Task Interspersal Implementation Practices with Individuals with Autism Spectrum Disorder

Summer Bottini^{1,2} · Jennifer Vetter¹ · Jennifer Gillis¹

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Abstract

Task interspersal is a teaching method frequently used with individuals with autism spectrum disorder (ASD). Although many different procedural variations of task interspersal have been reported in the literature, it is unclear how providers serving individuals with ASD implement task interspersal. The present study surveyed direct care providers to examine which variations of task interspersal they use most frequently, as well as how they choose a particular variation. Results revealed that many different procedural variations are used across providers. Provider discipline background appeared to be associated with differences in selection of specific procedural variations. Findings inform areas for further research as well as consideration of topics for discussion during training and/or supervision with employees and trainees. (1) Providers report frequently interspersing tasks of similar difficulty, despite research supporting the practice of interspersing tasks of varying difficulty. Service providers might consider primarily implementing maintenance among acquisition tasks when using task interspersal. (2) Due to potential problems associated with using the same reinforcement schedules/reinforcers for both tasks (e.g., satiation), providers and supervising BCBA's are encouraged to consider whether using different reinforcement schedules/reinforcers will enhance acquisition outcomes. (3) When selecting a procedural variation, providers reported relying on clinical judgment or guidelines from their organizations more frequently than directly contacting the current literature. It is important that organizations and supervisors provide clear guidelines and recommendations based on the most recent scientific literature and update these as new research is published. (4) Individualization of procedures based on specific client characteristics was found to be inconsistent. Supervisors are encouraged to discuss individualization practices for cases in which consistency of treatment across providers is preferred or necessary for maintenance of skills.

Keywords Task interspersal · Provider decisions · Instructional programming · Procedural variations · Autism

Per the BACB Professional and Ethical Code for Behavior Analysts, it is the responsibility of all certified behavior analysts and Registered Behavior Technicians (RBTs) to rely on knowledge derived from the available scientific literature (BACB, 2014). Board Certified Behavior Analysts (BCBA) and doctoral-level CBAs (BCBA-D) often serve in supervisory roles for Board Certified Assistant Behavior Analysts (BCaBA), RBTs, and providers without certification in behavior analysis. To identify whether supervisee behavior

is ethical and effective, one must first know what procedures the supervisee is implementing. Accordingly, it is important for research to assess current practices of direct care service providers. Research has begun to document specific practices within behavior analysis, especially for technologies that can vary in implementation. For example, Love, Carr, Almason, and Petursdottir (2009) documented clinical practices of early intensive behavioral intervention supervisors and found considerable variation in clinical practices across supervisors. Further, DiGennaro Reed and Henley (2015) documented staff training and performance management procedures for BACB certificants and found that clinical practices were not always consistent with the empirical literature. These two studies highlight the importance of continued assessment of the practices of service providers, including those without certification in behavior analysis. Assessment of individuals without certification is particularly relevant because these

✉ Summer Bottini
sbottin1@binghamton.edu

¹ Binghamton University, Binghamton, NY, USA

² Department of Psychology, 4400 Vestal Parkway East, Vestal, NY 13850, USA

individuals may not be intimately familiar with the scientific literature and often directly implement programs with clients under the supervision of certified behavior analysts. A better understanding of service provider practices can inform the types of information and guidelines that should be considered by supervisors when training and supervising staff. For example, if a particular instructional procedure is inconsistently implemented across providers, a supervisor may specify guidelines for implementation with particular clients who require greater consistency to maintain treatment gains (LeBlanc, Gravina, & Carr, 2009).

