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DISCUSSION AND REVIEW PAPER

A Practitioner's Guide for Selecting Functional Communication Responses

Elizabeth J. Houck[1] · **Joseph D. Dracobly**[1] · **Sara A. Baak**[1]

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Abstract
Functional communication training (FCT) is an effective and widely used procedure to reduce problem behaviors. The purpose of FCT is to replace a problem behavior with a socially appropriate and communicative behavior – the functional communication response (FCR), which produces the same reinforcer as the problem behavior. Recent reviews of FCT have focused on providing overall recommendations for how the procedure should be implemented. A relatively small body of literature has been devoted to the selection of the FCR. The purpose of this article is to propose a set of considerations for practitioners in selecting FCRs.

Keywords Functional communication · Problem behavior · Autism · Intellectual disability

Function-based treatments, and specifically functional communication training (FCT), have been among the most successful behavioral interventions to reduce problem behaviors and increase access to resources for people with developmental disabilities. Function-based treatments have led to improvements in both adaptive outcomes and quality of life for this population (e.g., Kurtz et al., 2011; Pyles et al., 1997; Tiger et al., 2008). FCT, first described by Carr and Durand (1985), consists of identifying the reinforcer maintaining problem behavior and replacing that problem behavior with a more socially appropriate, functional communication response (FCR).

In 2008, Tiger et al. published a guide for practitioners on the implementation of FCT that has been a valuable resource for both researchers and practitioners. Although there was limited research at that time to guide FCR selection, Tiger et al. recommended that the FCR be selected by considering response effort, social recognition of the response, and the likely speed of acquisition of the response. Recently, Ghaemmaghami et al. (2021) noted that although a multitude of studies have demonstrated the efficacy of FCT in reducing problem behavior in highly controlled settings, there is not clear evidence that FCT produces long-term effects with generalization across a variety of settings. We recently conducted a systematic review of FCT literature published since 2008 using PRISMA methods (Page et al., 2021). Overall, we found that researchers do not frequently report FCR selection strategies. Of those researchers that reported FCR selection strategies, most do not involve an assessment based on systematic procedures. The empirical literature should be a guide for practitioners, and the lack of updated, systematic procedures for an integral part of FCT – selection of the FCR – presents a barrier for consistency in implementation of FCT by researchers and practitioners (Ringdahl et al., 2009; Tiger et al., 2008; Valentino et al., 2018).

Although there is established and growing evidence on some parameters of FCT procedures (e.g., Ghaemmaghami et al., 2021; Tiger et al., 2008), very little research has been done to determine the best methods for selecting the FCR. Selecting an appropriate FCR is an important consideration not only for the immediate efficacy of FCT but also the long-term maintenance and generalization of FCT. Horner and Day (1991) provided the first demonstration that the topography of the FCR can differentially affect the outcome of FCT. They compared the use of three different American Sign Language responses as FCRs to reduce escape-maintained problem behavior. The three different responses included manually signing a single word – "help," manually signing a sentence, or manually signing for help three times before receiving assistance. Horner and Day found that rates

✉ Joseph D. Dracobly
joe.dracobly@unt.edu

[1] Department of Behavior Analysis, University of North Texas, 1155 Union Circle #3311070, Denton, TX 76201, USA

of escape-maintained aggression were more quickly reduced when the FCR required lower effort (i.e., a single sign rather than a signed sentence). Subsequent studies showed that for some individuals the use of existing or novel topographies differentially affected rates of problem behavior (Winborn et al., 2002) and that preferences between topographies can be established (Winborn-Kemmerer et al., 2010). Finally, Randall et al. (2021) demonstrated that resurgence of a previously reinforced behavior (a destructive behavior surrogate) was higher when a card-touch FCR was unavailable than when a vocal FCR was under extinction. Although specific recommendations regarding FCR selection appear to be limited, Randall et al.'s study provides further evidence that FCR topography differentially affects treatment outcomes during FCT.

The mand-teaching literature may be useful for informing FCR selection strategies, because the FCR functions as a mand for the reinforcer that maintains problem behavior. Several studies have compared selection-based (picture touch) and topography-based (sign or vocal) responses. Adkins and Axelrod (2001) found that selection-based mands were acquired more quickly than topography-based mands. However, other researchers found that topography-based mands were more successful and preferred by participants (Wraikat et al., 1991). Interestingly, one study found a change in efficacy during treatment. Chambers and Rehfeldt (2003) found that some participants learned a selection-based mand more quickly but preferred a topography-based mand by the end of treatment. Taken together, these studies provide additional evidence that the form of the response, specifically whether the response is selection based or topography based, should be considered when selecting FCRs to support long-term treatment effects during FCT.

In addition to these factors, in our review of the FCT literature since 2008, we found limited research specifically evaluating the long-term maintenance (assessed after more than 30 days). The lack of research evaluating the long-term maintenance of FCT and the differential effects of the use of FCRs noted in the mand literature and the FCR literature suggest that recommendations to help guide systematic FCR selection methods are needed. The available research on both FCT and mand training demonstrates that identifying the most effective FCR for an individual is likely dependent upon that individual and the contexts in which they live. If precisely replicating FCT conducted only in highly controlled settings is the primary factor considered in practitioner-application of FCT, we are likely to identify a wide range of "successful" options that may not be effective, in the long term, in less controlled, everyday settings. Taken together, when the everyday environment, generalization, and maintenance are considered, we may find that some FCT methods and FCR-selection methods are more effective than others, more socially and ecologically valid (e.g., based on individual preference), or both (e.g., Chambers & Rehfeldt, 2003). Additionally, toward the end of mitigating resurgence during FCT, when resurgence is considered as a choice, individual preference in different settings is likely to be very important to the overall long-term success of FCT (e.g., Randall et al., 2021). In the remainder of this paper, we describe the assessment-based FCR selection methods currently available to practitioners and recommend additional considerations for selecting an FCR.

Functional Communication Response (FCR) Selection

FCR Assessments

Three assessments have been published that are specifically designed for FCR selection. These assessments are an extinction-induced variability assessment (Grow et al., 2008), the Mand Topography Assessment (MTA; Ringdahl et al., 2009), and a topography-comparison assessment (Berg et al., 2015; Harding et al., 2009).

