Motivating Operations and Stimulus Control

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Abstract

The motivating operations concept has generated substantial conceptual analysis and research interest. Following an analysis of how motivating operations affect behavior, one which emphasizes the interactive role of motivating operations and discriminative stimuli, we propose: a) redefining motivating operations as *operations that modulate the reinforcing or punishing effectiveness of particular kinds of events and the control of behavior by discriminative stimuli historically relevant to those events*, b) dropping the distinction between behavior-altering and function-altering effects of motivating operations, and c) reducing or eliminating emphasis on conditioned motivating operations. This reconceptualization of the motivating operations concept is intended to increase its value in predicting and gainfully changing behavior.

Key words: establishing operations, motivating operations, motivation, reinforcer effectiveness, stimulus control

Consider a hypothetical experiment in which, over the course of several sessions, Response A (e.g., a lever press) is reliably reinforced with food in the presence of Stimulus A (e.g., a flashing light) and Response B (e.g., a chain pull) is reliably reinforced with food in the presence of Stimulus B (e.g., a tone). We can predict with some certainty that lever pressing and chain pulling will increase in frequency when a relevant motivating operation (MO), such as food deprivation, is put into effect (e.g., in comparison to a condition in which the animal has had an extended period of free access to the same food), which is the level of precision afforded under the current conceptualization of the MO. However, if we consider that the effects of MOs are mediated by current stimulus conditions, we can predict precisely which response will see the greater change in frequency as a result of the MO: Response A in the presence of Stimulus A and Response B in the presence of Stimulus B. We suggest that the MO concept is useful but imprecise in its current form and, herein, propose a means of improving its precision by incorporating the mediational influences of discriminative stimuli into the concept.

In Keller and Schoenfeld's (1950) treatment of motivation, they wrote, "The discovery, classification, measurement, and study of any drive are inextricably related to the identification of (and, hopefully, mastery over) its establishing operations" (p. 272). Michael (1982) suggested that "establishing operation" was an appropriate term for describing "any change in the environment which [a] alters the effectiveness of some object or event as reinforcement and [b] simultaneously alters the momentary frequency of the behavior that has been followed by that reinforcement" (p. 150-151). Subsequently, he and his colleagues used the term "establishing operations (EOs)" to refer to operations that specifically increase the reinforcing or punishing effectiveness of events as consequences and the term "abolishing operations (AOs)" to describe operations that decrease, rather than increase, the reinforcing

or punishing effectiveness of events as consequences (Laraway, Snycerski, Michael, & Poling, 2003). The term "motivating operations" (MOs) subsumed both EOs and AOs.

Since Michael's (1982) seminal article appeared, the MO (formerly EO) concept has received considerable attention and, more importantly, appears to have improved our ability to predict and change behavior (Laraway, Snycerski, Olson, Becker, & Poling, 2014). The two-part definition of the MO has not fundamentally changed since Michael's article appeared. For example, in a recent conceptual analysis, Laraway et al. wrote that MOs "(a) influence the capacity of operant consequences (reinforcers and punishers) to alter the strength of future behavior (the value-altering effect), and (b) change the current strength of behaviors related to the consequences affected by the MO (the behavior-altering effect)" (p. 603).[1]

The "value-altering effect" of MOs is useful to consider when differentiating between effects of MOs and discriminative stimuli (S^Ds). Both MOs and S^Ds alter the probability that a designated kind of behavior will occur, but they do so through different mechanisms. Michael (1993) explained that "discriminative variables are related to the differential *availability* of an effective form of reinforcement given a particular type of behavior; motivative [sic] variables are related to the differential *reinforcing effectiveness* of environmental events" (p. 193). The value-altering effect represents the unique contribution of the MO concept to the larger conceptual framework of behavior analysis as it provides a means of accounting for changes in the function (i.e., reinforcing and punishing effectiveness) of events as consequences.

The "behavior-altering effect," on the other hand, was included in the conceptual formulation of the MO to account for changes in behavior that occur as a result of an MO but are seen prior to contact with the relevant consequence (Michael, Hixson, & Clark, 1997).

[1] Although MOs clearly are related to the effects of punishment, to increase both clarity and brevity, we will essentially ignore this topic.

This addition patched a hole in the concept in that it dealt with behavior changes that preceded and, therefore, could not be attributed to, the function-altered consequence but, in our view, it was a fairly coarse patch. Under the current conceptualization, the "behavior-altering effect" is usually described as an *evocative* (or *abative*) effect in that the MO has a direct and unmediated effect on behavior relevant to the function-altered consequence (e.g., Laraway et al., 2014). The influence of this conceptualization is most apparent in definitions of the "mand," which are commonly described as verbal responses that are evoked by establishing operations. The "behavior-altering effect" implies that, when some event will function as a more effective reinforcer, the organism will do with greater frequency, intensity, etc. all of the things that have previously resulted in that event.

