

## Common and Intraverbal Bidirectional Naming

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**Abstract** *Naming* has been defined as a generalized operant that combines speaker and listener behaviors within the individual. The purpose of this paper is to reintroduce the concept of naming and its subtypes, *common* and *intraverbal*, distinguish it from other terms such as the tact relation, and discuss the role of naming in the development of verbal behavior. Moreover, a taxonomical change is proposed. The addition of the qualifier *bidirectional* would serve to emphasize the speaker-listener bidirectional relation and serve to distinguish the technical term from its commonsense use. It is hoped that this paper will inspire future basic and applied research on an important extension of Skinner’s analysis of verbal behavior.

**Keywords** Development · Intraverbal · Naming · Tact · Verbal behavior

In commonsense terms, a *name* is a word (or words) assigned to objects or events. It typically “indicates someone, something, or someplace” (Spears, 2002, p. 376). Thus, when we give a name to something, we are *naming* it. This usage of naming has appeared in both the psychological and behavior-analytic literatures for years. For example, the Boston Naming Test (Kaplan, Goodglass, & Weintraub, 2000), a common diagnostic tool in identifying neurodegenerative diseases, consists of 60 line drawings of objects graded in difficulty that participants are asked to name. In behavior analysis, a series of experiments (e.g., Olenick & Pear, 1980; Welch & Pear, 1980) have assessed different arrangements of prompting and reinforcement to teach picture naming to individuals with disabilities. Naming also appears across lessons in curricula aimed at teaching a variety of skills to children diagnosed with autism (e.g., Leaf & McEachin,

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This paper is dedicated to the 20th anniversary of Home and Lowe’s (1996) seminal paper on naming. I would like to thank Danielle LaFrance, Dave Palmer, Doug Greer, and Svea Love for their comments.

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1999; Lovaas, 2003) and is sometimes referred to as tact training (e.g., Sundberg & Partington, 1998). In the stimulus equivalence literature (Sidman, 1994), naming has been equated to vocal performances displayed by participants after auditory-visual matching-to-sample training. For example, Sidman (1971) assessed whether a participant could name pictures and printed words (i.e., oral naming test), after learning to select them in the presence of their spoken words.<sup>1</sup>

Although the terms *tacting*, *naming*, and even *labeling* (e.g., Lovaas, 2003) are used as synonyms, they are not. A *tact* is a term to describe a type of functional relation between an antecedent stimulus, a behavior, and a consequence. It is a verbal operant in which the topography (i.e., what is said, written, or signed) is under functional control of a nonverbal discriminative stimulus (e.g., an object, a property, an action), which has been differentially correlated with nonspecific or generalized reinforcement for the emission of a specific topography (Skinner, 1957). The terms *naming* and *labeling*, on the other hand, serve to describe a topographical relation or the assignment of a name to an object, property, or event. For example, when a child says, “car” in the presence of a picture of a car and the question, “What is this?” we may say that *the child named the picture*. Our description is based on what the child said (topography), since the correspondence between the word and its referent seems obvious. In contrast, we describe the child’s behavior as a tact, if we can verify that it was evoked by the picture (and not the question, for example), given its previous correlation with reinforcement for saying “car” in the presence of its referent (and not in its absence). Thus, we use the term *tact* to emphasize the functional relation among a stimulus, response, and reinforcer, and not as a way to describe what the child did or said (Carr & Miguel, 2013). Therefore, the terms *naming* and *tacting* are not synonyms. Skinner (1957) warned us about the temptation “to say that in a tact the response ‘refers to,’ ‘mentions,’ ‘announces,’ ‘talks about,’ ‘names,’ ‘denotes,’ or ‘describes’ its stimulus” (p. 82). However, the relation between the antecedent and response in the tact is no different than that of the one in the echoic, textual, and intraverbal, which are also operants under control of discriminative stimuli. Additionally, not all examples of naming or labeling could be described as tacts. When we see someone that we have not seen for a while, or when someone does something for us, the topographies “How do you do?” and “Thank you,” respectively, are strengthened (Skinner, 1957). These are clearly not labels, yet they are verbal topographies under the control of nonverbal discriminative stimuli and, thus, are functionally defined as tacts.

