RESEARCH ARTICLE

A Survey-Based Method to Evaluate Optimal Treatment Selection for Escape-Maintained Problem Behavior

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Abstract Geiger, Carr, and LeBlanc (2010) developed a decision-making model for escape-maintained problem behavior that could be used to guide the course of treatment selection. We used a digital survey to evaluate the model's potential usefulness. We presented novice and expert practitioners' written hypothetical scenarios and asked them to determine the optimal treatment in a given situation. Some

participants were given the model, whereas others were instructed to use their best clinical judgment. Using logistic regression analyses, the general findings for our scenarios were the following: (a) experts without the aid of a decision model had better odds of selecting the optimal treatment than novices without the decision model, (b) experts with the decision model did not have greater odds of selecting optimal treatment than experts without the model, and (c) novices with the decision model did not have better odds of selecting the optimal treatment than novices without the decision model.

Bullet-Point Summary

- Decision trees are simple, yet powerful, forms of multiple variable analyses that might be useful for behavior analysts in practice. However, their effectiveness may differ for novice and expert behavior analysts.
- Geiger et al.'s (2010) decision tree was most useful for novice behavior analysts when hypothetical clinical scenarios were made simple.
- Novice behavior analysts tend not to make optimal treatment decisions when hypothetical clinical scenarios increase in complexity.
- Geiger et al.'s (2010) decision tree did not significantly change or influence treatment selection for expert behavior analysts.
- Expert behavior analysts' treatment selections may be in line with optimal treatment without the aid of a decision-making model.
- Decision trees might not be a suitable replacement for appropriate training, supervision, and practical experiences in behavior analysis.
- This study was limited by its hypothetical nature, and future investigations might consider an experimental validation of Geiger et al.'s (2010) model to strengthen the current findings.

Keywords Clinical decision-making · Escape-maintained problem behavior · Treatment models

Social negative reinforcement, typically in the form of escape from instructions, has been reported to be the most common function of problem behavior for individuals with intellectual disabilities (Beavers, Iwata, & Lerman, 2013). Escape-maintained problem behavior might be especially prevalent in classroom settings where instructional tasks are given frequently (Lloyd, Weaver, & Staubitz, 2016). Classroom and school settings might also represent an environment where many behavior analysts practice or consult (Sugai et al., 2000). When escape is identified as a maintaining variable of problem behavior via functional analysis, the behavior analyst must determine the most appropriate course of function-based treatment. As noted by Geiger, Carr, and LeBlanc (2010), numerous function-based interventions for problem behavior maintained by escape have been researched and implemented to good effect in routine clinical practice. These interventions are highly amenable to classroom settings and include, but are not limited to, (a) activity choice (e.g., Dyer, Dunlap, & Winterling, 1990), (b) curricular and instructional revision

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(e.g., Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991), (c) demand fading (e.g., Zarcone, Iwata, Smith, Mazaleski, & Lerman, 1994), (d) differential negative reinforcement of alternative behavior (e.g., Vollmer & Iwata, 1992), (e) escape extinction (e.g., Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990), (f) functional communication training (e.g., Carr & Durand, 1985), and (g) non-contingent escape (e.g., Kodak, Miltenberger, & Romaniuk, 2003).

A number of considerations are involved in treatment selection, and the behavior analyst must navigate these considerations appropriately. The treatment selection decision is often constrained by the context in which problem behavior occurs, severity of problem behavior, safety of students and staff, available classroom resources, teacher and school personnel preferences, and ethical responsibilities of the behavior analyst. Moreover, it may be difficult for practitioners to evaluate the relative importance of each of these considerations or determine how the interaction of these variables should affect the development of appropriate function-based treatment.

To aid behavior analysts in practice, Geiger et al. (2010) developed a treatment selection model for escape-maintained problem behavior. They designed their model in the form of a binary (yes vs. no) logical algorithm that considered a number of the aforementioned variables and then presented them in a decision-making tree (see [Appendix A](#)). Decision trees are simple, yet powerful, forms of multiple variable analyses. They are relatively easy to understand and can delineate increasingly complex decision boundaries. A characteristic feature of a decision tree is that an algorithm is used to identify ways of splitting decisions into branch-like segments stemming from an initial root question until an outcome is achieved. In the case of severe problem behavior, practitioners are faced with choosing between implementation of a number of empirically validated treatment procedures and thus a decision tree may be helpful in determining the initial course of treatment (Kassirer, 1976).

Although the treatment selection model developed by Geiger et al. (2010) is based upon well-supported and established treatment interventions for destructive behavior, it is unclear if the decision tree improves the decision-making of behavior analysts by encouraging the behavior analyst to select the “optimal” treatment (i.e., a treatment that takes into account all of the aforementioned considerations) for a given student. Because this model has not been formally evaluated, it is equally possible that behavior analysts without the aid of a decision tree would also make optimal treatment decisions. Therefore, evaluating the utility of the model is clearly warranted prior to its adoption into clinical practice.

An initial method to evaluate the usefulness of the decision tree may be to present behavior analysts with hypothetical

scenarios intended to mimic real-life clinical situations. That is, instead of evaluating the model in vivo where external variables and considerations may come to influence the decision-making process, a hypothetical scenario could allow the behavior analyst to systematically work through the decision tree with only the information given within the scenario. This method is advantageous in that it allows multiple individuals with different decision-making histories to arrive at treatment decisions regarding the same clinical situation, which is unlikely to occur in the natural environment. This approach of using hypothetical situations as a basis to evaluate a given strategy has proved to be useful in prior research and often has good correspondence with real-world situations (Chang, Lusk, & Norwood, 2009; Drapkin, Wing, & Shiffman, 1995). Therefore, we opted to evaluate the decision-making model using hypothetical scenarios in lieu of actual clinical contexts.