To date, there have been no surveys of providers' implementation of task interspersal procedures. Task interspersal typically involves the combination of maintenance and acquisition targets within an instructional session (Charlop, Kurtz, & Milstein, 1992) and the general procedure of task interspersal is supported in the literature (e.g., Barbera & Rasmussen, 2007; Reid & Green, 2005; Sundberg, 2008). Task interspersal is frequently used to teach individuals with autism spectrum disorder (ASD; Love et al., 2009) and has empirical support demonstrating its effectiveness in teaching a variety of skills to individuals with ASD, including motor skills (Chong & Carr, 2005), food acceptance (Congdon, 2013), tacting (Kelly & Holloway, 2015), visual matching (Benavides & Poulson, 2009), and following instructions (Pitts & Dymond, 2012). Task interspersal can also be useful for decreasing problem behavior and increasing compliance during an instructional session (e.g., Adcock & Cuvo, 2009; Esch & Fryling, 2013). Understanding provider use of task interspersal may be informative because this procedure can vary in its implementation considerably and best practices do not yet exist. Thus, examination of provider practices informs how individuals choose to implement procedures when specific guidelines have not been identified in the literature.

Within task interspersal, there are many procedural variations that may impact the effectiveness, efficiency, discrimination skills, and preference of the instructional method. For example, researchers have examined using different task domains (e.g., motor skills, receptive language), interspersal ratios, and reinforcement schedules when implementing task interspersal. Some studies suggest that certain procedural variations can indeed impact effectiveness, at least for some clients. For example, Rowan and Pear (1985) demonstrated that interspersing a maintenance task within an acquisition session led to better learning of the target task than interspersing multiple acquisition tasks. Findings like these have led to the definition of task interspersal specifying that previously mastered tasks are interspersed among acquisition tasks (Majdalany, Wilder, Greif, Mathisen, & Saini, 2014). We would expect that providers would primarily follow this practice and implement maintenance among acquisition targets during task interspersal implementation.

Best practices for variations of the basic task interspersal procedure, such as reinforcement schedule for maintenance and acquisition tasks, have yet to be confirmed by empirical research. Charlop et al. (1992) found that relatively dense reinforcement programmed for maintenance tasks evoked correct responding to the maintenance task but decreased correct responding to the acquisition task. Specifically, when praise and food reinforcers were used for maintenance and acquisition tasks, participants did not learn the acquisition task. When only praise was used for maintenance targets, but both praise and food reinforcers for acquisition targets, participants met mastery criteria for the acquisition task. These findings are not consistently replicated (e.g., Chong & Carr, 2005; Mace, Mauro, Boyajian, & Eckert, 1997). For example, Chong and Carr (2005) attempted to replicate Charlop et al. (1992). Although experimental procedures were analogous between studies, Chong and Carr (2005) found that all participants met mastery criteria for the acquisition task when similar reinforcement was programmed for maintenance and acquisition tasks. The authors discussed that discrepant findings might have been due to the participant population and suggested that the findings of Charlop et al. (1992) might be limited to "early learners." Unfortunately, the literature is not yet substantial enough to allow for clear recommendations for the use of task interspersal procedures based on specific client or participant characteristics. In this case, it is unclear how providers would program reinforcement during task interspersal implementation. Therefore, consideration of procedural variations of task interspersal is important given variability in procedures and the potential impact on client outcomes.

With respect to efficiency of procedural variations, multiple studies have demonstrated that a larger ratio of maintenance tasks within a task interspersal session results in less efficient acquisition of the target task (Cooke & Reichard, 1996; Nicholson, 2013; Rapp & Gunby, 2016). Some researchers have also hypothesized that task interspersal may facilitate better discrimination ability, as the client must attend to and differentiate the alternating discriminative stimulus between tasks (Brandon & Houlihan, 1997; Dunlap & Koegel, 1980; Rowan & Pear, 1985). This reasoning suggests that programming the interspersal of tasks from different domains may be preferential over tasks from similar domains. Unsurprisingly, clients can demonstrate strong preferences for certain procedures or instructional methods. For example, Lancioni, O'Reilly, Campoodnico, and Mantini (1998) found that all four participants in their study demonstrated a clear preference for either task interspersal or massed presentation of a single task. It is important to consider a client's preference, especially in light of code 2.09 Treatment/Intervention Efficacy (BACB, 2014), which states that client preference should be considered when choosing between multiple scientifically supported treatments. Taken together, the current literature suggests that task interspersal may be differentially

beneficial for certain clients depending on how the instructional method is programmed (although it is unclear which procedural variations are most effective for clients with different skill repertoires, learning histories, etc.).