The qualifiers *receptive* and *expressive* have also preceded the terms *naming* and *labeling*. Receptive labeling/naming is often used to refer to auditory-visual conditional discriminations, while expressive labeling/naming is used to refer to simple discriminations usually in the form of tacts (e.g., Charlop, 1983; Grow & Van Der Hijde, 2016; Leung & Wu, 1997; Pettursdottir & Carr, 2011). Although these qualifiers may be familiar to nonbehavioral scientists and practitioners (Sidman, 1994), they de-emphasize behavior as the primary subject matter in the study of language and instead suggest that behavior is secondary to the expression and reception of ideas, which are assumed to be the origin of all communication (LaFrance & Miguel, 2014; Lowenkron, 2004). If this were the case, we would be studying verbal ideas, rather than verbal

<sup>1</sup> Subsequent equivalence studies have used the term naming in the same fashion (e.g., da Costa, Grisante, Domeniconi, de Rose, & de Souza, 2013; Hayashi, Schmidt, & Saunders, 2013).

behavior. Therefore, the terms *receptive* and *expressive* are not conceptually systematic (Baer, Wolf, & Risley, 1968) and should be completely abandoned in the behavior-analytic literature. Sidman (1994) suggested discarding this terminology as it “led inevitably to theoretical postulation of an underlying entity” (p. 62). Although behavior analysis has much to gain from improving communication with scientists and professionals from other fields, retaining some technical terms (e.g., discriminative stimuli, reinforcement, punishment), while abandoning others (e.g., speaker and listener behaviors), may lead to an inconsistent use of terminology. This inconsistency could serve to halt new discoveries by obstructing the flow of communication among behavioral scientists (Cuvo, 2003).

### Naming as a Technical Term

Although *naming*, as mentioned above, has been used in the behavior-analytic literature to refer to special cases of tacting and textual behavior, it has also served to describe how the speaker becomes his or her own listener (Horne & Lowe, 1996). In their seminal paper, Horne and Lowe defined naming as “a higher-order behavioral relation that a) combines conventional speaker and listener behavior within the individual, b) does not require reinforcement of both speaker and listener behavior to be established, and c) relates to classes of objects and events” (p. 207). The authors used research from developmental psychology to support the notion that naming evolves from the interaction between listener, echoic, and tact relations throughout the course of language development. Below is a summary of how this higher-order operant is established (see Horne & Lowe, 1996, pp. 191–205 for additional supporting research).

In the first year of life, a child begins attending to her parents’ voices, which have been correlated with different forms of reinforcement. Consequently, parents’ voices acquire both discriminative (for attending) and reinforcing functions (Vouloumanos & Werker, 2007). Parents also talk to their child and other adults while tacting objects in the child’s presence (Floor & Akhtar, 2006). Sometimes, they talk about things that their child is looking or pointing at, while at other times, they initiate the interaction by pointing at, or holding/playing with, the object that they are tacting.<sup>2</sup> Horne and Lowe (1996) acknowledged that during this phase of language development, *joint attention* becomes crucial, as children must look at the same object that the parent is talking about,<sup>3</sup> orient to the object, then to the parent, and then to the object again (Tomasello, Carpenter & Liszkowski, 2007) as a mand for parents to continue to attend and possibly tact the object (Dube, MacDonald, Mansfield, Holcomb, & Ahearn, 2004). Parents may also model appropriate behaviors toward objects (e.g., playing with a toy), a process consistent with the development of generalized imitation (Baer, Peterson, & Sherman, 1967).<sup>4</sup> At this point, we can say that children start reacting to objects by engaging in *conventional behavior*. In other words, objects become discriminative stimuli for

<sup>2</sup> Research suggests that children first learn context-bound words (Harris, Barrett, Jones & Brookes, 1988), with nouns (usually names of things) before verbs (Gentner, 1978; 1982).

<sup>3</sup> Joint attention develops between the ages of 9 and 15 months and seems crucial in the development of verbal behavior (Carpenter, Nagell, Tomasello, Butterworth & Moore, 1998); although see Lieven (1994).

<sup>4</sup> Note the importance of generalized imitation, and more generally, maternal responsiveness of vocalizations in the development of verbal behavior (Hart & Risley, 1995).

specific classes of behaviors. A chair, for instance, evokes sitting on it; a cup evokes drinking from it; a doll evokes playing with it, etc. Parents may then request the object (“Where’s the doll?”) and model and reinforce the reaching response, which leads to the development of *listener behavior*. Children are exposed to the aforementioned history of reinforcement multiple times with different objects. Thus, requests such as “Where’s the doll?” or “Where’s the cup?” become discriminative for orienting toward, looking at, or reaching for these objects, which could in turn evoke conventional behavior such as playing, or drinking, respectively. Exposures to the same and other exemplars may lead to covert seeing (i.e., imagining a doll when hearing the word “doll”) and serve to establish the (autoclitic) frame “Where’s...” as discriminative for looking for the item specified in the sentence (Horne & Lowe; p. 196).

