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A Motivation-Driven Framework for Developing Functional Communication and Social Interaction in Children with Autism

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Abstract

The article examines a motivation-driven framework for developing functional communication and social interaction in children with autism spectrum disorder. The aim is to integrate verbal behaviour theory, motivating operations, mand training, intensive teaching, errorless learning, natural environment teaching, and inclusive early childhood practice into a coherent clinical and educational model. The study's relevance stems from the central role of communicative and social deficits in autism, as well as the need for interventions that connect structured instruction with everyday social participation. The novelty lies in treating motivation as the organizing principle across theoretical, procedural, and contextual layers of intervention. The article concludes that functional communication develops through sequential mand training, systematic expansion of verbal operants, intraverbal instruction, and planned generalization across natural settings. Inclusive classrooms are presented as environments where peer interaction can generate meaningful communicative occasions and support social growth. The article will be useful for behavior analysts, speech-language specialists, early childhood educators, inclusion coordinators, and researchers in autism intervention.

Keywords: autism spectrum disorder, applied behavior analysis, verbal behavior, manding, motivating operations, functional communication, inclusive education.

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1. Introduction

Autism spectrum disorder, abbreviated as ASD, is a neurodevelopmental condition marked by persistent deficits in social communication and reciprocal interaction, alongside restricted, repetitive patterns of behavior. Surveillance data from the past decade show that prevalence is increasing. The most recent data estimates that autism affects around 1 in 36 children in some regions (Maenner, 2023). The core diagnostic features of autism are deficits in communication and social interaction (Amoretti et al., 2021). Their downstream effects have been reported for aspects such as schooling, peer relationships, and other areas of adaptive function. Notably, these areas can be affected by timely intervention during preschool, stressing the importance of research and development for efficacious early communication strategies (Zhu et al., 2026).

These traditions have also impacted perspectives on communication intervention for individuals with ASD within the field. Form-focused language work, drawn from speech-language pathology, addresses the structural scaffolding of speech, phonology, vocabulary, and syntax, and yields gains in linguistic form. Structural improvement does not, by itself, translate into functional use of language in everyday contexts. Children whose communicative motivation runs low gain less from form-focused work than peers whose motivation runs high. Behavior-analytic approaches grounded in Skinner's analysis of verbal behavior reframe language as operant behavior under the control of consequences and antecedent conditions. The target shifts from form to function. A robust procedural literature has developed within this tradition, encompassing discrete-trial teaching, errorless learning, manding, intraverbal training, and natural environment teaching (Roncati & De, 2023). Parallel work in inclusive early childhood education has examined how children with ASD can be supported alongside typically developing peers, with peer-mediated procedures showing promise for social-interaction outcomes. Each strand carries its own evidence base. The procedures live in separate publications, taught in separate workshops, embedded in separate program designs. Motivation surfaces in every account and operates as the connective tissue in none.

The present article works in this gap. The aim is to weave the literature on verbal behavior, motivating operations, applied behavior-analytic teaching procedures, and inclusive early childhood education into one motivation-driven framework for developing functional communication and social interaction in children with ASD. Section 2 sets out the methods of the narrative review. Section 3 presents a synthesis of five components and concludes with an integrated description. Section 4 discusses theoretical and applied implications, the limits of narrative synthesis, and directions for empirical validation. Section 5 offers a closing summary.

2. Methods

This article takes the form of a narrative review aimed at theoretical synthesis. The goal lies in conceptual integration across methodologically heterogeneous literatures. PRISMA reporting standards for systematic reviews do not apply here, and the review makes no claim to exhaustive coverage of intervention studies.

Sources came from peer-reviewed journals in applied behavior analysis, journals on autism and developmental disabilities, and seminal book-length treatments of verbal behavior and applied behavior analysis. Database searches ran through PubMed, PsycINFO, and ERIC, using combinations of the terms verbal behavior, manding, motivating operations, autism, functional communication, intensive teaching, discrete trial, natural environment teaching, errorless learning, and inclusion.

Sources were retained when they addressed at least one of five thematic areas relevant to the framework: the theory of verbal behavior and the functional independence of operants; motivating operations and manding repertoire development; intensive teaching procedures, including discrete trial teaching and errorless learning; natural environment teaching and the generalization of communicative behavior; and inclusive early childhood programs serving children with ASD.