The first type of assessment used to select an FCR was reported by Grow et al. (2008). These researchers selected the FCR for each participant by observing behaviors emitted when problem behavior was placed on extinction. The first socially acceptable behavior was reinforced in subsequent sessions as the FCR. This strategy has not been used by any subsequent studies. The MTA was first described by Ringdahl et al. (2009). It is conducted prior to FCT to evaluate an individual's proficiency with a variety of mand topographies. For each of the potential FCRs, ten trials are conducted using least-to-most prompting. For each FCR, on each trial, one records the prompt level needed to emit the FCR. The level of prompting needed to evoke the FCR across the ten trials is then used to determine a rank order of low proficiency to high proficiency mands. Since 2009, four other studies reported using the MTA (Adami et al., 2017; Falcomata et al., 2017, 2018; Muething et al., 2018). Two studies evaluated the tool with regard to whether or not the highest proficiency mands were the most successful and preferred topographies in subsequent FCT. Adami et al. demonstrated successful treatment using the topography that required the least intrusive prompt. However, in a comparison of high proficiency mands (i.e., mands that required the least intrusive prompt) and low proficiency mands, Falcomata et al. found that high proficiency alone did not predict the efficacy of FCT in every case. In some cases, the same participants showed similar results (levels of problem behavior and FCR use) with both the high and the low proficiency mands. They suggest that history with responses, individual preference, and effort needed for each response also influence the effectiveness of any FCR selected. The

last assessment described in the literature since 2008 is the topography-comparison assessment. This assessment was used in two FCT studies. In these studies, researchers compared the effectiveness of two or more FCR topographies during FCT. Berg et al., demonstrated that the topography-comparison assessment was a useful way to determine preference for a specific mand topography, with the specific topography varying on an individual basis. Harding et al. (2009) demonstrated that teaching multiple mand topographies was effective, and that over time a preference for vocal manding was displayed by all three participants.

Like the MTA, Valentino et al. (2018) described a pre-requisite-skills assessment to inform the selection of communication modalities for mand training. Their assessments included a motor-imitation assessment, an identity-matching assessment, and a vocal-imitation assessment. In mand training subsequent to the pre-requisite skills assessment, children with stronger vocal imitation (echoic) skills did better with vocal requests. The relationship between pre-requisite skills in motor imitation and identity matching and success with sign language or picture exchange was less clear. Their recommendations were children without vocal imitation skills should be taught non-vocal mands and should be assessed across multiple possible modalities to determine which is best on an individual basis. Valentino et al.'s assessment and similar assessments have been mostly used in early education environments in which many mands are very first taught. However, these types of approaches could also be useful for selecting FCRs, as a specific type of mands, provided practitioners are sensitive to the features of the modality relative to problem behavior (e.g., effort).

Taken together, each assessment is useful for identifying various features of FCRs. Grow et al.'s (2008) extinction-based assessment may be most useful to practitioners for identifying FCRs that are already in the participant's repertoire and may be part of the same response class as the problem behavior being replaced. The MTA and Valentino et al.'s assessments provide formal methods to determine ease of prompting and pre-requisite skills for each possible FCR (Ringdahl et al., 2009; Valentino et al., 2018). Finally, the topography-comparison assessment described by Harding et al. (2009) demonstrates an empirical method for determining the effectiveness of each FCR in reducing problem behavior. Although these assessments provide a starting point, they should be the starting point in a holistic approach to selecting an FCR. First, although the level of prompting necessary to teach a mand is important, it is possible that multiple responses require the same prompting level. Therefore, it would be useful to consider other factors relevant to selecting which response form(s) to train as FCR(s). Second, the initial teaching conditions may be very different from other environments the individual regularly contacts. For example, a card-exchange may require limited prompting, resulting in rapid acquisition as an FCR. However, in a loud environment, a card-exchange may not sufficiently evoke a response by others. Finally, the initial treatment goals of FCT are focused on eliminating problem behavior. However, as treatment progresses, goals may change, such as responses better integrating into an individual's typical communication system or responses becoming more complex as an individual's verbal repertoire becomes more complex. To these ends, in the remainder of the paper, we provide additional recommendations for selecting an FCR that can complement the outcomes from more formal assessments.

Recommendation 1 – Consider Starting with Multiple FCRs

Across the three assessments designed for FCT, one clear pattern emerges – the potential for more than one response as the FCR. Teaching multiple FCRs can include teaching multiple FCRs from the same modality (such as "Play with me" and "Look" to gain access to attention). Teaching multiple FCRs for individuals who have not yet shown a clear modality proficiency or preference can be accomplished by including simple combinations, such as providing a picture card that the participant could hand to the therapist and simultaneously teaching either a verbal request or teaching the use of an electronic device that produces a sound, such as the name of the reinforcer. Following initial training of the response forms, any of the three FCRs should be accepted indefinitely or until a preference for one FCR emerges. A second method would be to individually evaluate the teaching of two to three FCRs, using methods such as the MTA (Ringdahl et al., 2009) or the topography-comparison assessment (Harding et al., 2009). For example, if one conducted an extinction analysis, they might find multiple appropriate responses with varying dimensions. Alternatively, if one conducted a mand modality assessment, they might identify a hierarchy of modalities. Because the goal of FCT is to reduce or eliminate problem behavior, there may be a greater tolerance for "less than perfect" responses if they produce a reduction of problem behavior. Although our review found that most studies used a single FCR, there could be clinical benefits in starting with multiple FCRs. First, teaching multiple FCRs often does not require substantially more time but increases the likelihood of the occurrence of a response to reinforce (e.g., Adami et al., 2017; Dalmau et al., 2011; Derosa et al., 2015; Falcomata et al., 2017). Multiple FCRs, in turn, further reduce both the occurrence of problem behavior during FCT and the probability of resurgence (see Berg et al., 2015; Randall et al., 2021). Specifically, by increasing the overall response class size using appropriate responses, the overall probability of a given response, including problem behavior, decreases. If a response class is comprised primarily of appropriate responses, all other variables being

equal, the probability of any appropriate response is greater than the probability of problem behavior. Additionally, from the standpoint of resurgence as choice, if the response class is comprised of many appropriate responses, if one appropriate response undergoes extinction, there is a greater chance that the individual will choose to emit a different appropriate response rather than problem behavior (Berg et al., 2015). One method of teaching multiple FCRS is teaching two or three FCRs simultaneously (Berg et al., 2015, Harding et al., 2009). Following initial training, any of the three FCRs should be reinforced or FCRs should be individually evaluated using methods such as the MTA (Ringdahl et al., 2009) or the topography-comparison assessment (Harding et al., 2009).