Additionally, vocal utterances produced by the child (i.e., babbling) contact reinforcement early in life (2–7 months), with parents differentially reacting to vocal approximations to what they have said. This history of reinforcement with multiple exemplars (9–13 months) leads to a generalized echoic repertoire. After acquiring this repertoire, the child may attempt to repeat her parents’ vocalizations when talking and interacting with specific objects (e.g., parents say “doll” in the presence of a doll, and child attempts to say “doll”).<sup>5</sup> The auditory stimulus produced by the child (e.g., the sound “doll”) may serve to evoke listener behavior (e.g., looking at the doll or other dolls) given its similarity with the auditory stimulus previously produced by the parents. This is when the child starts to listen with understanding. In other words, she can react conventionally to her own speaker behavior.

The acquisition of echoic and listener behaviors serves as the ideal condition for the development of tacts. When parents continue interacting with their child, as described above, by showing and tacting an object (“Where’s the doll?” or “Look at the doll”), the child may attempt to repeat what they are saying (e.g., saying “doll”) while looking at, or interacting with the object. The reinforcer (in the form of acknowledgment, attention, praise, etc.) delivered contingent upon listener behavior will also serve to strengthen the child’s vocal echoic attempts in the presence of the object. This eventually leads to a transfer<sup>6</sup> of stimulus control whereby the object exerts (nonverbal) discriminative control over the specific vocal topography, “doll” (i.e., tact). This is when the child learns to name the object. When she sees the object again (e.g., the doll), it can evoke the tact (e.g., saying “doll”), which can in turn evoke conventional listener behavior (e.g., looking at or playing with the doll). So, naming involves not only tacting but also reacting to the (auditory) stimulus produced by the tact as a listener. In other words, the *tact* is the unidirectional relation between a nonverbal stimulus (i.e., a doll), and a verbal response (saying, “doll”), while the *name* is the bidirectional relation between the speaker (saying, “doll”) and listener (reacting conventionally to the vocal utterance “doll”) behaviors (Horne & Lowe, 1996). A child could be taught to vocally tact a nonverbal stimulus (with echoic prompts) as “caminhão,<sup>7</sup>” and still not react to this

<sup>5</sup> See Tamis-LeMonda, Bornstein, and Baumwell (2001) for a study on the effects of maternal responsiveness to children’s vocalizations on language development.

<sup>6</sup> Doug Greer pointed out to me that the term “transformation” of stimulus control may be best here. The control is not transferred from one stimulus to the other; rather the original stimulus retains its function, while the other stimulus function is “transformed” in a sense that it acquires control over a new verbal topography (tact).

<sup>7</sup> “Caminhão” is the word for “Truck” in Portuguese.

vocal production with understanding, unless directly taught to do so. Thus, naming involves more than just tacting. Simply put, *naming is tacting with understanding*. It is important to note that naming involves more than a relation between tact and listener behavior, for it also includes all speaker relations, as discussed below.

Horne and Lowe (1996) suggested that early names may be established through the process described above, in which listener, echoic, and tact relations are acquired separately. After repeated exposure to the aforementioned relations (multiple exemplar instruction), parents' behaviors of pointing and tacting an object may come to serve as contextual cues to "evoke the whole sequence of behavior that makes up the name relation" (p. 202). Several studies have shown that a history of reinforcement of speaker and listener behavior with multiple exemplars leads to the establishment of naming as a higher-order operant or generalized relation (e.g., Fiorile & Greer, 2007; Greer, Stolfi, & Pistoljevic, 2007). Moreover, a series of recent studies (Camerero & Pérez-González, 2014, 2015; Pérez-González, Cereijo-Blanco, & Camerero, 2014) have demonstrated that after a well-established naming repertoire has been acquired, individuals may learn to name an object solely by listening to others tact it. These results seem to support the notion that naming is a higher-order or generalized operant with essential implications for the development of verbal behavior.