Sources were grouped along these five thematic areas. Key constructs, procedures, and findings within each area were summarized. The synthesis then crossed area boundaries to track motivation as a recurring construct. The integrated framework presented in Section 3.7 emerged from this cross-thematic reading and was not predetermined. The framework operates as a heuristic for organizing practice and generating empirical hypotheses. It is not an empirically validated intervention package.

3. Results

3.1 Verbal behavior and functional independence

Skinner's analysis of verbal behavior treats language as operant behavior under the control of its consequences and the conditions under which it occurs (Simmons, 2021), depending on the controlling variables. Emitted under conditions of deprivation and reinforced by access to water, it functions as a mand. Emitted in the presence of water and reinforced by generalized social attention, it functions as a tact. Emitted in response to another speaker's words without the referent present, it functions as an intraverbal. Echoic, textual, and transcriptive operants round out the basic taxonomy. Table 1 lays out the operants and their controlling variables.

Table 1. Verbal operants and their controlling variables

Operant	Antecedent / controlling variable	Consequence (reinforcer)	Example	Function
Mand	Motivating operation (deprivation, aversive condition)	The specific reinforcer related to the MO	A thirsty child says "juice" and receives juice	Requesting
Tact	A non-verbal stimulus present in the environment	Generalized social reinforcement	A child sees a dog, says "dog", receives praise	Labeling / commenting
Echoic	Another speaker's verbal stimulus with point-to-point correspondence	Generalized social reinforcement	Adult says "ball", child says "ball"	Repeating speech
Intraverbal	Another speaker's verbal stimulus without point-to-point correspondence	Generalized social reinforcement	Adult asks "What did you eat?", child answers "pasta"	Conversation / answering
Textual	A written verbal stimulus	Generalized social reinforcement	A child sees the word "cat" and reads it aloud	Reading

A central empirical finding within this tradition is the functional independence of the verbal operants. A child who reliably emits a word as a tact may fail to emit the same word as a mand or intraverbal, and the reverse holds with equal force (Mason et al., 2024). The pedagogical consequence falls out cleanly. Teaching a child to label objects produces, in itself, no ability to request those objects, comment on them in conversation, or answer questions about them. Each operant deserves treatment as a distinct teaching target. For children with ASD, whose communicative deficits track function more closely than form, this analytic frame offers a more workable starting point than approaches treating language as the accumulation of vocabulary.

3.2 Motivation and manding

The motivating operation, refined in Michael's writings, names environmental events that alter both the reinforcing potency of stimuli and the momentary frequency of behavior tied to those reinforcers (Edwards & Poling, 2020). A child who has gone without a preferred toy for some time will, in that moment, find the toy more reinforcing and will be more likely to engage in behaviors previously tied to obtaining it. Motivating operations describe the conditions under which behavior becomes likely. They sit at one remove from the discriminative stimuli that signal whether reinforcement is available.

Among the verbal operants, the mand holds a unique position. It stands as the only operant under the speaker's direct control. A tact is evoked by the presence of a stimulus. An intraverbal is evoked by another speaker's words. A mand is evoked by what the child wants. This makes the mand the natural entry point into communication for learners with limited verbal repertoires. The procedural literature draws a line between captured motivating operations, in which the practitioner uses the child's existing motivation, and contrived motivating operations, in which the practitioner arranges environmental conditions to manufacture motivation for a target item or activity (Frampton et al., 2024). Both rest on a single underlying logic. Communication gets taught when the child has reason to communicate.

Two procedural prerequisites support manding instruction. The first is pairing, the systematic association of the practitioner with the teaching environment and its reinforcement, so that the practitioner's presence acquires the function of a conditioned reinforcer. Without pairing, instructional control rests on compliance, with the child's engagement in the learning context left out of the picture. The second is instructional control built through reinforcement-based procedures, with escape and avoidance contingencies kept off the table. Together pairing and

instructional control set the stage on which motivation can be harnessed for teaching. The thesis of this section runs as follows. Motivation operates as the organizing principle through which the other components of the framework do their work. It does not operate as one variable in a list.