The availability of a decision-making model such as the one proposed by Geiger et al. (2010) is likely to have different effects depending on the behavior analyst’s training, supervision, and years of experience (Banning, 2008). It is likely that expert behavior analysts would be more influenced by their past clinical experiences, and decisions regarding the course of treatment for a given student will be more heavily based on “clinical judgment” (i.e., contingency-shaped behavior or increased attention to variables that have historically produced reinforcement during treatment planning). It is possible that expert behavior analysts would select the optimal treatment in a given situation without the aid of a decision tree. In contrast, newly certified or licensed behavior analysts, or behavior analysts currently in training, might lack sufficient experience to permit relying on clinical judgment alone and may therefore benefit from a decision-making model (i.e., their behavior might be more prone to rule governance to compensate for less experience). The relative likelihood of selecting the optimal treatment as a function of experience, as well as how treatment selection may be influenced by Geiger et al.’s model, is unknown. Therefore, this also warrants investigation.

The purpose of this preliminary investigation was two-fold. We began by categorizing survey respondents as either expert or novice behavior analysts based on their responses to questions about their experiences with individuals with problem behavior. We used a digital survey-based assessment to present hypothetical scenarios based on clinical case examples. We then provided the decision tree to a percentage of respondents in both the novice and expert groups to determine if (a) respondents were more likely to select the optimal treatment based on level of expertise (both with and without the tree) and (b) novices were more likely to make selections similar to those of the experts when they had access to the decision tree.

Method

Participants

We sent a digital survey to 10,847 practicing Board Certified Behavior Analysts® (BCBA, BCBA-D) and Board Certified Assistant Behavior Analysts® (BCaBA) who were recruited from the Behavior Analyst Certification Board® registry and contacted via email with a 30-item questionnaire. Recipients were informed that the purpose of their participation was to evaluate the decision tree model presented by Geiger et al. (2010) using hypothetical scenarios. Recipients then consented to participate (this study was approved by the Florida Institute of Technology's institutional review board). We received 445 questionnaires (4.1%) over a 3-month period.

Instrument

A questionnaire was developed using QuestionPRO™ survey software. Along with basic demographic information (e.g., age, gender, country of residence), participants were asked to complete items regarding formal training in applied behavior analysis (e.g., “From which institution did you earn your highest degree?”), level of education (e.g., “What is your highest degree earned?”), current clinical practices (e.g., “With which population(s) of individuals do you currently work?”), clinical and professional histories (e.g., “How many years of experience do you have working with individuals with problem behavior?”), research experience (e.g., “Have you published research in behavior analytic journals about problem behavior?”), and continuing education information (e.g., “Where do you receive the majority of your information on current applied practices?”). Response options were presented in a single-option multiple-choice format, multiple-option multiple-choice format, or drop-down menu format. Efforts were made to include response options for a variety of clinical, academic, and research experiences to account for the potentially diverse backgrounds of participants. For instance, when developing questions regarding clinical interests, we consulted the Association for Behavior Analysis International's list of program areas. In addition, qualitative data were collected via open-ended text-box options wherein participants were able to manually enter information that was not provided as one of the response options. Qualitative data were coded in the same manner as data that was obtained from pre-existing response options. For example, if participants entered in a terminal degree that was not listed as an option (for the question “What is your highest degree earned?”), the response was given its own code and the total count of that response input from all participants was collected. The purpose of these questions was to obtain demographic information about the participant sample as well as to assign

participants into one of the following two groups: experts in the assessment and treatment of problem behavior (expert group) and non-experts (novice group; see the “[Experimental and Control Groups](#)” section).

The questionnaire concluded with one of three hypothetical scenarios of a child who engaged in escape-maintained problem behavior in an instructional setting. These scenarios were presented as a transcript between the consulting behavior analyst and the child's classroom teacher (see [Appendix B](#)) because a functional assessment of problem behavior will often begin with an open-ended interview with relevant stakeholders prior to functional analysis (Hanley, 2012). Open-ended interviews may also provide additional details about the environment in which problem behavior occurs. Participants were assigned to one of the three scenarios using simple randomization (Suresh, 2011). Additionally, simple randomization was used to determine whether the scenario included the decision tree as a treatment selection guide. Therefore, the participants were presented with one of three scenarios either with or without the decision tree (totaling six sub-groups). If the scenario produced the decision tree, participants were instructed to use it to aid in determining the optimal treatment for the student presented in the scenario. If the scenario did not produce the decision tree, participants were instructed to use their best clinical judgment in determining the optimal treatment. Note that in the present study, the “optimal treatment” for each scenario was the treatment implemented in the corresponding study on escape-maintained problem behavior (see the “[Scenario Development](#)” section).

Note that it is possible that other treatments besides the one that was deemed optimal would also have been effective in practice; however, for purposes of the present study, we limited response options to those in the decision tree and based “optimal treatment” on the case examples upon which the scenarios were based.

Experimental and Control Groups

Independent of experience, participants who did not receive the decision tree ($n = 215$) served as the control group for participants that did receive it ($n = 230$). Non-random assignment was used to categorize participants into either the expert ($n = 139$) or the novice ($n = 306$) group. Criteria for inclusion in the expert group were developed and refined based on the suggestions of several doctoral-level behavior analysts with extensive experience in the assessment and treatment of problem behavior in a wide variety of settings. Participants were placed into the expert group only if they (a) had a minimum of a Master's degree in behavior analysis, psychology, or related field, (b) were a BCBA or BCBA-D, (c) had been certified by the BACB for a minimum of 5 years, (d) had a minimum of 5 years of experience in the assessment and treatment of problem behavior including implementing function-based

interventions, and (e) had implemented a minimum of 10 experimental functional analyses independently. Participants that did not meet the criteria to be placed into the expert group were placed into the novice group.