However, it is possible to question whether naming is a higher-order operant without underscoring its importance in the development of novel behavior. Michael (1996) suggested that naming might simply portray the interaction among the different repertoires described above, which would still account for its generative effects. So, when parents ask a child for an object (e.g., "Where's the doll?"), the child may look at it and echo "doll" which may establish the tact. In contrast, when taught to say "doll" in its presence (i.e., tact), the child may also echo or self-echo while looking at the stimulus which could serve to establish the listener response. Regardless of its higher-order nature, naming serves to describe an important building block in the development of verbal behavior (Bosch & Hixson, 2004; Hixson, 2004).

## The Importance of Naming

We refer to a *naming repertoire* when speaker and listener responses toward a stimulus are established after only one of these components is directly trained. For instance, an individual who can point or orient toward a toy truck (i.e., listener behavior) upon hearing its name, solely after being directly taught to say "truck" in its presence (i.e., tact), has demonstrated a generalized naming repertoire (Greer & Longano, 2010; Miguel & Petursdottir, 2009). The generative nature of naming has led some behavior analysts to classify it as a "capability" (Greer & Ross, 2008) and to suggest that naming may be the main component responsible for children's "language explosion" or "word spurt" at about 18 months of age (Benedict, 1979).

In their original paper, Horne and Lowe (1996) also described how naming is central in the establishment of intraverbals, mands, rule-governed behavior, and categorization. Subsequent research has also shown naming to be important in the development of reading, writing, and spelling (e.g., Eby, Greer, Tullo, Baker, & Pauly, 2010; Greer, Yuan, & Gautreaux, 2005). When learning to read, for example, a child must not only engage in textual behavior (a form of speaker behavior) but also react to what she has

just read. In other words, when a child reads the word “fireman” (speaker behavior), its response product (the overt or covert sound “fireman”) must serve as a discriminative stimulus for conventional listener behaviors (e.g., imagining a fireman, looking for one). It is this textual/speaker-listener bidirectional relation that leads to reading comprehension (Carr & Miguel, 2013; Greer & Longano, 2010; LaFrance & Miguel, 2014). If the child can only engage in textual behavior (e.g., read “truck”), but not listen to what she said (e.g., react to the sound “truck”), the response will be meaningless, as the child cannot comprehend it.<sup>8</sup>

Much of the research on the effects of naming upon the development of other behavior has been conducted in the area of categorization and stimulus equivalence (Horne, Hughes, & Lowe, 2006; Horne, Lowe, & Harris, 2007; Horne, Lowe, & Randle, 2004; Kobari-Wright & Miguel, 2014; Lee, Miguel, Darcey, & Jennings, 2015; Lowe, Horne, Harris, & Randle, 2002; Lowe, Horne, & Hughes, 2005; Mahoney, Miguel, Ahearn, & Bell, 2011; Miguel et al., 2015; Miguel, Petursdottir, Carr, & Michael, 2008; Miguel & Kobari-Wright, 2013; Ribeiro, Miguel, & Goyos, 2015; Sprinkle & Miguel, 2012). In these studies, experimenters attempted to assess whether naming (i.e., the interdependence between speaker and listener behavior) plays a role in the development of stimulus categorization, typically measured via symbolic matching-to-sample (MTS) tasks, or some of its derivatives, such as stimulus sorting. Experimenters taught either speaker or listener behaviors and assessed for the emergence of visual categorization. Across all of these studies, participants visually categorized (i.e., sorted by category) dissimilar pictures only when they responded correctly as both speakers and listeners. In other words, they only sorted the pictures accurately when they could name the categories to which the pictures belonged. For example, Lee et al. (2015) taught four children with autism (3–5 years old) the listener behavior of selecting pictures of dissimilar dogs in the presence of their dictated categories (i.e., toy dog, hound dog, work dog). The two participants who categorized the pictures accurately (i.e., matched them by category) were the ones who could also tact these categories. The two participants who failed categorization tasks were the ones who could not accurately tact after listener training, suggesting a lack of naming (also see Miguel & Kobari-Wright, 2013; Kobari-Wright & Miguel, 2014).

Given the importance of naming as a generalized operant, researchers have developed procedures to teach it to children who do not demonstrate it (Fiorile & Greer, 2007; Gilic & Greer, 2011; Greer, Stolfi, Chavez-Brown, & Rivera-Valdez, 2005; Greer et al., 2007). These multiple-exemplar instruction procedures involve the interspersal of speaker and listener trials until the acquisition of one behavior (i.e., speaker or listener) leads to the emergence of the other (see Miguel & Petursdottir, 2009).