3.3 Intensive teaching and errorless learning

Intensive teaching, often delivered through a discrete-trial format, provides a structured framework in which a high density of learning opportunities can be delivered within a short window (Kasari et al., 2025). Each trial has three parts. The antecedent, the instruction or stimulus; the child's response; the consequence, reinforcement for correct responding. The format permits precise control over target difficulty, the schedule of reinforcement, and the introduction of new material.

Errorless learning procedures sit at the heart of effective intensive teaching. The practitioner provides prompts at the outset of acquisition to ensure correct responding, and then fades them across trials systematically. The alternative, letting the child err and then correcting, gets discarded. Transfer trials, in which a prompted correct response is immediately followed by an unprompted opportunity to produce the same response, accelerate the transfer of stimulus control from the prompt to the natural antecedent (Dell'Aringa et al., 2021). The approach holds the practice of incorrect responses to a minimum. Incorrect responses, once practiced, can prove resistant to extinction.

Two further procedural elements support intensive teaching: schedules of reinforcement and token economies. Variable schedules sustain responding across larger response requirements without satiating the child on a particular reinforcer. Token economies bridge the gap between immediate effortful responding and access to terminal reinforcers. These tools allow structured teaching to retain its motivational orientation as the density of reinforcement gets thinned. Intensive teaching depends on one. Without careful attention to what reinforces the individual child, the format collapses into compliance training.

3.4 Manding repertoire and intraverbal development

Manding instruction follows a developmental sequence that tracks the increasing complexity of the controlling motivating operations. Early-stage manding targets the child's requests for highly preferred, present items and activities. Once a stable repertoire of mands for present items has taken hold, instruction extends to mands for items in their absence, mands for missing components of an activity, mands for information (where, when, who, why), and mands for actions and attention (Domanska et al., 2022). Each step calls for more abstract motivating operations and more differentiated discriminative control. Table 2 lays out the typical progression of manding targets and procedural emphases across learner levels.

Table 2. Manding targets and procedural emphases across learner levels

Learner level	Manding targets	Procedural emphasis
Early	Mands for present, highly preferred items and activities (a specific toy in view, a favored food in sight).	Captured motivating operations. Immediate, item-specific reinforcement. Dense prompting paired with rapid fading. Pairing of the practitioner with reinforcement.
Intermediate	Mands for absent items, mands for missing components of an activity, mands for actions and assistance.	Contrived motivating operations. Transfer trials moving from prompted to unprompted responses. Variable schedules of reinforcement.
Advanced	Mands for information (where, when, who, why), mands for attention, mands embedded in conversational exchanges.	Naturalistic arrangements. Thinned reinforcement. Integration with the intraverbal repertoire and peer interaction. Generalization across people, settings, materials.

The intraverbal repertoire forms a further developmental layer. An intraverbal is verbal behavior under the control of other verbal behavior without point-to-point correspondence, such as answering a question, completing a song, or taking a turn in conversation. For children with ASD, intraverbal behavior tends to lag the most among the verbal operants, and its absence carries direct consequences for social interaction. Conversation, narrative, commentary on personal experience, and the back-and-forth of peer engagement all share an intraverbal structure. Teaching children to generate comments about their own past experiences, what they did at the weekend, and what they ate for lunch calls for careful procedural sequencing. The practitioner sets up the antecedent verbal stimulus. The practitioner prompts the response under conditions that resemble the natural occasion. The practitioner fades prompts systematically until the child's own memory of the experience controls the response. The technical specificity of this work pulls intraverbal training apart from informal conversation practice.

3.5 Natural environment teaching and generalization

Natural environment teaching, abbreviated as NET, takes up the problem of generalization. Skills acquired in highly structured, discrete-trial formats do not transfer to contexts where they are functionally needed without support. Without explicit programming for generalization, intensive teaching risks producing skills that stay tied to the therapy room. NET embeds teaching within the child's ongoing activities and the motivating operations that occur within them. The antecedents under which skills are practiced come to resemble those under which the skills will need to occur.