Within each scenario, we compared participants in the novice group who received the decision tree ($n = 158$) to those in the novice control group that did not receive the decision tree ($n = 148$). Similarly, we compared the treatment selections of experts with the decision tree ($n = 72$) and experts without the decision tree ($n = 67$). We further compared experts with the decision tree to novices with the decision tree as well as experts without the decision tree to novices without the decision tree. We also compared the treatment decisions of all novices who received the decision tree to those of all members of the expert group regardless of tree availability ($n = 139$).

Participants were queried about whether they considered themselves experts in the assessment and treatment of problem behavior. This allowed us to determine the degree to which subjective (self-reported) and objective (based on pre-determined criteria) measures of “expert” corresponded.

Scenario Development

Scenarios were designed based on reported cases of escape-maintained problem behavior in the extant literature on the assessment and treatment of problem behavior.¹ Three scenarios were created to evaluate whether the decision tree was likely to produce the “optimal intervention” in the given clinical situation. This safeguarded against participants selecting response options without working through each branch of the decision tree as each scenario provided unique details that directly addressed relevant questions to the decision-making process. Further, this ensured that the decision tree was not garnered in such a way as to lead practitioners to select one treatment more often than others independent of the clinical situation (i.e., a bias towards one particular intervention).

The response options for all scenarios were all treatments described by Geiger et al. (2010) and that culminated at the end-point of each branch of the decision tree. Therefore, regardless of which scenario participants were exposed to, they were always presented with the following response options: (a) curricular and instructional revision, (b) demand fading and non-contingent escape, (c) activity choice and extinction, (d) functional communication training, (e) differential negative reinforcement of alternative behavior, or (f) differential negative reinforcement of other behavior.

The optimal treatment for scenarios one ($n = 150$), two ($n = 145$), and three ($n = 150$) was functional communication

training, demand fading and non-contingent escape, and curricular and instructional revision, respectively. Each scenario was designed in such a way as to ensure participants arrived at the optimal treatment using the logic provided in the decision tree. That is, each scenario provided relevant details for each end-point in the decision tree. If participants used the decision tree as designed, the scenario included relevant information that would address each question posed and would supersede any potentially distracting or irrelevant information. For example, the first question in the decision tree asked participants to determine whether the curriculum was appropriate and instruction was optimal. Therefore, in scenarios one and two, we explicitly made efforts to either state that the curriculum was appropriate, avoided presenting that as a variable of interest, or emphasized more important environmental events in the child’s classroom (e.g., child had limited communication or was unable to request for breaks). These strategies were used because it is unlikely that a classroom teacher would explicitly inform the behavior analyst about the appropriateness of the curriculum. Moreover, we included distractor information that was not relevant to developing the child’s treatment as it is possible that the behavior analyst would need to determine what information is and is not useful in the treatment development process. This more closely resembled the information that is often provided in an open-ended interview wherein the behavior analyst must assess a number of variables simultaneously. If participants used the decision tree as designed, they would move to question two and continue to apply the decision-making logic.

Data Analysis

Logistic regression analysis is well-suited for testing hypotheses about relationships between one or more categorical or continuous predictor variables (i.e., the availability of the decision tree) and a categorical outcome variable (i.e., identifying the optimal treatment for the given scenario; Peng, Lee, & Ingersoll, 2002). For each scenario, we conducted logistic regression analyses to determine if the odds of selecting the optimal treatment choice were improved when the decision tree was made available (across decision tree and no decision tree groups and within expert and novice groups). The analyses were conducted with interaction terms (decision tree and group factors), and subsequent estimates of differences in odds were based on these analyses.

Inter-rater Agreement

An initial rater applied the expert criteria for establishing expert and novice groups to all received questionnaires. A second, independent, rater examined 33.7% of received questionnaires and applied the pre-determined expert criteria. An item-by-item agreement was assessed by comparing data tables

¹ Scenario one was developed based on the case of Sue reported in Carr and Durand (1985). Scenario two was developed based on the case of Kevin reported in Vollmer, Marcus, and Ringdahl (1995). Scenario three was developed based on the case of Jill reported in Dunlap et al. (1991).

generated for each participant's response forms by the two raters. Inter-rater agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and converting the resulting proportion to a percentage for each category. The mean inter-rater agreement was 100% across data tables for all questionnaires.

Results

The composition of the population sample is displayed in Table 1. We identified 139 experts who were primarily females (74.8%) that held the BCBA certification (69.1%). Of this group, 67.6% identified themselves as experts. In contrast, we identified 306 novices who, similarly, were females

(80.7%) with the BCBA certification (78.1%). Of the novice group, only 37.5% identified themselves as experts. This result suggests that there was good correspondence between self-report of expertise and our objective inclusionary criteria for the expert group. Participants in each group were equally distributed among the three scenarios, and approximately half in each group received the decision tree.

Table 2 presents the results of the logistic regression analyses expressed both as expert vs. novice outcomes and as a decision tree availability outcome. In scenario one, the optimal treatment decision, based on the case of Jenny, was functional communication training. Novices with the tree made no better judgments than novices without the tree ($p = .15$), and experts with the tree made no better judgments than experts without the tree ($p = .15$). However, the expert group had 3.3

Table 1 Composition of the population sample and distribution of questionnaires returned