## Two Kinds of Naming Plus a Possible Third

The process described above (e.g., Lee et al., 2015) can be referred to as *common naming*, as different stimuli that evoke the same speaker and listener behavior become members of the same class. Another type of naming is *intraverbal naming* (Horne & Lowe, 1996). When discussing intraverbal relations between names, Horne and Lowe

<sup>8</sup> It could be suggested that this response is not verbal (Barnes-Holmes, Barnes-Holmes, & Cullinan, 2000).

explained how children might learn word combinations by hearing their parents use them contiguously (Skinner, 1957), or by learning to tact them when they appear together in the environment (e.g., “milk-bread”). Self-echoic repetitions (e.g., “milk-bread-milk”) establish the once unidirectional intraverbal (“milk-bread”) into a bidirectional relation (“bread-milk”). Other words that have been evoked by one of these stimuli may also enter into the relation (e.g., butter). This bidirectional intraverbal relation among stimuli may serve to group them into classes, which could share some behavioral functions. For instance, if a child learns to engage in avoidance behavior when hearing the word “hot,” then hearing “hot milk,” and “hot bread” may serve to transfer the function of “hot” to “milk” and “bread” (see Horne & Lowe, pp. 209–210 for a similar example).

Recent studies have focused on whether intraverbal naming is sufficient to establish arbitrary stimulus classes in typically developing children and adults (Jennings & Miguel, in press; Ma, Miguel & Jennings, 2016; Petursdottir, Carp, Peterson, & Lepper, 2015; Santos, Ma, & Miguel, 2015). Ma et al., 2016, for example, taught 14 typically developing adults to first tact pictures of birds, states, and flowers, and then intraverbally relate them (e.g., “The state for *cardinal* [A] is *Virginia* [B]” and “The flower for *Virginia* [B] is *dogwood* [C]”). All participants subsequently passed intraverbal tests consistent with symmetry (e.g., “The state for *dogwood* [C] is *Virginia* [B] and The bird for *Virginia* [B] is *cardinal* [A]”) and transitivity/equivalence (e.g., “The flower for *cardinal* [A] is *dogwood* [C]” and “The bird for *dogwood* [C] is *cardinal* [A]”), and formed (equivalence) stimulus classes as evidenced by positive results in visual-visual MTS tasks. In a follow-up study (Jennings & Miguel, in press), failures to categorize stimuli appeared correlated with deficits in intraverbal performance, which, once remediated, produced positive MTS outcomes. These results suggest that participants’ categorization depended on naming. In other words, during MTS posttests, participants may have tacted the sample (e.g., “cardinal”), whose auditory product would evoke the trained intraverbals linking the other two class members (e.g., “Virginia”; “dogwood”), which would have evoked the (listener) behavior of selecting the corresponding comparison (e.g., “dogwood”).<sup>9</sup> However, in the only intraverbal naming manipulation conducted with young children, researchers found inconsistent (Petursdottir et al., 2015) results, leading to the preliminary conclusion that children’s limited verbal repertoires may have hampered the acquisition of intraverbals, which affected their subsequent categorization performance (Santos et al., 2015).<sup>10</sup>

A process that seems related to naming is *joint control* (not to be confused with *joint attention*, described earlier). According to Lowenkron (1998), joint control consists of “a discrete event, a change in stimulus control that occurs when a response topography evoked by one stimulus and preserved by rehearsal,<sup>11</sup> is emitted under the additional

<sup>9</sup> For didactic purposes, my example involves the same stimuli used in Ma et al. (2016), even though Jennings and Miguel (in press) used different stimulus sets.

<sup>10</sup> It is possible to argue that novel categorization is a direct product of the same history of reinforcement responsible for the development of naming as a generalized operant. Although this perspective sees naming as a form of relational responding between words and their referents (Hayes, 1996), naming may still be considered a precursor for other types of relational responding. Evidence (and common sense) suggests that verbal behavior may be used (as a problem-solving strategy) to mediate adult performances in derived relations tests (e.g., Miguel et al., 2015; Ma et al., 2016).