The procedural literature draws distinctions among learner profiles. Early learners need frequent prompting, dense reinforcement, and a narrow set of targets practiced across many opportunities. Intermediate learners can sustain longer instructional sequences and gain from increased variation in materials and contexts. Advanced learners take on more complex social and verbal targets and can tolerate thinner schedules of reinforcement and longer delays between response and reinforcer. Adapting NET procedures to the learner profile carries weight. Apply advanced learner techniques to an early learner, and the procedures fail. Restrict an advanced learner to early-stage procedures and progress stalls.

3.6 Application in inclusive educational settings

Inclusive early childhood programs, in which children with ASD attend classrooms alongside typically developing peers, offer a context in which the components reviewed above can be deployed in concert. The literature on inclusion-oriented practice for children with ASD points to three structural conditions for effectiveness (Hasson et al., 2022). The first concerns environmental organization. Intensive teaching and naturalistic teaching coexist without interference when dedicated spaces and times for structured instruction sit alongside ongoing opportunities for embedded teaching during routines and play. The second concerns staff training. Educators and behavior-analytic practitioners share a working command of the verbal operants, motivating operations, and prompting procedures, or the framework cannot be implemented with fidelity. The third concerns coordination across the therapeutic and educational teams. Targets pursued in one setting receive support in the other, and progress in one does not get undone in the other.

Social interaction with peers calls for procedural attention of its own. It does not arrive as a by-product of communicative training (Alassaf, 2025). Teaching children with ASD to initiate interactions, sustain conversational exchanges, and form preferred peer associations draws on structured peer-mediated procedures, peer modelling, scripted initiations under systematic fading, and reinforcement of reciprocal exchanges. Within the framework, these procedures sit on a continuum with intraverbal training. A child who can answer questions about a peer's preferences, comment on shared activities, and recall past interactions has the verbal repertoire on which friendship gets built.

A motivation-driven approach fits well with the inclusive context. The presence of typically developing peers generates natural motivating operations on a continuous basis. Children's interest in what their peers are doing, their pull toward joining activities, and their reactions to peers' commentary, these create occasions for communication that no contrived arrangement can match. The practitioner's task lies in recognizing and harnessing these naturally occurring motivating operations. The task does not lie in imposing a structure that overrides them.

3.7 Integrated model

The five components synthesized above can be folded into a single framework with motivation as the through-line. The theoretical contour comes from the analysis of verbal behavior and the functional independence of operants. The procedural layer holds intensive teaching with errorless learning, the manding sequence, intraverbal training, and natural environment teaching. The contextual layer is the inclusive educational setting, where these procedures run in coordination. Figure 1 represents the model schematically.