Sample characteristic	Expert group ($n = 139$)	Novice group ($n = 306$)
Age		
19–25	0 (0.0)	10 (3.3)
26–35	50 (36.0)	161 (52.6)
36–45	45 (32.4)	58 (19.0)
46–55	21 (15.1)	36 (11.8)
56–65	14 (10.1)	23 (7.5)
66+	4 (2.9)	1 (0.3)
Unknown	5 (3.6)	17 (5.6)
Gender		
Male	30 (21.6)	45 (14.7)
Female	104 (74.8)	247 (80.7)
Unknown	5 (3.6)	14 (4.6)
BACB certification level		
BCBA-D	43 (30.9)	22 (7.2)
BCBA	96 (69.1)	239 (78.1)
BCaBA	0 (0.0)	45 (14.7)
Years certified		
1–5	0 (0.0)	78 (25.5)
6–10	72 (51.8)	161 (52.6)
10–20	47 (33.8)	58 (19.0)
Greater than 20	16 (11.5)	8 (2.6)
Received decision tree		
Yes	72 (51.8)	158 (51.6)
No	67 (48.2)	148 (48.4)
Scenario assessed		
One (optimal treatment: functional communication training)	45 (32.4)	105 (34.3)
Two (optimal treatment: demand fading and non-contingent escape)	39 (28.1)	106 (34.6)
Three (optimal treatment: curricular and instructional revision)	55 (39.6)	95 (31.0)
Consider themselves experts		
Yes	94 (67.6)	115 (37.6)
No	45 (32.4)	191 (62.4)

Values outside of parentheses indicate total number of participants and values inside parentheses indicate percentage of sample

Table 2 Logistic regression analyses comparing decision tree availability and expert level across three scenarios

		Expert vs. novice		With tree vs. without tree	
		OR (95% CI) ^a	<i>p</i> value	OR (95% CI)	<i>p</i> value
Scenario 1				Scenario 1	
Without tree	3.3 (1.1, 10.1)	.03	Novice	1.8 (0.8, 3.9)	.15
With tree	0.8 (0.3, 2.0)	.56	Expert	0.4 (0.1, 1.4)	.15
Scenario 2				Scenario 2	
Without tree	0.3 (0.1, 3.2)	.10	Novice	0.7 (0.3, 1.5)	.30
With tree	1.0 (0.3, 3.2)	.97	Expert	2.0 (0.4, 10.0)	.39
Scenario 3				Scenario 3	
Without tree	3.3 (1.2, 8.8)	.02	Novice	4.4 (1.8, 10.4)	.001
With tree	1.2 (0.6, 3.6)	.70	Expert	1.7 (0.5, 5.4)	.40

^a OR odds ratio, CI confidence interval

times the odds (95% confidence interval [CI] 1.1, 10.1) of the novice group in selecting the correct answer when the tree was unavailable for both groups ($p = .03$).

In scenario two, the optimal treatment decision, based on the case of Daniel, was demand fading and non-contingent escape. Within each group, having the decision tree did not increase the odds of selecting the correct answer for either the expert ($p = .39$) or the novice ($p = .30$) group over those that did not receive the decision tree. For participants who did not receive the decision tree, there was no significant increase in odds of selecting the correct treatment based on membership in the expert or novice group ($p = .10$).

Finally, the optimal treatment decision for Lisa in scenario three was curricular and instructional revision. In this scenario, when the decision tree was made available, there was no significant difference in the odds of selecting the optimal treatment between experts and novices ($p = .70$). However, the odds of selecting the optimal treatment decision were 4.4 times (95% CI 1.8, 10.4) greater for novices who received the decision tree versus novices who did not receive the decision tree ($p = .001$). Odds of selecting the optimal treatment were not affected by the availability of the tree within the expert group ($p = .40$). When the decision tree was unavailable for both groups, experts had 3.3 times the odds (95% CI 1.2, 8.8) of selecting the optimal treatment than the novice group ($p = .02$).

Table 3 displays the percentage accuracy in selecting the optimal treatment for each scenario across groups. There were

no overall differences in accuracy in scenario one; however, when examining groups, novices with the decision tree were more accurate than novices without the tree. In contrast, experts with the tree were less accurate than experts without the tree. With respect to scenario two, overall accuracy was poor and patterns within group were opposite to scenario one (i.e., greater accuracy with decision tree for experts but lesser accuracy with decision tree for novices). Scenario three produced the best overall accuracy. Both experts and novices with the decision tree had better accuracy than their respective counterparts without the decision tree.

Discussion

The present study evaluated the efficacy of the decision-making model proposed by Geiger et al. (2010) by presenting hypothetical clinical scenarios to novice and expert behavior analysts. Although there was some variability in results obtained across scenarios, some general conclusions can be made regarding the potential usefulness of the model in these theoretical contexts.

For scenarios one and three, the availability of the decision tree did not significantly improve decision-making for participants in the expert group (although there were overall increases in accuracy). That is, experts both with and without the model often selected the optimal treatment

Table 3 Differences in accuracy across participants within each group displayed as a percentage of individuals who selected the optimal treatment for a given scenario

	Scenario 1		Scenario 2		Scenario 3	
	With tree	Without tree	With tree	Without tree	With tree	Without tree
All participants	55.0	51.4	26.6	30.0	73.3	46.6
Expert	50.0	71.4	26.3	15.0	75.8	65.3
Novice	57.1	42.8	26.7	36.0	71.7	36.7

(i.e., statistically equal odds). This result supports our hypothesis that expert behavior analysts may not benefit significantly from a decision-making model. It is likely that their treatment selections are primarily influenced by clinical judgment and that this judgment is often aligned with optimal treatment (i.e., contingency-shaped). It is possible that expert behavior analysts are more likely to attend to the relevant variables of a clinical situation without the aid of a decision tree designed to increase the saliency of those variables. However, our results suggest that even experts are likely to be benefitted somewhat with respect to overall accuracy.

For two of three scenarios, novices with the decision tree did not have significantly greater odds of selecting the optimal treatment than novices without the decision tree. This calls into question for whom the decision tree would be most useful and the conditions under which it would guide optimal treatment selection. However, this finding may be specific to the hypothetical situations presented in scenarios one and two and may not be exemplary of the utility of the decision tree in applied clinical practice. For scenario three, where the optimal treatment decision was “curricular and instructional revision,” novices with the decision tree performed significantly better than novices without the decision tree. It is possible that the decision tree was most effective for this scenario because it was designed to produce an outcome very early in the decision-making process. Geiger et al. (2010) developed their model with increasing complexity as practitioners moved to lower branches in the decision tree (i.e., the ordering of questions was based on responsibilities of the behavior analyst, safety, practical considerations, and organizational issues). Because scenario three terminated decision-making early in the model, it was the least complex of all scenarios, and its simplicity may have made it clearer for novices with the decision tree to determine which treatment was optimal. This would suggest that the general organization of the decision tree may resemble real-world clinical situations reasonably well.