A second benefit of training multiple FCRs is the establishment of a response-class hierarchy. For example, one could train one FCR under control of "low" levels of the establishing operation (EO), such as a brief period of deprivation. Next, one could train a second FCR under control of a "moderate" level of the EO. Finally, one could train a third FCR under control of a "high" level of the EO. By training specific FCRs under specific EO conditions, a progression of FCRs based on the level of the EO could be established. Training in this way could be considered a form of serial training, a procedure that has been found to be effective at reducing resurgence (e.g., Diaz-Salzat et al., 2020; Lambert et al., 2017). In serial training, multiple responses are taught, first by establishing a single response and then by placing that response on extinction while teaching a subsequent response. This training pattern could be conducted for as many responses as desired and could have multiple benefits. First, progression through multiple responses before emitting problem behavior further delays the resurgence of problem behavior (e.g., Berg et al., 2015; Harding et al., 2009; Lieving et al., 2004). Second, serial training of FCRs provides the individual with a history of FCRs under different levels of the EO. Training distinct FCRs at different levels of the EO could prove beneficial in the everyday environment, in which individuals are likely to encounter varying levels of the EO. Finally, teaching distinct FCRs under different levels of the EO can signal to caregivers the likelihood of problem behavior. For example, the emission of an FCR that was trained under the "high" level of the EO could prompt caregivers to deliver reinforcement because it is likely that problem behavior may occur because the EO is strong. The emission of the FCR trained under the "low" level of the EO could signal to the caregiver a lower risk of problem behavior. A clear signal of the current level of the EO could be important for a caregiver to know, particularly if it is not possible to deliver reinforcement. As an analogy, one may consider how children indicate they need to go to the bathroom. Many caregivers are familiar with the "potty dance." However, before the "potty dance" occurs, a child may ask to go to the bathroom. If that does not produce access to the bathroom, the child may ask more loudly or may begin to hold themselves. As time passes, the child may then begin to move around in the "potty dance." When a caregiver sees that "potty dance," they may be very likely to stop whatever they are doing and take the child to the bathroom, because the "potty dance" signals a high likelihood of urination. By establishing this pattern with FCRs, caregivers would have specific behavior-based signals for the level of EO and could better determine when they can wait to provide a reinforcer and when they should immediately provide a reinforcer. Signals that allow caregivers and therapists to more appropriately match their responses to the current level of the EO could enhance the long-term effectiveness of FCT by further preventing resurgence of problem behavior.

Recommendation 2 – Consider Individual Factors

Individual factors that should be considered include physical abilities that may make certain FCRs more or less effortful (e.g., Dracobly & Smith, 2012), the individual's total communication system (e.g., Najdowski et al., 2008), and ease of prompting (Falcomata et al., 2017; Fisher et al., 2018). The importance of considering physical abilities is obvious in some cases, such as eliminating picture exchange options for a person who is visually impaired. Other, more subtle individual abilities (such as discrimination abilities) should also be considered. Individuals who have difficulty discriminating between pictures should not be limited by communication systems that require these discriminations. If teaching one idiosyncratic sign, one picture exchange, and one vocal response allows a person to master requests for three different items, this person should be given that opportunity, rather than requiring mastery of picture discriminations before teaching vocal responses. Practitioners will, at times, need to be more creative in identifying behaviors to use as FCRs to promote successful communication. For example, Dracobly and Smith (2012) used a precursor behavior (head raising) as the FCR to access attention, the reinforcer that maintained the individual's self-injury. Because the individual spent much of the day with his head down due to a physical condition with his neck, providing a picture to exchange may not have been effective, because the individual was not regularly looking up to see if caregivers were present. Likewise, for a person for whom pictures or signs have not been effective, using a small referent object could be beneficial. For example, lifting a clean soda can or water bottle to the mouth could be used to indicate a request for drinks and an empty, clean snack bag could be used to indicate a request for food. Utilizing all possible features of the FCR to increase the likelihood of success, particularly with individuals with communication difficulties, could greatly

improve quality of life for people who otherwise have minimal control over their environments.

Ease of prompting is another characteristic of FCRs that should be considered on an individual basis. Specifically, ease of prompting can directly affect EO exposure during FCT, as responses that can be more quickly prompted allow the therapist to manipulate the duration of the EO more precisely (e.g., Falcomata et al., 2017; Fisher et al., 2018). Additionally, certain FCR topographies may be contraindicated, based on available prompting strategies. For example, manual signs may be contraindicated as FCRs for individuals who find physical prompting aversive. Fortunately, ease of prompting can be evaluated using the MTA (Ringdahl et al., 2009).

Finally, the individual's likely communication system across the lifespan should be considered. Some FCRs will only be appropriate for a period of time in specific contexts. For example, teaching a person to raise their hand or raise a communication card above their head to gain another person's attention in a classroom may be acceptable during initial stages of FCT in a school setting (e.g., Najdowski et al., 2008). However, the occurrence of hand raising in a restaurant or with a small group of friends could be socially stigmatizing and disruptive. Likewise, if a person already uses an electronic communication device, adding a card-touch FCR may make the individual's total communication system unnecessarily difficult to maintain. The unavailability of FCR materials could also increase the probability of resurgence of problem behavior (see Randall et al., 2021).