There is a clear relationship between this conceptualization of the behavior-altering effect and the concept of the operant (sometimes termed "operant response class"), a class of behavior defined by a shared outcome. The behavior-altering effect classifies behavior in the same way as the operant and shares the same degree of imprecision when it comes to predicting and changing behavior. For example, when an individual is deprived of water, we would predict an increase in strength of all response topographies previously reinforced with water, which is of no practical value (for a critical account of the operant, see Domjan, 2016).

Given information about the stimulus conditions that were in effect when specific response topographies were reinforced, we can predict the specific form of responding (e.g., asking a server for a drink of water, versus going to the tap and filling a cup with water) that is likely to occur under the present stimulus conditions. Skinner (1938) was well aware of the important role of contextual stimuli in determining the probability of a response. In his discussion of the later-abandoned concept of the "reflex reserve," he described the influence of the discriminative stimulus as follows: "The discriminative field at the moment of emission acts as a sort of patterned filter: if it matches the field existing at the time of

reinforcement, the rate of responding is maximal; if it does not, the rate is depressed" (p. 229). Nevertheless, he seemed hesitant to ascribe a behavioral function to discriminative stimuli and instead tended to provide procedural definitions or use vague terms to describe their effects on behavior. Of the discriminative stimulus, he wrote, "It…is perhaps best described as 'setting the occasion' for a response. Whether or not the response is to occur does not depend upon the discriminative stimulus, once it is present, but upon *other factors*. ... Strictly speaking we should refer to a discriminated operant as 'occurring in the presence of' rather than 'elicited as a response to' S^D" (Skinner, 1938, p. 241, emphasis ours). Other behavior analysts have generally followed suit. For example, Pierce and Cheney (2017) defined the S^D as "an event or stimulus that precedes an operant and sets the occasion for operant behavior (antecedent stimulus)" (p. 509).

As Whelan and Barnes-Holmes (2010) noted, these "other factors" are largely the domain of MOs. With the MO concept, we can speak with greater certainty about the evocative function of discriminative stimuli because we can specify the conditions under which they are likely to evoke relevant behavior. An S^D evokes responses that historically have been reinforced in the presence of the S^D when an establishing operation for the relevant reinforcer currently is in effect. Conversely, we can speak with greater precision about the influences of MOs on specific topographies of behavior if, in our conceptual analysis, we acknowledge the critical role played by discriminative stimuli.

Motivating Operations and Discriminative Stimuli

In response to Michael's (1993) detailed presentation of the MO concept, McDevitt and Fantino (1993) wrote that, "The evocative function of an MO appears to bring us no closer to predicting the nature of the response, which is usually dependent upon additional contextual stimuli…The discriminative function of the MO seems to have a more general effect, namely that of strengthening related S^Ds" (p. 226). The same point was made by

Michael (2007) and by Laraway et al. (2003), who noted that "the behavior-altering effects of MOs may depend on the presence of relevant discriminative stimuli" (p. 412). Researchers working from an associationist perspective have noted that motivating operations (i.e., "revaluation" procedures) alter the control of behavior by antecedent stimuli and have conducted a significant amount of research on this topic (e.g., Balleine & Dickinson, 1998; Dickinson & Balleine, 1994; for an overview and a biobehavioral perspective, see Donahoe & Burgos, 2000).

In experimental arrangements in which the influence of MOs on the evocative functions of S^Ds have been examined, the mediational influence of S^Ds on MO-response relationships is clear. In a review of research examining the influences of MOs on stimulus control, Lotfizadeh, Edwards, Redner, and Poling (2012) found that MOs reliably alter the evocative function of discriminative stimuli (i.e., increasing the EO increases the evocative function of relevant S^Ds), and the degree of stimulus generalization (i.e., increasing the EO increases stimulus generalization). In most reviewed studies, the range of stimuli that were tested when producing generalization gradients was not sufficiently broad to determine the rate of responding that would occur in the presence of a stimulus significantly different from the original discriminative stimulus, but even with small differences in the range of tested values (e.g., testing at a wavelength 490 nm after training with an S^D of 550 nm), significant reductions in responding were observed as the testing stimulus deviated from the S^D. These reductions occurred under all EO levels (e.g., regardless of the duration of food deprivation). Additionally, in the only study that involved discrimination training (i.e., inclusion of an S^Δ condition prior to testing; Coate, 1964), although the S^Δ was not included in the testing phase, little responding occurred in the presence of the stimulus that was most similar to the S^Δ, and the frequency of responding in the presence of this stimulus did not correspond with the EO level (i.e., a higher EO level did not produce more responding).

Similarly, in drug-discrimination studies where the reinforcer is the same for both drug- and vehicle-appropriate responding, only the injection-appropriate response occurred in the presence of the S^{Δ}. In one such study, Gaiardi, Bartoletti, Bacchi, Gubellini, and Babbini (1987) reinforced (with food) rats' pressing of one lever following 10 mg/kg morphine injections and another lever following saline injections. During testing, they evaluated responding under intermediate doses of morphine with and without pre-feeding. Regardless of the pre-feeding status, no rats responded to the "drug lever" when tested with the lowest dose of morphine (2.5 mg/kg).