<sup>11</sup> Dave Palmer suggested that rehearsal is just one common example of a source of stimulus control, but it is not always required (see Palmer, 2006).

control of a second stimulus” (p. 332). Joint control is also described as a by-product of related repertoires, in this case echoic and tact relations, which jointly exert control over selection responses (Lowenkron, 1991). Because this selection is evoked by events that control other verbal behavior and reports which stimulus brings the currently rehearsed topography under joint control, it is described as a *descriptive autoclitic* (see Skinner, 1957).

According to Lowenkron (1996a), “the conditions Horne & Lowe specify for the development of the naming relation are in fact exactly the conditions that produce joint control” (p. 1). After listener, echoic, and tact relations are acquired for a particular object (e.g., a doll), requests to retrieve the doll may evoke not only searching for and orienting toward the doll, but also echoing the word “doll” spoken by the parents. When the child finds the doll, the object itself may evoke the previously acquired tact “doll,” while the child is still engaging in self-echoic behavior (repeating the word, “doll,” spoken by the parents). At this point, the topography “doll” occurs under joint tact/self-echoic control. When parents reinforce the selection of the doll, they also (accidentally) reinforce a tact that enters into joint control with the self-echoic “doll.” After experiencing these contingencies with multiple objects, the child’s selection responses may simply be controlled not by the auditory stimulus (listener behavior) but by this “joint control event.” So, for instance, in an MTS task, a participant may either tact or echo the sample (visual and auditory samples, respectively), whose response product will be rehearsed (self-echoic). The comparison that evokes the same topography (tact) as the current echoic rehearsal is the one selected (Lowenkron, 1997). In other words, the simultaneous presentation of two stimuli that control responses of the same topography is a discriminable event that may evoke subsequent behavior (in this case, selection).

Despite Lowenkron’s (1996a, 1996b, 1997, 1998) criticisms of the naming account, naming and joint control seem to both be established in the course of language development, with joint control possibly developing later. As mentioned above, the contingencies present during parent-child interactions may serve to evoke the same topography for both tacts and self-echoics, which could be discriminated by the child. When presented with a novel or difficult task, such as finding an item at the pet shop (e.g., organic dog treat), self-echoic rehearsal may be used or even necessary, especially if there is a long delay between the instruction (e.g., “get the organic dog treat”) and the opportunity to make the selection (e.g., arriving at the shop). When the self-echoic and tact relations evoke the same response topography (i.e., “organic dog treat”), the item is “found” and placed into the shopping cart (Lowenkron, 1998).

In an experiment evaluating the role of naming in stimulus categorization, as measured by sorting pictures of outlines of state maps as either north or south, Miguel et al. (2008) suggested that some of the participants (preschool children) might have not sorted the stimuli correctly due to failures to tact comparisons. The authors speculated that in addition to tacting samples, it may have also been necessary for participants to tact comparisons. The correct pictures in the array would have jointly controlled the specific topography (e.g., “north”) that was being rehearsed by the child after tacting the sample, which would in turn evoke the correct sort. However, for some participants, additional tact or listener training strengthened the name relation, leading to accurate sorting. In other words, it is possible that additional training established the response product of tacting as a more effective discriminative stimulus for the sorting response.



Although naming and joint control are used to explain similar phenomena, it is possible that the discriminability of the joint stimulus control over a common topography plays an important role “in certain kinds of tasks, such as identity judgments, matching-to-sample, recall, problem-solving, and in other tasks in which recognition is required” (Palmer, 2014, p. 382). In a delayed MTS, for example, if both the sample and positive comparison occasion the same name, then they evoke the same listener and speaker behaviors, making it possible for tacts to be jointly evoked by both the sample and positive comparison. Whether participants need to always tact comparisons prior to their selection during these types of problem-solving tasks remains an important empirical question (e.g., Clough, Meyer, & Miguel, 2016).