Recommendation 3 – Consider Everyday Environments

Practitioners should also consider the everyday environment in which the client and caregivers want the FCR to occur, specifically with respect to the environments in which problem behavior has regularly occurred, environments in which the FCR is likely to be reinforced, or both. Tiger et al. (2008) recommended considering the social recognizability – that is, the likelihood that the chosen FCR will be reinforced by untrained people. Consideration of the everyday environment should also include consideration of materials necessary for the FCR to occur, including the associated costs (e.g., Franco et al., 2009). FCRs that require additional materials that may get lost (e.g., picture exchange) or the use of equipment that could break or be expensive to replace may limit the long-term maintenance and effectiveness of the FCR. Likewise, for certain individuals, an over-emphasis on developing "socially recognizable" responses may present an unnecessary hurdle to the initial efficacy of FCT. For example, individuals with severe or profound intellectual disability may rarely, if ever, be in settings without a known caregiver. In those cases, an individual may be better served by an FCR that is simple for a caregiver to reinforce even if that FCR is not easily understood by the general public (see Dracobly & Smith, 2012). Once the simple FCR is acquired and problem behavior is reduced, additional FCRs that are more recognizable by the general public should be taught when applicable. Choosing an initial FCR of a card touch, object touch, or a unique manual sign may allow for more rapid efficacy of FCT without sacrificing long-term maintenance and effectiveness. For a discussion of some of the more conceptual considerations, we would also recommend Valentino et al.'s (2018) study on assessing for prerequisite skills, which provided a clear and concise overview of how communication response modalities may be differentially supported in the everyday environment.

Practitioners should also consider staff resources and relevant policies. In congregate living environments, such as residential facilities, group homes, or schools, there may be high client-to-staff ratios. In settings with high client-to-staff ratios, caregivers may not be able to deliver reinforcement at the same rate as occurs during FCT. For example, it is common to use a continuous schedule of reinforcement during FCT and then alternate between periods of continuous (or high-rate) reinforcement and no reinforcement during schedule thinning (e.g., Fisher et al., 2014, 2015; Fuhrman et al., 2016; Greer et al., 2016). In settings with high client-to-staff ratios, however, these dense schedules of reinforcement may not be possible. To address constraints of staff time and resources specific to each individual's environments, practitioners should determine feasible rates of reinforcement in the everyday environment. Then, when conducting FCT, after the FCR is acquired, practitioners should establish response patterns that are maintained under the rates of reinforcement that are feasible in the everyday environment (e.g., Austin & Bevan, 2011; Ghaemmaghami et al., 2016). There are several ways practitioners can transition response patterns towards rates that can be supported in everyday environments. One method involves practitioners analyzing the relative frequency or inter-response times (IRTs) of problem behavior. Information on IRTs provides empirical data on the overall frequency of EOs and reinforcement. For example, if the mean IRT of problem behavior is 4 h, this suggests both the duration of time necessary for the EO to evoke problem behavior and the temporal availability of reinforcement. During the later stages of FCT, it is important to ensure FCRs are maintained at a rate that matches the temporal patterning of EOs and reinforcers. An alternative method is to record naturally occurring periods of putative reinforcement. For example, in preschool environments, teachers may deliver attention on a time-based schedule (e.g., Austin & Bevan) or may provide play, choice opportunities, and escape periods from demands (e.g., Ghaemmaghami et al., 2016) on a regular schedule. During the later stages of FCT, practitioners should ensure the FCRs

occur at a rate that closely matches the time-based delivery of reinforcers.

Additionally, practitioners should consider whether certain policies limit the frequency or type of reinforcement used. For example, in certain environments (e.g., a library), the delivery of items that make noise or consumption of drinks may be problematic. In other environments, there may be a requirement that some time elapses between delivery of reinforcers (e.g., schools in which students must alternate activities). If the individual is likely to encounter these environments, practitioners should incorporate these factors into FCT. One strategy would be to develop conditioned reinforcers associated with the delivery of the terminal reinforcer once the FCR is established. Practitioners and caregivers can make conditioned reinforcers (e.g., tokens) available in environments in which the functional reinforcer is not available, and then allow an exchange of the conditioned reinforcers for the functional reinforcer once the individual is outside that environment or once the time between deliveries has elapsed. Alternatively, practitioners can thin the schedule of reinforcement using delay-tolerance procedures or establish a lower rate of the FCR using differential reinforcement of low rates (e.g., Hanley et al., 2014; Ghaemmaghami et al., 2016; Vollmer et al., 1999; see Hagopian et al., 2011, for a review of delay tolerance procedures). Delay-tolerance procedures allow for periods of time to elapse between reinforcer deliveries while requiring only one to two responses, thus reducing the likelihood of the FCR contacting extinction and producing resurgence of problem behavior. For example, practitioners should teach tolerance to a delay (e.g., Falcomata et al., 2010) greater than the time-elapsed requirement or increase the IRTs of the FCRs to greater than the time-elapsed requirement. In addition to better ensuring the FCR contacts reinforcement, a time-based delivery of the reinforcer before the FCR occurs could function as noncontingent reinforcement (NCR). NCR (even if it is "incidental") could further reduce the likelihood of problem behavior while maintaining the availability and delivery of reinforcers (e.g., Austin & Tiger, 2015; Doughty & Anderson, 2006).

Recommendation 4 – Consider FCR Features

There are several considerations regarding the features of the FCR. Using pre-existing responses as FCRs (e.g., Berg et al., 2015; Grow et al., 2008; Winborn-Kemmerer et al., 2010), selecting FCRs that are incompatible with problem behavior (Falcomata et al., 2010), using FCRs that are always available to the user and may mitigate resurgence more effectively (Randall et al., 2021), or FCR topographies that will allow for response restriction (Fisher et al., 2014) should be considered during FCR selection. Some features of the FCR may impact treatment outcomes only minimally while other aspects of the FCR may be critical for treating certain forms of problem behavior. For example, an FCR that is incompatible with the problem behavior being replaced may be critically important for treatment. Examples of incompatible FCRs include touching a card held by a caregiver in the treatment of elopement (e.g., Falcomata et al., 2010) or an FCR that requires both hands (a manual sign) that could be incompatible with certain aggression topographies. Finally, when using an established response as an FCR, practitioners should consider the relationship between the established response and problem behavior. If the established response is a precursor, validated through either a precursor FA (e.g., Smith & Churchill, 2002) or a precursor assessment (e.g., Fritz et al., 2013), a strong treatment effect may be obtained much more quickly. However, there may also be an increased likelihood of resurgence because the individual has a history of choosing between the precursor and problem behavior (see Greer & Shahan, 2019, for a discussion of resurgence as choice). For example, if the established response occurs a few times but does not produce reinforcement, resurgence may occur quickly (e.g., Harding et al., 2009; Lieving et al., 2004).