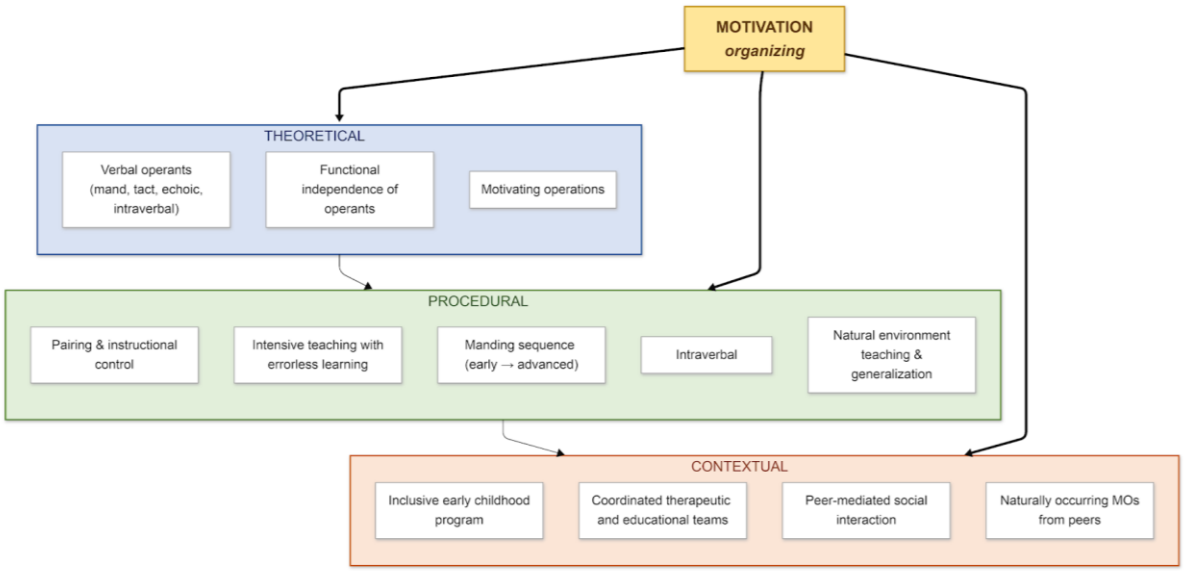

Figure 1. Integrated motivation-driven framework

Motivation operates as the organizing principle that cuts across the theoretical, procedural, and contextual layers. A child's progression through the model traces a developmental arc. Pairing and establishing instructional control come first. Early manding for present preferred items follows. The verbal operants extend, intraverbal behavior takes shape, the repertoires get put to work in social interaction with peers, and the child takes a place within the inclusive educational environment. At each stage, the practitioner identifies the operative motivating operations and arranges instruction so that communication serves the child's own purposes.

4. Discussion

Three contributions of the framework deserve attention. The first is theoretical. Treating motivation as the organizing principle that runs across components, and not as one variable in a list, offers a unifying account of practices that have been described in isolation. Discrete-trial teaching, manding, intraverbal training, and naturalistic procedures do not constitute alternatives from which the practitioner chooses. They form coordinated elements of a single approach in which the child's motivation determines what gets taught, when, and how. The verbal-behavior fundament fits ASD because the deficits of the condition track function more than form. A function-based analysis aligns more closely with the structure of the impairment than do form-focused approaches.

The second contribution is applied. For practitioners, the framework offers a coherent decision structure. Assess the child's motivating operations. Establish pairing and instructional control. Build the manding repertoire as the entry point into communication. Extend across the operants. Program for generalization through naturalistic teaching. For designers of inclusive early childhood programs, the framework outlines the structural conditions under which components can be implemented with fidelity, including coordinated teaching formats, trained staff, and integration across therapeutic and educational teams. For specialist training, the framework supplies a curriculum architecture that ties theoretical concepts to procedural practice.

As a narrative review, the synthesis bears the imprint of the author's selection of sources and interpretive lens. It does not claim to be exhaustive and may underrepresent strands of the literature falling outside the verbal-behaviour tradition. The framework operates as a theoretical and procedural integration. The integrated

model in its present form has not undergone direct empirical evaluation as a single package, though its individual components rest on substantial evidence. Children with ASD differ from each other in cognitive, linguistic, and behavioral profiles. The framework calls for adaptation to individual cases, in particular the calibration of NET procedures to learner profiles and the selection of targets for intraverbal and social-interaction training.

Several directions for future research follow. Empirical evaluations of the integrated model, against alternative frameworks or against eclectic practice, would test whether the proposed coordination across components yields outcomes beyond those produced by the components in isolation. Longitudinal studies of children educated within inclusive programs that implement the framework could track social-interaction and academic outcomes across the transition to school-age settings. Adaptation studies could examine the framework's application across age groups beyond the preschool years and across levels of functioning. Implementation research could examine the staff-training and coordination conditions under which inclusive programs sustain the model over time.

5. Conclusion

Functional communication and social interaction in children with ASD develop with the greatest leverage when intervention organizes itself around the child's motivation. The analysis of verbal behavior gives this principle its theoretical contour. Manding establishes the entry point into communication. Intensive teaching with errorless learning builds initial repertoires. Intraverbal training extends those repertoires into the verbal substrate of social interaction. Natural environment teaching ensures generalization to the contexts in which communication does its work. Inclusive early childhood programs offer a setting in which these procedures run in coordination, and in which the natural motivating operations generated by typically developing peers become a resource for communicative growth. The framework presented here treats these elements as a single approach unified by the through-line of motivation. The treatment moves past the older picture of separate techniques sitting side by side. Further empirical work should validate the integrated model and refine its application across the heterogeneity of children with ASD. The framework offered here serves as a heuristic for that work and as a structure within which both practice and research can proceed.

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