Information concerning task interspersal implementation practices in organizations can also inform future research. For example, by first examining the most frequently used client characteristics that inform provider practices, researchers may then explore whether the effectiveness of task interspersal differs across these specific client characteristics. Thus, researchers can examine whether providers are making conceptually systematic decisions in regards to their implementation practices. Further, providers may endorse implementing procedural variations of task interspersal not yet examined in the literature. Understanding these practices can inform what procedural variations might be most useful for researchers to compare in order to influence providers' decisions within applied settings.

Task interspersal is frequently used, varies considerably in implementation, and may be differentially effective for clients depending on implementation. Therefore, the present study surveyed direct care providers of individuals with ASD about their task interspersal practices. Providers certified as a BCaBA, RBT, or without certification were targeted for recruitment as these are the individuals often under the supervision of a BCBA or BCBA-D. For the purposes of this study, participants were asked questions regarding (1) which procedural variations they use most frequently, (2) how they choose a procedure to implement, and (3) their preference for task interspersal.

Method

Participants

Participants were predominantly recruited from the BACB listserv. One hundred and seventeen providers (109 females and 8 males), with a mean age of 31.40 years ($SD = 9.12$ years; range = 20–60), participated in this study. To participate, individuals were required to be providing direct care services to individuals with ASD at the time of the study. The majority of participants identified as having either a bachelor's degree (61.5%) or master's degree (34.2%). One participant identified as having a doctorate degree, and the remaining participants indicated having high school diplomas. Forty-nine individuals (42.8%) indicated that they were currently working towards a degree in a related field. The most frequently reported fields of degree included psychology (54.6%), education (25.3%), applied behavior analysis (20.0%), and speech pathology/communication disorders (10.0%). Of note, participants were able to endorse having multiple fields of degree.

Participants reported working with individuals with ASD for an average of 6 years ($SD = 5.98$ years), with the longest length of service being 35 years. One third of participants endorsed holding a certification as a RBT, 13.1% a BCaBA, and 4.8% a BCBA. For the purposes of the present study, having one of these certifications will be referred to as "training in behavior analysis" as no statistically significant differences were found among these groups. The remaining participants (48.8%) did not report having any training in behavior analysis. When asked to indicate all settings within which they work, the majority of participants responded that they worked in the following settings: the client's home ($n = 65$), a clinic ($n = 43$), an ABA-based school ($n = 33$), public school ($n = 28$), a private school ($n = 20$), outpatient care ($n = 3$), residential care ($n = 3$), or other ($n = 20$). Participants reported that they had an average caseload of 8 clients per week ($SD = 8.34$) and that clients primarily consisted of children (95.7%).

Survey

The *Interspersal Practices Survey* was developed by the authors and administered in an online format as part of a larger study inquiring about provider practices and experiences. Survey questions were developed based on information derived from the empirical literature on task interspersal (e.g., Adcock & Cuvo, 2009; Benavides & Poulson, 2009; Charlop et al., 1992; Chong & Carr, 2005; Kelly & Holloway, 2015; Majdalany et al., 2014; Pitts & Dymond, 2012; Romano & Roll, 2000; Rowan & Pear, 1985). The survey was reviewed and edited by all co-authors and three additional doctoral-level graduate students receiving training in clinical psychology and applied behavior analysis. A subset of 15 questions was included in the present study. These questions covered the following areas: (1) use of task interspersal, (2) procedural variations of task interspersal most frequently used, (3) what variables influence their decision of how to program a particular task interspersal procedural variation, and (4) preference for using task interspersal. Prior to answering questions regarding task interspersal, participants were provided a brief definition of task interspersal ("The intermixing of one type of trial among another type of trial") and two examples of task interspersal. The *Interspersal Practices Survey* consisted of 13 multiple-choice questions and two open response style questions allowing participants to elaborate on their responses to two of the multiple-choice questions. Open response questions were coded by categorizing individual responses into a theme (e.g., if the participant indicated choosing to use task interspersal for younger clients, the response was coded as a decision based on client age). Responses were coded via consensus of the first and third author. The *Interspersal Practices Survey* took approximately 10 min to complete. See Table 1 for a list of survey questions.