Alternatively, scenario three represented the only clinical situation where the optimal treatment was a strictly antecedent-based intervention. Treatment interventions for severe problem behavior often include consequence manipulations; therefore, behavior analysts may be more apt to select consequence-based interventions in lieu of antecedent-based alternatives (due to their own past reinforcement histories with clinical decision-making). Therefore, the decision tree may aid in selection of optimal treatments that might be overlooked in the treatment selection process or might be less intrusive than strictly consequence-based interventions.

For two of three scenarios, experts without the decision tree had better odds of selecting the optimal treatment than

novices without the decision tree, and a general finding was greater accuracy in optimal treatment selection for experts versus novices in scenarios one and three. Therefore, it is clear that novices require some aid in decision-making to make up for lapses in experience. In line with the study’s second purpose, we examined whether novice behavior analysts who were aided in their decision-making with Geiger et al.’s (2010) model would make optimal treatments in correspondence with the expert group (both with and without the model). Only for scenario three did novices with the decision tree make expert-level decisions regarding the course of treatment (i.e., both novices with the decision tree and all participants in the expert group had equal odds of selecting the optimal treatment). Again, perhaps this was a result of the simplicity of scenario three and the relative placement of optimal treatment in the decision tree.

Scenario two yielded the lowest overall accuracy across groups, and the availability of the decision tree did not significantly improve decision-making (all $ps > .05$). That is, both experts and novices typically responded inaccurately. The optimal treatment for this scenario was demand fading and non-contingent escape. Although the prevalence of these treatment procedures has not been formally reviewed in the literature, similar to scenario three, it is possible that treatment selection in this case was based more upon each participant’s own reinforcement histories with clinical decision-making instead of what was suggested by the model; however, this requires further investigation. Alternatively, it may be the case that behavior analysts have not had more formalized training with implementing these procedures. Future researchers who examine survey-based assessments using hypothetical scenarios might consider methods to refine scenarios to increase the saliency of relevant variables within each scenario.

A general finding from this study was that novice behavior analysts might not initially select treatments that could be considered the best fit for a given set of environmental conditions; however, we also found low accuracy in optimal treatment selection for some members of the expert group (e.g., scenario two). This finding may have been due to the categorization of “optimal” and “non-optimal” treatments for the given hypothetical case example. The treatment deemed optimal for a given scenario was the treatment applied in the published study from which the scenario was modeled. However, because those studies did not compare all possible treatment options presented to the survey respondents, it is unknown if a “non-optimal” treatment would have been effective, or an intervention not described would have been effective at decreasing escape-maintained problem behavior. That is, the purpose of the studies from which the hypothetical scenarios were based

was not to compare all of the treatment options offered in the case scenarios but only to identify an effective treatment. Therefore, the present study is limited in this respect as the nature of what constituted “optimal” was predetermined and not based on a fair comparison of the available treatment options.

One limitation of the present study is that we did not have participants actually implement the “optimal treatment,” and it is unknown if that intervention would have been effective for the given scenario or if it would have even been optimal. The present study used three very specific and carefully constructed hypothetical scenarios to allow for a systematic evaluation of the model’s usefulness. However, none of the interventions were implemented or compared as part of a clinical evaluation. Our scenarios and corresponding treatment options were developed strictly to evaluate Geiger et al.’s (2010) model in a hypothetical sense and are not representative of what might actually occur in clinical practice. Our scenarios were also based on the assumption that a functional analysis had been conducted, which identified escape from instructions as responsible for problem behavior maintenance. Therefore, caution must be exercised when drawing conclusions regarding the present findings and the usefulness of the model in actual clinical situations, which may be more robust in the natural environment. Future researchers might consider an experimental method of evaluating the model’s effectiveness that has greater congruence with events that commonly occur in clinical practice and measures actual occurrences of problem behavior in response to treatment (i.e., evaluating intervention effectiveness). For example, Karsten, Carr, & Lepper (2011) conducted an experimental validation of a clinical decision-making model for selecting the appropriate stimulus preference assessment given the prevailing environmental circumstances. A similar method could be adopted to experimentally validate the model in the present study to further support the results of our evaluation, which was based on non-experimental hypothetical contexts.

Although this study provides an initial investigation of the usefulness of the decision-making model proposed by Geiger et al. (2010) and provides preliminary evidence based on hypothetical scenarios (i.e., simple availability of the decision tree may not be sufficient for producing optimal treatment selection under hypothetical scenario-based conditions), our scenarios did not include within-subject data on each student’s level of problem behavior. Although it is unlikely that a behavior analyst would base a treatment decision on the information provided in a 15-min interview, it is equally likely that practitioners would have limited data available prior to making a clinical decision (i.e., data

beyond that obtained in a functional analysis or baseline). Nonetheless, treatment selection in the natural environment is a complex process that requires a detailed understanding of the student and environment(s) in which problem behavior does and does not occur and we provided participants with limited information, and that which was hypothetical in nature (despite being based on clinical case studies). It is certainly possible with additional sources of information (e.g., data from direct observation, analysis of behavioral level, trend, and variability, and additional information provided by the student’s teacher or caregiver), the decision tree might in fact be very useful for practitioners.