To begin evaluating these FCR properties, we recommend asking and answering the following questions:

1. Which FCRs are the easiest to prompt (effectively reducing exposure to the EO)?
2. Are any available FCR options incompatible with problem behavior in a way that might be helpful?
3. Do any of the available FCRs allow for response restriction if this individual is likely to need response restriction to successfully tolerate thinning of the schedule of reinforcement?
4. What future response(s) will need to be taught to ensure the request is specific enough to efficiently access reinforcement?
5. Which FCR will be the easiest for the individual to always carry with them?

By considering specific teaching strategies, practitioners can plan and prepare for both initial acquisition and fading prompts, to ensure the FCR occurs under control of naturally occurring EOs. Likewise, by considering the historical relationship between the potential FCR and problem behavior, one may alter the design of FCT to preclude problem behavior from occurring by using an incompatible response or reduce the likelihood of resurgence during reinforcement fading procedures by including alternative activities during delay periods. Finally, by considering whether the FCR will require training additional responses during maintenance or

whether the FCR will require materials, practitioners can begin preparing the everyday environment for supporting the FCR while FCT is initially being implemented. Forethought about the cost of the intervention to those in the environment provides the opportunity for caregivers to adapt as the FCR is being acquired and ensure adequate environmental arrangements are made to fully support maintenance and generalization of the FCR once practitioners have established FCT as effective.

Recommendation 5 – Build Skills Towards More Specific, Differentiated FCRs

Specific FCRs (i.e., doll, talk to me, go away, etc.) should be the most common FCR type. By teaching a specific FCR, practitioners ensure caregivers know precisely what reinforcer to deliver, thus reducing treatment errors, such as delays to reinforcement (e.g., Franco et al., 2009; Olive et al., 2008). However, the most common FCRs are general FCRs that specify only the class of reinforcer (i.e., break, attention, food, my way, etc.). Although there is little evidence as to whether general or specific FCRs are most likely to be maintained in natural environments, practitioners should consider the potential long-term benefits of teaching specific, differentiated FCRs. First, initial treatment effects would likely be the greatest when a general FCR is used to access a variety of reinforcers, particularly if problem behavior is multiply controlled. For example, if the FCR is "I want me time," a caregiver could deliver a break, preferred toys and activities, and high rates of attention. For any given occurrence, only one EO may be present and thus only one reinforcer may be necessary. Although simultaneous delivery of multiple potential reinforcers would mean irrelevant reinforcers are delivered, it is unlikely that their delivery would negatively impact the efficacy of the contextually relevant reinforcer. Further, the delivery of other reinforcers may enhance the efficacy of the contextually relevant reinforcer, such as access to preferred items enhancing the reinforcing efficacy of a break. Despite these benefits of teaching a general FCR, in many everyday environments, specific requests are more likely to efficiently access reinforcement. The problem with teaching a general FCR and delivering a variety of possible reinforcers for the general response is particularly salient when considering problem behavior maintained by multiple reinforcers. For example, in environments with multiple clients, requiring a single caregiver to deliver multiple, potentially mutually exclusive reinforcers simultaneously could present a major barrier to reliable, timely delivery of reinforcement (e.g., Austin & Bevan, 2011; Becraft et al., 2017). Additionally, if a general FCR is taught, when a single EO is present but multiple reinforcers are delivered, it is possible that the reinforcer related to the EO is not delivered. Failure to deliver the matched reinforcer could lead to extinction of the FCR and resurgence of problem behavior. In this situation, it would be difficult to determine if the reduced efficacy is due to simply not delivering the relevant reinforcer or something more serious, such as missing a function or a mis-identified function.

Second, a lack of specificity may soon lead to frustration. For example, teaching a general FCR of "food please" but only providing a specific type of cookie may cause frustration if the individual's preference shifts throughout the day. Third, the propensity towards the use of general FCRs may jeopardize long-term treatment effects as it may not always be socially recognizable to an untrained communication partner. Although there have been studies demonstrating movement from "simple" to "complex" FCRs, this change is often in utterance length (e.g., Ghaemmaghami et al., 2018) rather than increasing request specificity. As compared to simply increasing the utterance length (e.g., to "I want food please"), teaching more specific, differentiated FCRs (e.g., "cookie,", "chip," "soda") would support more efficient access to reinforcers across settings (e.g., Franco et al., 2009).

Finally, using a single, general FCR may not lend itself towards the development of a more nuanced communication repertoire. Although "My way" interventions or teaching ominibus mands (e.g., Hanley et al., 2014) may not prevent the development of more specific requests (e.g., Ward et al., 2021), they do not seem likely to facilitate the development of repertoires with many different mand topographies. As discussed above, the inclusion of multiple FCRs may have important clinical benefits, both in increasing adaptive skills, including independence, and reducing problem behavior. For example, both Franco et al. (2009) and Olive et al. (2008) taught multiple mands within and across classes or reinforcers. They both demonstrated successful reductions in problem behavior. Further, Olive et al. presented data suggesting that FCT increased appropriate pronoun use for the participant, resulting in a more precise manding repertoire. Rather than teaching a general mand that results in access to a wide range of reinforcers, teaching specific mands could be more beneficial in assisting caregivers to provide relevant reinforcers as individuals grow and change. For example, at the end of treatment, Olive et al.'s participant could effectively communicate to gain the attention of the specific person from whom she desired attention and the type of attention she desired. Further, reinforcing specific mands resulted in Franco et al.'s participant using 32 different mands that reduced problem behavior and were useful in a variety of settings. These are both critical pieces of information for caregivers as preferences shift over time.

Given these discrepant results from the research literature, practitioners should consider structuring the teaching of multiple FCRs to capitalize on the strengths of both general and specific FCRs. For example, it may be beneficial to teach a general or omnibus FCR to obtain a rapid treatment effect and then transition to teaching multiple, specific FCRs to allow for the individual to have more precise influence over their environment.