Table 1 Provider responses on the interspersal practices survey

Survey item	Percent of participants
Do you use task interspersal?	
Yes	83.8%
No	16.2%
If so, how often?	
Rarely	4.3%
Sometimes	20.7%
Often	39.7%
Always	20.7%
Do you only use task interspersal for specific clients?	
Yes	20.7%
What distinguishes these clients from those with whom you do not use this procedure?	N/A (open response)
Do you intersperse maintenance/acquired or targets among nonacquired or difficult ones?	
Yes	91.4%
No	8.6%
How often is this your practice?	
Never	2.6%
Rarely	2.6%
Sometimes	17.2%
Often	39.7%
Always	34.5%
Do you intersperse items among others of a similar difficulty?	
Yes	82.8%
No	17.2%
How often is this your practice?	
Never	4.3%
Rarely	4.3%
Sometimes	30.2%
Often	41.4%
Always	15.5%
Do you intersperse items...	
From the same skill domain?	39.1%
From different skill domains?	68.1%
That are topographically the same?	35.3%
That are topographically different?	64.7%
On average, how often do you intersperse an item?	
Every other trial	10.3%
Every 2 trials	16.4%
Every 3 trials	37.9%
If other, specify why	N/A (open response)
For the two types of trials/tasks interspersed, I typically use the _____ reinforcers	
Same	57.8%
Different	42.4%
For the two types of trials/tasks interspersed, I use the _____ reinforcement schedule	
Same	47.4%
Different	52.6%
How do you decide the most appropriate way to implement task interspersal? (check all that apply)	
Specific protocol decided by your organization	52.6%
Your own clinical judgment	50.0%

Table 1 (continued)

Survey item	Percent of participants
Based on the current literature	5.2%
Depends on client and his/her abilities	84.5%
Depends on the ease of program implementation	37.1%
Based on a workshop on task interspersal	2.6%
To what degree do you prefer using task interspersal?	
Highly unpreferred	0.0%
Unpreferred	3.4%
Neutral	27.6%
Preferred	46.6%
Highly preferred	19.0%
To what degree do you find implementing task interspersal easy?	
Extremely difficulty	0.0%
Difficulty	18.6%
Neutral	31.0%
Easy	46.6%
Extremely easy	10.3%
If not using task interspersal, what would be your preferred method for trial implementation?	
Massed trial	12.9%
Probes	36.2%
Set number of trials before switching targets	38.8%
Other	8.6%

Procedure

Participants were recruited from the nine regional divisions of the USA (as outlined by the US Census Bureau) via e-mails through the BCBA listserv, provider agencies, and Facebook state associations for behavior analysis. To participate, interested individuals contacted a secure email address and were sent a link and password to access the study via Survey Monkey. Participants were required to confirm consent on the first page before proceeding to survey questions. All survey responses were anonymous. The survey was available for participants to respond for approximately 3 months. Participants were remunerated via entry into a lottery to win \$50 or \$100 in the form of an Amazon™ gift card. Entry and selection in the lottery was based on the initial email inquiry so as to keep participant responses on the survey separate and anonymous.

Results

Research Question 1: Which Procedural Variations Do Providers Use most Frequently?

Task Interspersal Use Of the 117 participants included in the present analysis, 98 (83.8%) reported that they use task

interspersal. Of the 98 participants who use task interspersal, 24 indicated that they only use task interspersal for specific clients. When asked to specify what distinguishes these clients from others in an open-response format, 22 of the 24 participants responded and indicated that the decision depends on the following variables: the skill or functioning level of the client ($n = 10$), the client's learning history ($n = 4$), a supervisor's written program ($n = 4$), the age of the client ($n = 2$), and the client's attending skills ($n = 2$). Please see Table 1 for a summary of all participant responses. Interestingly, individual responses were contradictory across participants for a handful of cases: of participants who reported using client functioning-level for decision making, two participants specified they typically use task interspersal for "higher functioning" clients, whereas two different participants specified they typically use task interspersal for "lower functioning" clients.