## Renaming Naming

At this point, the reader should be able to distinguish the term *naming* from other terms like *tacting*, *labeling*, and even *expressive language*. Horne and Lowe (1996) were aware that *naming* is a commonly used term in the English language that was also used in scientific contexts by psychologists, linguists, etc. However, they sought to provide a behavior-analytic definition that would “foster productive interaction with scientists from other traditions” (p. 186). It has been 20 years since the publication of their seminal paper, and the potential for interaction with other disciplines may be at the cost of effective communication among behavior analysts. It seems that the addition of the qualifying autoclitic “bidirectional” could serve as a simple solution to distinguish the technical term from its commonsense use. Thus, we could use the term *bidirectional naming*, with the acronym *BiN*, to emphasize the fact that the stimulus being named occasions both speaker and listener behaviors. We would refer to the subcategories described above as *common bidirectional naming* and *intraverbal bidirectional naming*, using the acronyms *C-BiN* and *I-BiN*, respectively (see Table 1). Alternatively, henceforth, all behavior analysts should reserve the term *naming* to describe Horne and Lowe’s concept and avoid using it as a synonym for *tacting*, or something else. Although this latter option may seem more parsimonious, the multiple uses of *naming* will likely continue to cause confusion among behavior analysts.<sup>12</sup> This minor taxonomical change, from *naming* to *bidirectional naming*, would only require that those studying verbal behavior change their own verbal behavior about naming. The term *tact* should be used solely to refer to verbal topographies under control of nonverbal discriminative stimuli, completely eliminating the need for the term *naming* (without the qualifier) in the behavior-analytic literature. The qualifier *bidirectional* would alert the reader that what is to be described is a technical, rather than a colloquial term.

<sup>12</sup> I cannot count the times I have been asked to explain the differences between tact and naming, sometimes after one of my talks on the subject. I take partial responsibility for not being more didactic. Thus, the current (hopefully didactic) paper should be taken as an apology.

**Table 1** Summary of terms

Term and acronym	Brief definition	Example
Bidirectional naming (BiN)	Higher-order operant involving a bidirectional relation between speaker and listener behaviors. The teaching of one of these components suffices to establish both.	Learning to say, “cow” in the presence of its picture (tact) establishes the selection of the picture when hearing the word “cow” (listener) with no direct training (or vice-versa).
Common bidirectional naming (C-BiN)	Common tacts and listener behaviors may establish stimuli as related or equivalent (having the same meaning).	Learning to say, “cow” in the presence of an actual cow and its picture. Also learning to look at the cow and select its picture when hearing “cow.” Seeing an actual cow would evoke saying, “cow” (tact), whose response product (the sound “cow”) serves as an $S^D$ for selecting the picture of a cow, imagining a cow, etc. (listener).
Intraverbal bidirectional naming (I-BiN)	Intraverbal relations may establish stimuli as related or equivalent.	Learning to say, “milk comes from the cow” may establish the stimuli “milk” and “cow” as intraverbally related. Seeing an actual cow may evoke saying, “cow” (tact) whose response product (the sound “cow”) serves as an $S^D$ for the response “milk,” whose product serves as an $S^D$ for looking for milk, covertly tasting milk, selecting a picture of a milk bottle, etc. (listener).
Joint control (JC)	The simultaneous presentation of two stimuli that control responses of the same topography. The onset of joint control is a discriminable event that may evoke subsequent behavior.	Learning to say, “cow” in the presence of a cow and its picture (tact). Seeing an actual cow may evoke saying, “cow” (tact) whose response product serves as an $S^D$ for repeating the word “cow” (echoic). Seeing another cow or any other stimulus that evokes saying, “cow” (tact) would lead to the emission of the topography “cow” under joint stimulus control (echoic + tact) which would in turn evoke looking for or selecting the picture of the cow (autoclitic).

## Conclusion

The primary aim of this paper was to reintroduce the concept of naming and highlight its importance in understanding verbal behavior development (also see Greer & Longano, 2010). Additionally, a taxonomical change was proposed as an attempt to dissociate the technical term from its more common usages. It is hoped that this paper rekindles interest in Horne and Lowe’s (1996) original conceptualization, as well as subsequent research on the topic. As one of the most important extensions of Skinner’s (1957) analysis of verbal behavior, Horne and Lowe’s work on bidirectional naming serves as a conceptual framework for understanding how verbal operants interact to produce all sorts of complex novel verbal and nonverbal relations, most of which are of

interest to those working in applied settings. An important caveat is that some of the behaviors that constitute the bidirectional name relation are unobservable, as they seem to occur at the covert level. Although this can be seen as a limitation (e.g., Saunders & Spradlin, 1996), our inferences about bidirectional naming and joint control are “easily accommodated by well-established behavioral principles and require no revision of our conceptual machinery” (Michael, Palmer, & Sundberg, 2011, p. 18). They also create exciting opportunities for the development of new methodologies to advance the study of private events and covert (verbal) behavior.

### Compliance with Ethical Standards

**Conflict of Interest** The author declares no conflict of interest.

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