Behavior analysts likely review medical, educational, and psychological reports when evaluating a child’s problem behavior. They further conduct interviews with multiple individuals relevant to the child’s social environment, briefly observe the child in conditions under which problem behavior is and is not likely to occur, conduct formal analyses, and consult with caregivers and other professionals when developing treatment. As such, the decision tree could be used in conjunction with other assessment procedures to collectively guide treatment or inform assessment. For example, following functional analysis, the decision tree could be referenced during treatment development when consulting with relevant stakeholders prior to formal intervention. In the present study, we asked participants to make a clinical decision based only on a brief interview, which is not likely to occur in the natural environment and not recommended.

In conclusion, the treatment selection model provided by Geiger et al. (2010) might be a useful guide to explain to others why a particular treatment may be selected for escape-maintained problem behavior or could be useful when combined with other assessment procedures. The model’s usefulness with respect to guiding burgeoning clinicians to optimal treatment warrants further investigation, and the findings of the present study might be strengthened by more formal experimental validation. Decision-making models might be particularly useful as the field of applied behavior analysis grows and could be particularly advantageous for behavior analysts who practice in less controlled settings such as classrooms. However, their pragmatic value should continue to be assessed, and refinements of those models should be a function of those assessments. Ultimately, differences in clinical judgment should be best remedied by appropriate training, supervision, and practical experiences in behavior analysis.

Compliance with Ethical Standards This study was approved by the Florida Institute of Technology’s institutional review board.

Appendix A

Treatment selection model for escape-maintained problem behavior proposed by Geiger et al. (2010)

Appendix B

Scenarios

1. Instructions: A behavior analyst has been consulted on a case regarding a typically developing 13-year-old girl with an acquired brain injury who

demonstrates problem behavior in the classroom. Since her injury, Jenny's mental age has been 5 years according to the Peabody Picture Vocabulary Test. Below is a transcribed conversation between the behavior analyst and the girl's 7th grade special education school teacher. Use this transcription to help aid in your treatment decision for Jenny.

Behavior Analyst: What is the problem behavior and what does it look like?

Teacher: Jenny has a lot of different disruptive behaviors during our regular classroom activities. Usually she is aggressive and tries to hit her one-to-one support staff. Sometimes she'll try to run away from our classroom tasks and hit another student! She also screams and sometimes hits her own head with her hand but this occurs more rarely. It's her aggression that is the most problematic.

BA: When Jenny hits her support staff worker how severe is it? Also, how intense are her hits to self/ self-injury? How often do these behaviors occur?

T: Usually they're not very intense; none of her hits leave bruises or marks on the support staff or other kids. She doesn't cause any serious harm to herself either. She is pretty weak and frail overall so her hits to others usually just sting for a little bit. It's hard to say how often they occur but I'm going to guess that the aggression occurs once per hour and self-injurious behavior occurs once per day. However, they seem to vary in their occurrence depending on what she is doing. For instance, if she's playing by herself it will rarely occur and when it does its very low intensity. But if she's made to work it will occur more, and if we don't let her get up from her desk it is at its worst level. We try not to let it get to that point though.

BA: Does Jenny do anything before she starts engaging in aggression? Does she do anything after?

T: When she first came into the classroom she would occasionally point to the window before she hit anyone. That was our heads up that she was getting annoyed so we just kept redirecting her to her work hoping that she would become focused and complete the activity. This rarely worked and she almost always ended up hitting someone. She doesn't do the pointing anymore though so the hits usually come out of the blue.

BA: What do you or the support staff usually do when Jenny begins engaging in these behaviors? Is there a plan set up?

T: Well we try not to let her escalate and cause a disturbance in the classroom that might disrupt the other students. We find that when we let her walk away from the table and take 10 minutes to relax on her own she calms down. We only let her walk away from the table when she is aggressive or engages in self-injury. We let her go into one of the empty spaces of the classroom where she can be by herself and do what she wants. Sometimes when she is on break we try to get her to do an alternative assignment and occasionally that will be successful but other times she will start hitting the teachers again. After 10 minutes we require her to go back to the table and she is usually much more calm at this point. We cannot keep her at the table for too long because she will start hitting others again. It's best to give her some space when she starts hitting other people.

BA: That's interesting. Can you tell me more about the different classroom activities and tasks Jenny is currently working on as well as some of her future educational goals?

T: At school we try to work on a variety of different skill areas with Jenny but we primarily focus on language. As of right now, Jenny has some expressive skills that consist of 2-3 word utterances. This is her primary mode of communication and she requests for her favorite toys and activities frequently. When she does not get what she requests for with these utterances she will often point to things. Her VB-MAPP assessment that we received prior to the school year starting stated that she was a level 2 learner and that her curriculum focused heavily on receptive language. That was the area that showed deficits. Jenny seems to do well on most of the tasks we give her and she understand the instructions in each of the activities. Since she has improved so well in the receptive language area, one of our future IEP goals is to begin working on her expressive language as well so she can better communicate to her family and us.

BA: Why do think Jenny is engaging in these behaviors? Do you think she is trying to communicate something?

T: I don't think so; I think Jenny is just being fussy about being at school. She has always had these problems in all of her classrooms. It's not as if the assignments we are giving her are too hard since she knows how to answer most of them correctly. We've seen her demonstrate these skills when she is working on preferred activities or with peers she likes. We also let her pick her own schedule at the beginning of the day but she'll still be aggressive when we start working. Her schedule is comprised of 3 work blocks and 1 free time block and we let her pick the order in which they occur. If the classroom is very busy and the other students require attention then we may occasionally shorten her free time to get her engaging in an activity.

BA: The answers to your questions have been very helpful. Let me make sure all of my information is correct: Jenny engages in low-intensity aggression and occasional self-injury. These behaviors seem to increase in intensity the longer Jenny is working on school-related activities. The current behavior plan consists of allowing Jenny to take breaks from the table that are 10 minutes long. This happens whenever she is aggressive and is an attempt to calm her down. During this break time Jenny is usually left alone with infrequent prompting to engage in an alternative activity. With respect to Jenny's skills and curriculum, the focus of her work is oriented towards language development. Her expressive language consists of 2-3 word utterances that she uses to request preferred items and activities. Her receptive language seems to function at a higher level than her expressive language. Targeting her expressive language is an important IEP goal. Jenny appears to be able to do the classroom activities and tasks given to her but still engages in aggression

whenever these events occur. In an attempt to reduce these work periods, Jenny creates her own schedule each day.