Procedural Variations Participants were asked about their use of the following procedural variations: type of tasks, task domains, interspersal ratio, and reinforcement schedule. With respect to task type, 91.4% of participants endorsed interspersing maintenance targets among acquisition targets. However, 82.8% stated that they also interspersed targets for which the client showed similar levels of performance. When asked if the interspersed task is from the same skill domain or a different skill domain than the target task, the majority of

participants (68.1%) reported that they interspersed items from a different skill domain (e.g., a gross motor task with a verbal communication task).

When asked how often interspersed tasks are presented within an acquisition session, 37.9% of all participants stated that they intersperse targets on a fixed 3:1 ratio, whereas 16.4% indicated interspersing on a fixed 2:1 ratio, and 10.3% indicated interspersing on a fixed 1:1 ratio. Thirty-two percent provided open-ended responses as to reasons for selecting a task interspersal ratio other than the ones listed. Almost half of these participants indicated that identifying a ratio for a client depended upon several factors (i.e., on client, setting, purpose of goal), but no common themes emerged to inform this decision.

With respect to reinforcer selection, the majority of participants (57.8%) indicated that they use the same reinforcer for both tasks as opposed to using reinforcers specific to each task. With regard to reinforcement schedule, a similar percentage of participants indicated using the same reinforcement schedule for each task (47.4%). Interestingly, of those using the same reinforcer and reinforcement schedule, 88.3% of participants endorsed using both the same reinforcer and same reinforcement schedule for all tasks during task interspersal sessions.

To investigate the association between participants' training background (i.e., degree, training in behavior analysis, field of degree, length of service, regional location) and their use of task interspersal, chi-square tests were conducted. Procedural differences were not found across providers from different regional locations or with varying lengths of service. Three significant relationships emerged between certain procedural types and training in behavior analysis or field of degree.

A statistically significant association emerged between training in behavior analysis and the interspersal of maintenance tasks within an acquisition session, $\chi^2(2) = 6.81$, $p = 0.03$. Specifically, a larger proportion of participants with training in behavioral analysis reported implementing maintenance tasks among not-yet acquired tasks, compared to participants without training in behavioral analysis. Given that not all of the expected cell frequencies were greater than five, a Fisher's exact test was unable to be used, and thus, this significance should be interpreted with caution.

A chi-square test for association also indicated a statistically significant association between having training in behavior analysis and task type used, $\chi^2(2) = 7.22$, $p = 0.03$. Specifically, more individuals with training in behavior analysis reported interspersing items of different task domains (e.g., gross motor task with verbal communication) than individuals without training in behavior analysis.

Last, a statistically significant association was found between field of degree and task domain used, $\chi^2(6) = 14.90$, $p = 0.02$, such that individuals with a degree in speech-language pathology were more likely to intersperse items from

the same skill domain than individuals with any other type of degree. The significance of the chi-square test should be interpreted with caution as not all expected cell frequencies were greater than five, and a Fisher's exact test was unable to be conducted.

Research Question 2: How Do Providers Choose a Procedure to Implement?

Participants were asked to indicate different factors that influenced whether task interspersal procedures were implemented for clients. The majority of participants (84.5%) reported that programming of task interspersal depends on the client and his/her specific abilities. Approximately half the participants reported that the decision is based on a specific protocol decided by their overarching organization (52.6%) and half based upon their own clinical judgment (50.0%). In addition to these reasons, 37.1% reported that the ease with which they are able to implement the procedures was a basis for deciding how to program interspersal. Only a minority of participants indicated using the literature or what they previously learned in a workshop as a basis for how they program interspersal procedures (5.2 and 2.6%, respectively).

Research Question 3: What Are Providers' Preferences for Task Interspersal?

To examine whether task interspersal may impact provider experiences, participants were asked the degree to which they preferred using task interspersal, the degree to which they found implementation of task interspersal difficult, and what was their most preferred method for trial implementation aside from task interspersal. On a five-point scale ranging from highly unpreferred to highly preferred, most participants rated task interspersal as preferable to highly preferable (65.6%), in comparison to the 27.6% of participants that reported no preference in using interspersal and 3.4% that reported preferring not to use task interspersal.