Summary and Conclusions

Choosing an appropriate FCR is a critical but difficult component of effective FCT. Interestingly, we found that a clear FCR selection strategy was described in fewer than 10% of FCT evaluations. Additionally, in their discussion of the effectiveness of FCT, Ghaemmaghami et al. (2021) reported on the paucity of literature available on the maintenance and generalization of FCT across settings. Despite the recommendations available from Tiger et al. (2008) and Ringdahl et al. (2009), there is limited evidence that their guidance is being systematically used to select FCRs. As Ringdahl et al. suggested, it may be that previous recommendations have not been described in a way that makes them easily applicable for individual practitioners. Alternatively, it may be that description of the selection process has not been prioritized by researchers or editors. However, it is clear that FCR selection impacts immediate and long-term effectiveness of FCT because certain FCRs are either more or less costly for caregivers to maintain and either more or less likely to be easily transferred across environments (Randall et al., 2021). In comparing the relative mitigation of resurgence between an unretractable and a retractable FCR, Randall et al. found that an unretractable FCR better mitigated resurgence. Although Randal et al., provided initial evidence of specific benefits of certain FCRs (unretractable) over other FCRs (retractable), further research on FCR selection methods is critical for ensuring the long-term maintenance and generalization of FCT in practice.

Taken together, there are patterns from the research literature that can inform how practitioners select an FCR and conduct FCT, especially when considering long-term change in their client's everyday environment. To that end we have provided recommendations for FCR selection based on the currently available research. The appendix provides a checklist to guide FCR selection based on these recommendations (see Table 1). Although this checklist has not been validated as a formal assessment, it is derived from the recommendations discussed in this paper, based on the literature from 2008 to 2021, and may be a useful tool in guiding practitioners.

Although researchers have not regularly evaluated specific procedures for selecting FCRs, there are patterns in the empirical literature that suggest effective practices for practitioners: considering multiple FCRs, considering individual factors, considering the everyday environment, considering FCR features on an individual basis, and building toward multiple, specific FCRs. For FCT to move from an efficacious to an effective intervention (as described by Ghammeghami et al., 2021), it is important that researchers and practitioners consider long-term goals of FCT in their FCR selection. It is also critical that researchers devote more systematic evaluation to identifying the best selection strategies and important features of FCR topography to support long-term, generalizable treatment gains, a goal that can be facilitated by close collaboration with practitioners taking systematic approaches to selecting FCRs and implementing FCT.

Appendix

Checklist for Selecting Functional Communication Responses

To use the table, practitioners should add to the list of common FCRs in Row 2 any unique, client-specific FCR options where common FCRs are listed. Each subsequent row of the table asks a question or presents a consideration based on our recommendations, with exemplar references from the peer-reviewed empirical literature. For each row, under each FCR topography, practitioners can place an "X" if the topography should be eliminated from the potential options due to that consideration. For the remaining FCRs, assign a rank order starting with a "1" for the best FCR in that consideration category and less optimal FCRs being given larger numbers. Multiple topographies could receive the same score if they are equally optimal based on that specific consideration. Once all topographies have been scored, assign a total score for each non-eliminated topography by adding together all the scores from each row. The topography(ies) with the lowest score(s) are considered the most optimal topography, given all considerations. Finally, if several topographies are identified as optimal, consider these factors: the ease of prompting each topography; determining ways to best assess client preference throughout treatment; and creating a plan to teach both omnibus or general FCRs and more specific FCRs.

Table 1 Checklist for selecting functional communication responses

Considerations	Functional Communication Responses								References
Identify multiple possible FCRs	Vocal	Sign	Picture exchange	Picture touch	Object Exchange	Object touch	Electronic	Other:	Berg et al., 2015; Harding et al., 2009; Winborn-Kemmerer et al., 2009
Individual Factors									
Are any FCR(s) contraindicated by the individual's physical features/ abilities?									
Which FCRs fit best with the individual's current communication system?									
Which FCR(s) are easiest to prompt/limit exposure to the EO?									Falcomata et al., 2017; Fisher et al., 2018
Environmental Factors									
Which FCR(s) are most socially recognizable in the individual's environments?									Tiger et al., 2008
Which FCRs are least costly for caregivers or the individual to access and maintain?									Randall et al., 2021
FCR features									
Are there FCRs that are preferred due to their incompatibility with problem behavior?									Falcomata et al., 2010
What FCR(s) will be the easiest for the individual to have with them at all times?									Randall et al., 2021
If response restriction is needed, which responses can the clinician control access to?									Fisher et al., 2014
Total									
Evaluate response effort and speed of acquisition for multiple FCRs									Ringdahl et al., 2009
Identify ways to assess individual preference throughout treatment									Berg et al., 2015; Harding et al., 2009; Winborn-Kemmerer et al., 2009
Create a plan to move from general to specific FCRs to enhance social recognizability									Tiger et al., 2008

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Declarations

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References

Adami, S., Falcomata, T. S., Muething, C. S., & Hoffman, K. (2017). An evaluation of lag schedules of reinforcement during functional communication training: Effects on varied mand responding and challenging behavior. *Behavior Analysis in Practice, 10*(3), 209–213. https://doi.org/10.1007/s40617-017-0179-7

Adkins, T., & Axelrod, S. (2001). Topography-versus selection-based responding: Comparison of mand acquisitions in each modality. *The Behavior Analyst Today*, *2*(3), 259. https://doi.org/10.1007/BF03393051

Austin, J. E., & Tiger, J. H. (2015). Providing alternative reinforcers to facilitate tolerance to delayed reinforcement following functional communication training. *Journal of Applied Behavior Analysis, 48*(3), 663–668. https://doi.org/10.1002/jaba.215

Austin, J. L., & Bevan, D. (2011). Using differential reinforcement of low rates to reduce children's requests for teacher attention. *Journal of Applied Behavior Analysis, 44*(3), 451–461. https://doi.org/10.1901/jaba.2011.44-451

Becraft, J. L., Borrero, J. C., Mendres-Smith, A. E., & Castillo, M. I. (2017). Decreasing excessive bids for attention in a simulated early education classroom. *Journal of Behavioral Education, 26*(4), 371–393. https://doi.org/10.1007/s10864-017-9275-6

Berg, W. K., Ringdahl, J. E., Ryan, S. E., Ing, A. D., Lustig, N., Romani, P., Wacker, D. P., Andersen, J. K., & Durako, E. (2015). Resurgence of mands following functional communication training. *Revista Mexicana De Analisis De La Conducta, 41*(2), 166. https://doi.org/10.5514/rmac.v41.i2.63747

Carr, E. G., & Durand, V. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis, 18*, 111-126. https://doi.org/10.1901/jaba.1985.18-111

Chambers, M., & Rehfeldt, R. A. (2003). Assessing the acquisition and generalization of two mand forms with adults with severe developmental disabilities. *Research in Developmental Disabilities, 24*(4), 265–280. https://doi.org/10.1016/S0891-4222(03)00042-8

