behavior, the concept of ES has implications for more than the development of reac-

tive strategies for crisis management. Certain proactive strategies may also decrease (or increase) ES. In a rare case study, Neufeld and Fantuzzo (1987) reported a reduction in ES. In that study, the proactive use of a protective helmet was reported to reduce the ES of self-injurious behavior. Data analysis was carried out based on a retrospective review of mean severity ratings of self-injurious behavior incidents; however, observational reliability was not reported. In a multiple-baseline study, the severity of resistance to dental treatment was reliably measured by session, rather than by behavioral incident (Maguire, Lange, Scherling, & Grow, 1996). The dependent variable of session severity (vs. episodic severity) was reduced through the proactive use of rehearsal and positive reinforcement. The results of this study indicate that ES could be reliably measured.

In future research, it would be interesting to explore other proactive strategies to empirically determine, for example, whether the proactive use of time-based schedules (Poling & Normand, 1999; Tucker et al., 1998) would reduce ES. That is, for example, tantrums might have reduced ES if they occurred in settings in which a high density of reinforcement had been arranged, as opposed to those that occurred in settings with a relatively lower density of reinforcement, independent of the reactive strategies employed.

Whether or not proactive or reactive strategies are included in a plan for the specific purpose of reducing ES, it may still be important to produce pre- and postintervention ES data. This might allow one to make statements regarding changes in ES in comparison with trend lines that portray changes in critical skills learned, reductions in the rate and severity of behavior over time, changes in community presence and other quality of life changes, and so forth. Different changes and trends may be better received by clients and families than others, providing a basis for improving the social validity of PBS. At the very least, the behavior analyst would have a responsibility not to do anything to increase ES in cases in which increases may be undesirable.

Conclusion

This discussion has presented the concept of ES as an additional dependent variable for study in the field of behavior analysis as it applies to challenging behavior. It has introduced a conceptual framework for understanding ES and an agenda for future research. This agenda includes, among other things, developing methods for obtaining reliable and valid measures of ES, developing and validating proactive and reactive strategies for reducing ES, and developing and validating potential establishing operations and other procedures for preventing the negative side effects that may be associated with some strategies. Perhaps the greatest challenge, however, may be the development

and validation of strategies to establish the social validity of reactive strategies based on the concept and procedures of resolution. This is because they might appear to fly in the face of the understandable practice of avoiding the reinforcement of challenging behavior. ABA, however, is well equipped to meet the challenge of developing reactive strategies that reduce and minimize ES without producing the negative side effect of reinforcement.

We also believe that this research agenda has the potential to make a contribution to the further development of PBS. This opportunity goes beyond developing effective and positive proactive strategies for purposes of improving quality of life and reducing the rate and other measures of problem behavior over time. It also includes developing effective and positive reactive and proactive strategies for reducing episodic severity, thereby enhancing the social validity of PBS.

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