With respect to participants' reporting of the ease of implementation of task interspersal, only 8.6% of participants indicated that they found it difficult, whereas 56.9% indicated implementation to be easy or extremely easy. Other than task interspersal, the majority of participants indicated that their most preferred method of trial implementation was "a set number of trials" or "implementing probes" (38.8 and 36.2%, respectively). The remaining participants indicated they preferred massed practice or "other."

Discussion

As many behavior analysts serve in supervisory roles, it is important that they monitor supervisee behavior in regard to

implementing procedures to ensure consistency with the contemporary empirical literature. If inconsistent, the supervisor is obligated to correct the supervisee's implementation practices. Rectification may include additional training for the supervisee, more frequent consultation between supervisor and supervisee, or use of mandated guidelines specifying procedures for individual clients. Understanding current practices of supervisees (e.g., BCaBAs, RBTs, noncertified individuals) is important given literature suggesting the impact of procedural variations on the effectiveness of task interspersal (e.g., Charlop et al., 1992; Rowan & Pear, 1985). The present survey examined direct care providers' overall use of task interspersal, which procedural variations they implement most frequently, variables influencing their decisions, and their preference for using task interspersal. See Table 2 for a summary of findings and recommendations.

Findings indicate that task interspersal is a widely utilized procedure for individuals with ASD, consistent with previous research (Love et al., 2009). There was little consistency regarding specific task interspersal procedure types: about half the participants indicated they use the same task domain, reinforcer, or reinforcement schedule, and the other half of participants indicated they use different task domains, reinforcers, and reinforcement schedules during interspersal. The most consistent procedural variation used was a 3:1 interspersal schedule, which is also the most frequently used schedule in the literature (e.g., Esch & Fryling, 2013; Henrickson, Rapp, & Ashbeck, 2015; Houlihan, Jacobson, & Brandon, 1994; Humm, Blampied, & Liberty, 2015; Majdalany et al., 2014; Ray, Skinner, & Watson, 1999; Riviere, Becquet, Peltret, Facon, & Darcheville, 2011). Of individuals that use other interspersal ratios, many indicate that they base their choice of ratio on several factors, such as the client, the setting, or the purpose of the goal. Future research may examine how variables like these impact the effectiveness of various interspersal ratios.

A notable finding in terms of procedural variations was providers' reported use of task type. Analyses indicated that almost all providers reported interspersing maintenance items among acquisition targets. In addition, a majority of participants also reported interspersing items of a similar difficulty. This pattern of endorsement appears to be in direct contradiction with itself, since maintenance items may be considered "easy" and acquisition items considered "difficult." This discrepancy may reflect that providers frequently use both task types, as they generally seem to use multiple variations of task interspersal across sessions and clients. However, within the empirical literature, studies examining task interspersal consistently program maintenance/easy tasks among acquisition/difficult tasks, per the definition of task interspersal (Cooper, Heron, & Heward, 2006), with enhanced performance found for this method in comparison to task interspersal of multiple difficult acquisition tasks (Rowan & Pear, 1985). Thus, the

effectiveness of task interspersal has primarily been demonstrated for this type of procedural variation. Future research is needed to explore other potential benefits of interspersing items of similar difficulty, such as compliance or client preference. Until then, service providers might consider primarily implementing maintenance among acquisition tasks when using task interspersal.

Provider decisions regarding use of reinforcement (reinforcers and schedule) during task interspersal procedures were also examined. Approximately half the participants indicated using either the same reinforcer or the reinforcement schedule for each task (maintenance and acquisition), and the majority of these participants indicated using the same reinforcer and reinforcement schedule for both tasks. It is possible that using the same type and amount of reinforcement may increase responding to the less effortful (maintenance) task and decrease responding to the acquisition task (Charlop et al., 1992). A client is also more likely to become satiated if only a single reinforcer is used across tasks due to more frequent presentation of the stimulus. Given this reasoning, researchers have recommended using different reinforcers and/or reinforcement schedules between tasks during task interspersal, especially for clients in which task interspersal with similar reinforcement between tasks has been ineffective (Charlop et al., 1992; Chong & Carr, 2005). Additional research is necessary to clarify the impact of using similar reinforcement between tasks. Service providers and supervising BCaBAs are encouraged to consider whether using different reinforcement schedules and reinforcers between tasks will facilitate better acquisition for the target task for their clients.