Dalmau, Y. C., Wacker, D. P., Harding, J. W., Berg, W. K., Schieltz, K. M., Lee, J. F., Breznican, G. P., & Kramer, A. R. (2011). A preliminary evaluation of functional communication training effectiveness and language preference when Spanish and English are manipulated. *Journal of Behavioral Education, 20*(4), 233–251. https://doi.org/10.1007/s10864-011-9131-z

Derosa, N. M., Fisher, W. W., & Steege, M. W. (2015). An evaluation of time in establishing operation on the effectiveness of functional communication training. *Journal of Applied Behavior Analysis, 48*(1), 115–130. https://doi.org/10.1002/jaba.180

Diaz-Salvat, C. C., & St. Peter, C. C. and Shuler, N.J. (2020). Increased number of responses may account for reduced resurgence following serial training. *Journal of Applied Behavior Analysis, 53*, 1542–1558. https://doi.org/10.1002/jaba.686

Dracobly, J. D., & Smith, R. G. (2012). Progressing from identification and functional analysis of precursor behavior to treatment of self-injurious behavior. *Journal of Applied Behavior Analysis, 45*(2), 361–374. https://doi.org/10.1901/jaba.2012.45-361

Doughty, S. S., & Anderson, C. M. (2006). Effects of noncontingent reinforcement and functional communication training on problem behavior and mands. *Education and Treatment of Children*, 23–50. http://www.jstor.org/stable/42899869

Falcomata, T. S., Muething, C. S., Silbaugh, B. C., Adami, S., Hoffman, K., Shpall, C., & Ringdahl, J. E. (2018). Lag schedules and functional communication training: Persistence of mands and relapse of problem behavior. *Behavior Modification, 42*(3), 314–334. https://doi.org/10.1177/0145445517741475

Falcomata, T. S., Roane, H. S., Feeney, B. J., & Stephenson, K. M. (2010). Assessment and treatment of elopement maintained by access to stereotypy. *Journal of Applied Behavior Analysis, 43*(3), 513–517. https://doi.org/10.1901/jaba.2010.43-513

Falcomata, T. S., Shpall, C. S., Ringdahl, J. E., Ferguson, R. H., Wingate, H. V., & Swinnea, S. B. (2017). A Comparison of high and low-proficiency mands during functional communication training across multiple functions of problem behavior. *Journal of Developmental and Physical Disabilities, 29*(6), 983–1002. https://doi.org/10.1007/s10882-017-9571-z

Fisher, W. W., Greer, B. D., Fuhrman, A. M., & Querim, A. C. (2015). Using multiple schedules during functional communication training to promote rapid transfer of treatment effects. *Journal of Applied Behavior Analysis, 48*(4), 713–733. https://doi.org/10.1002/jaba.254

Fisher, W. W., Greer, B. D., Mitteer, D. R., Fuhrman, A. M., Romani, P. W., & Zangrillo, A. N. (2018). Further evaluation of differential exposure to establishing operations during functional communication training. *Journal of Applied Behavior Analysis, 51*(2), 360–373. https://doi.org/10.1002/jaba.451

Fisher, W. W., Greer, B. D., Querim, A. C., & DeRosa, N. (2014). Decreasing excessive functional communication responses while treating destructive behavior using response restriction. *Research in Developmental Disabilities, 35*(11), 2614–2623. https://doi.org/10.1016/j.ridd.2014.06.024

Franco, J. H., Lang, R. L., O'Reilly, M. F., Chan, J. M., Sigafoos, J., & Rispoli, M. (2009). Functional analysis and treatment of inappropriate vocalizations using a speech-generating device for a child with autism. *Focus on Autism and Other Developmental Disabilities, 24*(3), 146–155. https://doi.org/10.1177/1088357609338380

Fritz, J. N., Iwata, B. A., Hammond, J. L., & Bloom, S. E. (2013). Experimental analysis of precursors to severe problem behavior. *Journal of Applied Behavior Analysis, 46*(1), 101–129. https://doi.org/10.1002/jaba.27

Fuhrman, A. M., Fisher, W. W., & Greer, B. D. (2016). A preliminary investigation on improving functional communication training by mitigating resurgence of destructive behavior. *Journal of Applied Behavior Analysis, 49*(4), 884–899. https://doi.org/10.1002/jaba.338

Ghaemmaghami, M., Hanley, G. P., & Jessel, J. (2016). Contingencies promote delay tolerance. *Journal of Applied Behavior Analysis, 49*, 548–575. https://doi.org/10.1002/jaba.333

Ghaemmaghami, M., Hanley, G. P., & Jessel, J. (2021). Functional communication training: From efficacy to effectiveness. *Journal of Applied Behavior Analysis, 54*, 122–143. https://doi.org/10.1002/jaba.762

Ghaemmaghami, M., Hanley, G. P., Jessel, J., & Landa, R. (2018). Shaping complex functional communication responses. *Journal of Applied Behavior Analysis, 51*(3), 502–520. https://doi.org/10.1002/jaba.468

Greer, B. D., Fisher, W. W., Saini, V., Owen, T. M., & Jones, J. K. (2016). Functional communication training during reinforcement schedule thinning: An analysis of 25 applications. *Journal of Applied Behavior Analysis, 49*(1), 105–121. https://doi.org/10.1002/jaba.265

Greer, B. D., & Shahan, T. A. (2019). Resurgence as Choice: Implications for promoting durable behavior change. *Journal of Applied Behavior Analysis, 52*(3), 816–846. https://doi.org/10.1002/jaba.573

Grow, L. L., Kelley, M. E., Roane, H. S., & Shillingsburg, M. A. (2008). Utility of extinction-induced response variability for the selection of mands. *Journal of Applied Behavior Analysis*, *41*(1), 15-24. https://doi.org/10.1901/jaba.2008.41-15

Hagopian, L. P., Boelter, E. W., & Jarmolowicz, D. P. (2011). Reinforcement schedule thinning following functional communication training: Review and recommendations. *Behavior Analysis in Practice, 4*(1), 4–16. https://doi.org/10.1007/BF03391770