BA: One last question, what are some things that Jenny likes?

T: She likes spending time with the other students and playing games with her support workers. She is very sociable and sometimes when we give her time to relax she'll just want to interact with the other students. The other students like her a lot too. But sometimes she likes to just sit in the beanbag chair while the other students are working. She also likes listening to music when we give her free time.

Given the environmental conditions, Jenny's current skill level, and available resources, what is the best function-based treatment for Jenny?

- A. Curricular & Instructional Revision
 - B. Demand Fading & Non-contingent Escape
 - C. Activity Choice & Extinction
 - D. Functional Communication Training
 - E. Differential Negative Reinforcement of Alternative Behavior
 - F. Differential Negative Reinforcement of Other Behavior
2. Instructions: A behavior analyst has been consulted on a case regarding an 11-year old boy diagnosed with autism spectrum disorder and mild mental retardation. It has been reported that he engages in high rates of destructive behavior at home that has begun occurring in his classroom environment. Below is a transcribed conversation between the behavior analyst and the boy's grade school teacher. Use this transcription to help aid in your treatment decision for Daniel.

Behavior Analyst: What is the problem behavior and what does it look like?

Teacher: Daniel has a lot of different disruptive behaviors during our regular classroom activities. Usually he is aggressive and tries to hit the other students whenever we ask him anything. Sometimes he hits his own head with her hand and also throws classroom objects. He tries to break and smash things with his hands but this occurs more rarely. It's his aggression and self-hitting that is the most problematic.

BA: When Daniel hits the other students and teachers how severe is it? Also, how intense are his hits to self/ self-injury? How often do these behaviors occur?

T: Usually they are quite intense and leave bruises on the other students. His self-hitting is quite persistent and we often try to block his hits as best we can. His property destruction is very bad as he often destroys the whole work area. If we ask him to do anything during this time it just gets worse. These behaviors happen all the time, it's very difficult to get Daniel to comply with anything. We find this strange because his

workload is very light and easy. He also has a one-to-one worker that comes in 3/5 days of the week.

BA: Does Daniel do anything before he starts engaging in aggression? Does he do anything after?

T: He doesn't do anything before he starts engaging in aggression, or self-injury. It just comes out of the blue. We try to engage him in the on-going activities by asking him participation questions and then he erupts. He becomes increasingly aggressive and we have to remove all the other students from the area. We have learned to not ask him anything else once he starts engaging in these behaviors because it ends up getting worse. Therefore, nothing happens afterwards until he is done, we just clean up his mess. This eruption happens every time, even if we ask him something he knows.

BA: What do you or the support staff usually do when Daniel begins engaging in these behaviors? Is there a plan set-up?

T: Currently, there is no plan set-up for Daniel. He has good expressive and receptive language skills so we sometimes try to get him to talk us through what is happening. During this time he rarely uses his words. He is much more talkative outside of these incidents. He is quite social with his classmates but does not like sharing or being told how to play.

BA: That's interesting. Can you tell me more about the different classroom activities and tasks Daniel is currently working on as well as some of her future educational goals?

T: Since Daniel has just arrived to us, we have not set up many goals for him yet. We are currently reviewing his academic ability but will certainly start him with some easier exercises to get him used to the classroom routine. His one-to-one staff is great as well and very supportive of his learning. Thankfully, she is also excellent in re-engaging Daniel when his episodes of aggression and self-injury are over. However, he won't listen to her much either. Daniel has lots of free choice throughout the day as well and we allow him to pick his schedule. Our future goals for Daniel include working on his compliance and reading skills. He has pretty good vocabulary so we're sure he will do well in this area.

BA: Why do think Daniel is engaging in these behaviors? Do you think he is trying to communicate something?

T: I think Daniel is trying to tell us that he doesn't want to do anything. He wants to come to school and play with the activities instead of learn. We are trying to figure out a way to incorporate more learning opportunities for Daniel across the day.

BA: This information has been very helpful! Let me make sure I have all the facts correct: Daniel engages in very intense and severe aggression, self-hitting, and property destruction. His aggression is targeted towards the other students and gets worse when he is asked to do something while engaging in these behaviors. He does not engage in any other behaviors prior to the problem behaviors but a common antecedent event is a large number of questions asked of him consecutively.

Occasionally these behaviors will also occur when Daniel is told to share his toys or play a certain way with the other students. Currently, there is no behavior plan set up to prevent these behaviors. The support staff have been instructed to attempt to block Daniel's aggression and self-injury as long as it is safe to do so. With respect to educational goals and classroom routines, no concrete goals have been set for Daniel yet, however he has good expressive and receptive skills. He is also quite social and has a good vocabulary repertoire. Currently, Daniel is able to select his own daily schedule at the start of each day where teachers attempt to imbed learning opportunities.

BA: One last question, what are some things that Daniel likes?

T: He likes spending time with the other students and playing games with his support workers. He is very sociable and often when he has to relax he'll just want to interact with the other students. The other students like him a lot too. He also likes listening to music and engaging with independent activities. Anything that is unstructured that Daniel does not have to follow rules or instructions for, he will enjoy.

Given the environmental conditions, Daniel's current skill level, and available resources, what is the best function-based treatment for Daniel?