Some inconsistencies in the reported use of task interspersal may be due to differences in education and training. Interestingly, almost half the participants indicated that they did not hold certification in behavior analysis. Further, differences in implementation across field of study were found for task type (i.e., interspersing a maintenance task or additional acquisition task) and task domain (i.e., tasks of similar or different response class, such as a motor and verbal communication task), but not for reinforcement (type/schedule) or interspersal ratio. These differences appear consistent with one's field. For example, speech-language pathologists primarily intersperse tasks from the same domain given that their interventions generally focus more exclusively on language use and acquisition. Individuals with training in behavior analysis might be more likely to intersperse tasks from different domains or varying levels of difficulty as this is recommended practice within the empirical literature of behavior analysis on task interspersal (e.g., Rowan & Pear, 1985). Future research might examine whether differences in preferences across fields of specialty or graduate training programs impact individual provider preferences and use of certain procedure types, as well as client outcomes.

Table 2 Summary of common practices and recommendations

Procedural variation	Common practice reported by participants	Current literature	Recommendations for research and organizations/supervisors
Interspersal schedule	Most used a 3:1 interspersal schedule. Many indicated basing their choice on the client, setting, or purpose of goal	A 3:1 ratio is the most frequently cited in the literature (e.g., Esch & Fryling, 2013; Henrickson et al., 2015). No research available on how client or setting factors influence effectiveness	Examine how variables like client, setting, and goal purpose impact the effectiveness of various task interspersal ratios. Discuss how to decide best ratio with providers
Task type	Most reported interspersing maintenance items among acquisition targets, as well as interspersing items of a similar difficulty	Interspersing maintenance among acquisition is the accepted practice in research (e.g., Rowan & Pear, 1985).	Additional examination of potential benefits of interspersing items of similar difficulty. Suggest providers to implement maintenance among acquisition targets
Reinforcement	Half use same reinforcer and reinforcement schedule for each task.	Mixed findings (e.g., Charlop et al., 1992; Chong & Carr, 2005). Using different reinforcers/schedules may enhance effectiveness for some learners.	Additional examination of impact of reinforcement between tasks on effectiveness. Consider utility of different reinforcement schedules for clients
Task domain	Using same/different task domain depends on field of study.	Mixed findings of which is more effective (e.g., Esch & Fryling, 2013; Volkert, Lerman, Trosclair, Addison, & Kodak, 2008)	Examine how training background impacts individual provider preferences and use of certain procedure types, as well as client outcomes. Discuss preferences for task domain between tasks with providers
Decision-making	Majority makes decisions based on guidelines from their organizations and their own clinical judgment.	Clinical practices should be guided by scientific knowledge and data-driven. Clinical judgment is not always accurate.	Examine how variables impacting clinical judgment (e.g., various client characteristics) impact outcomes associated with task interspersal. Provide providers with specific guidelines and rationale when possible

Furthermore, our findings indicate that providers rely more on guidelines from their organizations and their own clinical judgment than evidence in the literature or from professional development events (e.g., workshops, conferences) to determine how to program task interspersal sessions. Although using guidelines from the organization is encouraged, it presumes that the organization is maintaining contact with the current research literature. In addition, as evidenced in other treatment research, clinical judgment may not always qualify as the most accurate judgment (Miller, Spengler, & Spengler, 2015). Many participants in the present study did not hold certification in behavior analysis. Without training in behavior analysis, clinical judgment and decision-making may be less reliable for programming behavioral procedures. Thus, it is important that organizations and supervisors provide clear guidelines based on current scientific literature, when applicable. For example, supervisors may discuss with providers instructional decision-making in light of a recent review demonstrating that massed trial instruction results in more rapid acquisition than task interspersal (Rapp & Gunby, 2016). Future research is warranted to examine how variables impacting clinical judgment (e.g., various client characteristics) impact outcomes associated with task interspersal. Future research may also examine how clinical judgment and decision-making differs across individuals with differing levels of training.