Hanley, G. P., Jin, C. S., Vanselow, N. R., & Hanratty, L. A. (2014). Producing meaningful improvements in problem behavior of children with autism via synthesized analyses and treatments. *Journal of Applied Behavior Analysis*, *47*, 16– 36. https://doi.org/10.1002/jaba.106

Harding, J. W., Wacker, D. P., Berg, W. K., Winborn-Kemmerer, L., Lee, J. F., & Ibrahimovic, M. (2009). Analysis of multiple manding topographies during functional communication training. *Education & Treatment of Children*, *32*(1), 21. https://doi.org/10.1353/etc.0.0045

Horner, R. H., & Day, H. (1991). The effects of response efficiency on functionally equivalent competing behaviors. *Journal of Applied Behavior Analysis, 24*, 719–732. https://doi.org/10.1901/jaba.1991.24-719

Kurtz, P. F., Boelter, E. W., Jarmolowicz, D. P., Chin, M. D., & Hagopian, L. P. (2011). An analysis of functional communication training as an empirically supported treatment for problem behavior displayed by individuals with intellectual disabilities. *Research in Developmental Disabilities, 32*(6), 2935–2942. https://doi.org/10.1016/j.ridd.2011.05.009

Lambert, J. M., Bloom, S. E., Samaha, A. L., & Dayton, E. (2017). Serial functional communication training: Extending serial DRA to mands and problem behavior. *Behavioral Interventions, 32*, 311–325. https://doi.org/10.1002/bin.1493

Lieving, G. A., Hagopian, L. P., Long, E. S., & O'Connor, J. (2004). Response-class hierarchies and resurgence of severe problem behavior. *The Psychological Record, 54*, 621–634. https://doi.org/10.1007/BF03395495

Muething, C. S., Falcomata, T. S., Ferguson, R., Swinnea, S., & Shpall, C. (2018). An evaluation of delay to reinforcement and mand variability during functional communication training. *Journal of Applied Behavior Analysis, 51*(2), 263–275. https://doi.org/10.1002/jaba.441

Najdowski, A. C., Wallace, M. D., Ellsworth, C. L., MacAleese, A. N., & Cleveland, J. M. (2008). Functional analyses and treatment of precursor behavior. *Journal of Applied Behavior Analysis, 41*(1), 97–105. https://doi.org/10.1901/jaba.2008.41-97

Olive, M. L., Lang, R. B., & Davis, T. N. (2008). An analysis of the effects of functional communication and a voice output communication aid for a child with autism spectrum disorder. *Research in Autism Spectrum Disorders, 2*(2), 223–236. https://doi.org/10.1016/j.rasd.2007.06.002

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chour, R., Glanville, J., Grimshaw, J.M., Hrobjartsson, A., Lalu, M.M., Li, T. L., E.W., Wilson, E.M., McDonald, S., McGuinness, L.A.,… & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *International Journal of Surgery*, *88*, 105906. https://doi.org/10.1016/j.ijsu.2021.105906

Pyles, D. A., Muniz, K., Cade, A., & Silva, R. (1997). A behavioral diagnostic paradigm for integrating behavior-analytic and psychopharmacological interventions for people with a dual diagnosis. *Research in Developmental Disabilities, 18*(3), 185–214. https://doi.org/10.1016/S0891-4222(97)00003-6

Randall, K. R., Greer, B. D., Smith, S. W., & Kimball, R. T. (2021). Sustaining behavior reduction by transitioning the topography of the functional communication response. *Journal of Applied Bbehavior Analysis*. https://doi.org/10.1002/jaba.824

Ringdahl, J. E., Falcomata, T. S., Christensen, T. J., Bass-Ringdahl, S. M., Lentz, A., Dutt, A., & Schuh-Claus, J. (2009). Evaluation of a pre-treatment assessment to select mand topographies for functional communication training. *Research in Developmental Disabilities, 30*(2), 330–341. https://doi.org/10.1016/j.ridd.2008.06.002

Smith, R. G., & Churchill, R. M. (2002). Identification of environmental determinants of behavior disorders through functional analysis of precursor behaviors. *Journal of Applied Behavior Analysis, 35*(2), 125–136. https://doi.org/10.1901/jaba.2002.35-125

Tiger, J. H., Hanley, G. P., & Bruzek, J. (2008). Functional communication training: A review and practical guide. *Behavior Analysis in Practice, 1*(1), 16–23. https://doi.org/10.1007/BF03391716

Valentino, A. L., LeBlanc, L. A., Veazey, S. E., Weaver, L. A., & Raetz, P. B. (2018). Using a prerequisite skills assessment to identify optimal modalities for mand training. *Behavior Analysis in Practice, 12*, 22–32. https://doi.org/10.1007/s40617-018-0256-6

Vollmer, T. R., Borrero, J. C., Lalli, J. S., & Daniel, D. (1999). Evaluating self-control and impulsivity in children with severe behavior disorders. *Journal of Applied Behavior Analysis, 32*, 451–466. https://doi.org/10.1901/jaba.1999.32-451

Ward, S. N., Hanley, G. P., Warner, C. A., & Gage, E. E. (2021). Does teaching an omnibus mand preclude the development of specifying mands? *Journal of Applied Behavior Analysis, 54*, 248–269. https://doi.org/10.1002/jaba.784

Winborn, L., Wacker, D. P., Richman, D. M., Asmus, J., & Geier, D. (2002). Assessment of mand selection for functional communication training packages. *Journal of Applied Behavior Analysis, 35*, 295–298. https://doi.org/10.1901/jaba.2002.35-295

Winborn-Kemmerer, L., Ringdahl, J. E., Wacker, D. P., & Kitsukawa, K. (2009). A demonstration of individual preference for novel mands during functional communication training. *Journal of Applied Behavior Analysis, 42*(1), 185–189. https://doi.org/10.1901/jaba.2009.42-185

Winborn-Kemmerer, L., Wacker, D. P., Harding, J., Boelter, E., Berg, W., & Lee, J. (2010). Analysis of mand selection across different stimulus conditions. *Education & Treatment of Children, 33*(1), 49. https://doi.org/10.1353/etc.0.0086

Wraikat, R., Sundberg, C. T., & Michael, J. (1991). Topography-based and selection-based verbal behavior: A further comparison. *The Analysis of Verbal Behavior*, *9*(1), 1-17. https://doi.org/10.1007/BF03392856