- A. Curricular & Instructional Revision
 - B. Demand Fading & Non-contingent Escape
 - C. Activity Choice & Extinction
 - D. Functional Communication Training
 - E. Differential Negative Reinforcement of Alternative Behavior
 - F. Differential Negative Reinforcement of Other Behavior
3. Instructions: A behavior analyst has been consulted on a case regarding a 12-year old girl who has been described as severely emotionally disturbed. Lisa has been diagnosed with mild mental retardation, attention-deficit-hyperactivity-disorder and schizophrenia. She has begun demonstrating severe problem behavior since starting at her new school. Following a comprehensive medical review, there is no indication that a drug interaction is related to the change in her behavior. It appears that her increase in problem behavior is directly related to environmental variables. Below is a transcribed conversation between the behavior analyst and her grade school teacher. Use this transcription to help aid in your treatment decision for Lisa.

Behavior Analyst: What is the problem behavior and what does it look like?

Teacher: Lisa has a lot of different disruptive behaviors during our regular classroom activities. Usually she is aggressive and tries to hit her one-to-one support staff. Sometimes

she will scream very loudly to disrupt the other students and/or attempt to spit at teachers and students. Also, she occasionally will try to flip over her writing desk during work periods. A few times she has ripped up her worksheets but this is very rare.

BA: When Lisa hits her support staff worker how severe is it? Also, how intense is her screaming and other disruptive behaviors? How often do these behaviors occur?

T: Usually they are very intense but short-lived. Her screaming is also very loud. Sometimes she will speak to herself and this will persist throughout the day even without social reciprocity. Our school days are split up into 30-minute work and non-work periods. The work periods usually consist of textbook and worksheet activities and this is when we see the most of her aggression and table flipping. During leisure time she usually does not engage in these behaviors but will scream occasionally at high pitches. She is also very compliant when we ask her to help with setting up and cleaning up. However, her aggression seems to be becoming increasingly more intense throughout the past few weeks.

BA: Does Lisa do anything before she starts engaging in aggression? Does she do anything after?

T: Before Lisa hits anyone she will usually scream on-and-off for 5 minutes. She will just stare at her desk and scream. Then she will either flip the table or hit Derek, her support staff worker who is with her everyday. Afterwards she will continue to scream even when we send her to time-out. She has good receptive and expressive language skills so we encourage her to tell us what she wants instead of hitting us.

BA: What do you or the support staff usually do when Lisa begins engaging in these behaviors? Is there a plan set up?

T: All the students in our class have the same outcome when they engage in any behaviors they're not supposed to. We send them to the corner where they must remain quietly for 3-minutes. At Lisa's old school, before she came here, they were doing a DRO procedure but it didn't seem to be very effective. It was suggested to us to avoid that procedure. However, Lisa's behaviors have become a lot worse since she came to our school. We also have a point system in place where the students can earn points for completing work and trade them in for prizes. Lisa does not earn very many points.

BA: That's interesting. Can you tell me more about the different classroom activities and tasks Lisa is currently working on as well as some of her future educational goals?

T: Well, first you should know that Lisa was referred here because she has been having a lot of academic difficulty this past year. Her performance was at least 3 years behind grade level in reading and math. Also, she received an adaptive behavior composite age equivalent to 5 years and 4 months on the Vineland Adaptive Behavior Scales. Our current goals for her are to get her up to par in reading and math so her worksheets are heavy in these content areas. At her previous school, she barely did any reading and math worksheets,

instead, they focused on language and writing in a group activity format. Derek really tries hard to have her complete these worksheets because he believes that it will eventually click. However, her aggression has become so intense lately that it's hard to get her to complete anything. Ideally, we can have her at the same math and reading level as her classmates!

BA: Why do think Lisa is engaging in these behaviors? Do you think she is trying to communicate something?

T: I don't think so; I think Lisa is just being fussy about being at school. She's usually very good at communicating with us: she can ask for help and ask for a break independently. She also works well on language assignments for extended periods independently. She probably isn't used to the kinds of worksheets she gets at our school because her old school used different learning tools. Sometimes she tells us that the assignments are "too hard" but we think she is just trying to avoid it because she doesn't like reading and math. The assignments might be a little bit challenging but we know she can do it. What's concerning is that she will continue to try to aggress even when we are helping her with the work! One thing we've started is that we let her pick her own schedule at the beginning of the day. However, she'll still be aggressive when we start working on specific subjects.

BA: Thank you, this information has been extremely helpful. Let me make sure that all of the information I've recorded is correct: Lisa engages in high-intensity low-frequency aggression, screaming, and spitting targeted at her support staff and other students. Prior to the occurrence of her severe aggression, Lisa will scream and attempt to flip over her desk. The current behavior plan consists of sending Lisa to a time-out corner for 3 minutes. In the past, a DRO and point-system has been in place but these have had little effect on decreasing Lisa's problem behaviors. With respect to Lisa's classroom routine, her day consists of 30-minute work and non-work periods. As per her IEP goals, Lisa's work periods are heavy in math and reading worksheets, areas that she is not very familiar with. This is when her aggressive behavior occurs at the highest frequency and intensity. During the 30-minutes of free time, problem behaviors never occur. Lisa is usually quite compliant, and therefore her support staff encourages her to complete her tasks even when she is screaming and attempting to flip her desk. These behaviors do not stop even when she is being aided in her work. Her communication is quite good as she requests for breaks independently.

BA: One last question, what are some things that Lisa likes?

T: She likes spending time with the other students and playing games with her support workers. She is very sociable and sometimes when we give her time to relax she'll just want to interact with the other students. The other students like her a

lot too. She also likes listening to music when we give her free time; she has lots of choice throughout the day.

Given the environmental conditions, Lisa's current skill level, and available resources, what is the best function-based treatment for Lisa?

- A. Curricular & Instructional Revision
- B. Demand Fading & Non-contingent Escape
- C. Activity Choice & Extinction
- D. Functional Communication Training
- E. Differential Negative Reinforcement of Alternative Behavior
- F. Differential Negative Reinforcement of Other Behavior

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