Findings highlight the many ways providers individualize procedures for clients based on clinical judgment. However, the ways in which providers individualize procedures based on specific client characteristics were found to be inconsistent. For example, some participants reported to use task interspersal with higher functioning clients, whereas, others reported to use it with lower functioning clients. Other client characteristics that providers reported using to inform task interspersal practices included learning history, age, and attending skills. While this finding is positive in light of the importance of individualization of interventions for children with ASD (Durand, 2014; Ventola et al., 2015), it highlights the variability in how interventions are individualized. Unfortunately, the current literature does not yet provide sufficient information regarding client characteristics in order to delineate how to most effectively individualize task interspersal interventions. Thus, future research should aim to address best practices for individualization. Supervisors are encouraged to discuss individualization practices with supervisees to promote consistency across providers, as consistency across treatment implementers may be important for maintaining treatment gains (LeBlanc et al., 2009). These types of discussions may be important during transitions in services (i.e., transitioning to a new organization/school/district), in which practices are likely to change. Alternatively, supervisors may want to discuss how best to prepare for expected changes in care.

These findings and recommendations should be considered in light of a few limitations. First, information was only collected regarding service provider practices and not what is recommended, trained, or mandated by supervisors and/or the organization. It is unclear if participants consulted supervisors, if they received appropriate training on the reported task interspersal procedures, or if they were the primary decision makers for reported implementation practices of task interspersal. Second, a limited number of individuals with a BCBA responded to the survey. Future research should compare instructional programming of BCBA and BCBA-D certificants to BCaBA/RBT certificants as well as individuals undergoing certification and training in behavior analysis. This would help clarify how certification influences clinical decision-making and to what extent decision-making differs across training levels. Third, given the nature of survey research, it cannot be concluded how consistent self-reported practices are with actual practices. Finally, the present study did not collect information on client outcomes. Exact replication of evidence-based decisions is only desirable when it promotes positive outcomes. Selecting or altering procedural variations of any behavioral procedure, like task interspersal, should be primarily guided by ongoing performance data. In some cases, performance data may contraindicate the use of empirically recommended procedures. Future research on provider practices and decision-making could examine client outcomes in relation to clinical decision-making. For example, research may examine how providers decide to alter procedures in response to different client behaviors (e.g., performance, observed affect, disruptive behavior, attending) and how these procedural changes affect efficiency/effectiveness of the procedure and future decisions made by the provider.

The present study adds to the growing body of literature documenting clinical practices within behavior analysis and is the first to examine specific procedural variations of task interspersal that direct care service providers program in their interventions with individuals with ASD. There is noteworthy inconsistency across providers in task interspersal use, likely to some extent reflecting individualization of procedures for specific clients. Although the relative effectiveness of most procedural variations in task interspersal implementation is still unclear, practices were also inconsistent for implementing maintenance among acquisition targets, which is recommended based on empirical studies (e.g., Rowan & Pear, 1985). It may be that interspersing multiple acquisition tasks may be advantageous for reasons not yet explored (e.g., attention to task, client preference). Thus, further research on task interspersal and different procedural variations is warranted. Specifically, additional research is necessary to examine and compare procedural variations in order to develop best practices of task interspersal implementation. Given limited research on best practices of task interspersal, it would be interesting to examine changes in provider practices as this

literature develops and becomes more conclusive; for example, we should hope to see reduced variability reported by providers in the future.

It may be inferred that when left to their own devices, service providers without certification in behavior analysis might elect to use numerous procedural variations, perhaps inconsistently across sessions and clients. In the case of supervisors who hold specific procedural variation preferences or clients who should be provided with particular procedural variations, service providers should receive clarification of expected practices with respect to task interspersal. As the demand for behavior analytic services increases and additional research is conducted to assist providers in implementing effective interventions, continued documentation of clinical practices in both intervention providers and supervisors is crucial to uphold a high quality of care provided to individuals with ASD.

Compliance with Ethical Standards

Conflict of Interest The authors declare that there is no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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