Outside the operant chamber, in applied settings, the stimulus context is often in flux. Under these conditions, the mediational influence of S^{D}s on MO-response relationships are readily apparent. For example, the outcome of effective discrete-trial training with people in the clinic, school, or home is behavior that is differentiated according to the stimuli that are presented, even when the same reinforcer is used for each response. As a case in point, bits of apple may be used as the reinforcer for every correct response, but the response "horse" is only reinforced when a picture of a horse is shown, and the picture comes to reliably evoke the response "horse" but not "watermelon" when the relevant MO is in effect, even though the responses "horse" and "watermelon" have both previously been followed by bits of apple.

If we disregard the influences of stimulus control when considering the effects of MOs on verbal behavior, the MO concept offers very little in the way of prediction and influence. For example, if a child has mastered 300 tacts and the MO for the reinforcer that was used during training is in effect and we are only able to conclude that all 300 tacts will now occur with greater frequency, we are wielding a rather blunt conceptual instrument. If, instead, we consider that MOs increase the evocative influence of relevant S^{D}s, we are directed to attend to these environmental stimuli, which reliably predict the occurrence of the behavior of interest.

Similarly, and perhaps controversially, when the MO relevant to a mand is in effect, we must also consider the S^D. According to Michael (1988), "the mand is a type of verbal operant in which a particular response form is reinforced by a characteristic consequence and is therefore under the functional control of the establishing operation relevant to that consequence" (p. 7). Cooper, Heron, and Heward (2007) describe the mand as "an elementary verbal operant that is evoked by an MO and followed by specific reinforcement" (p. 699) and say that "ultimately the response should be free from additional sources of control" (Sundberg, 2007, p. 541). Michael, however, acknowledged the influence of the S^D in his analysis of the mand, writing that, "even under water deprivation the response [*water*] will not ordinarily occur until appropriate circumstances are in effect," then he went on to say that, "the audience or the circumstances are clearly functioning as S^Ds, but not in the sense of determining the form of the response" (p. 6). Based on the present analysis, we would disagree and say that the form of the response is very much determined by the S^D. For example, if potato chips currently function as a reinforcer for Jimmy's behavior, he asks Uncle Bob from the USA for "chips," which historically has often resulted in access to potato chips in Bob's presence, and he asks Aunt Sally from the UK for "crisps," which has often resulted in access to potato chips when she was around (and not French fries, which Jimmy detests). These are two distinct response forms that are under the control of relevant S^Ds.

In a more clinically-relevant example, if functional communication (i.e., mand) training is conducted by a graduate student in weekly sessions, the client should not be expected to appropriately mand in the presence of a staff member who has historically reinforced self-injurious behavior with the consequence relevant to the mand (e.g., adult attention). The mand and the self-injurious behavior are two distinct response forms that are

likely to be under the control of relevant S^Ds.[2] We suggest that the mand can still be considered a unique verbal operant that is associated with characteristic reinforcement but that mands are not evoked in an unmediated fashion by relevant establishing operations.

The control of mand response forms by discriminative stimuli has been described as an example of "multiple control" of behavior because the response is simultaneously controlled by both the MO and by the discriminative stimuli (see Michael, Palmer, & Sundberg, 2011; Miguel, 2017). Based on the present analysis, we suggest that the mand (for all practical purposes) is *always* multiply controlled in that the emission of the response and the form of the response will be determined by the present stimulus context (e.g., the presence or absence of a listener and specific listener characteristics) in addition to the MO. Following this line of reasoning, we would also be forced to conclude that all tacts are also multiply controlled because social stimuli must function as effective reinforcers for the relevant discriminative stimuli to evoke the tact (e.g., when one has a severe headache, social stimuli may not function as effective reinforcers and, instead, may function as punishers; stimuli that might normally evoke the tact do not readily do so under these conditions).[3] Continuing with this line of reasoning, we would conclude that all behavior is multiply controlled because the MO is relevant to all operant behavior. There does not appear to be any major flaw in such an analysis, but a more parsimonious solution may be to consider the MO as a prerequisite for the reinforcement of behavior with relevant consequences and the control of behavior by antecedent stimuli relevant to those consequences. This is a form of "multiple control," but this specific terminology (multiple control) may imply that the

[2] Note, although one response might be considered "verbal" and the other "nonverbal" according to Skinner's (1957) definition, they are functionally equivalent and, therefore, the distinction is irrelevant. See Palmer (2008) for a summary of some of the issues associated with Skinner's definition of verbal behavior.

[3] Skinner (1957) described the "pure" or "objective" tact as having a "form determined solely by a specific feature of the stimulating environment" but went on to clarify that "a truly generalized reinforcement is, however, rare…and pure objectivity in this sense is probably never achieved" (p. 83).

response can be controlled directly by the MO, directly by the S^D, or by a combination of the two, which does not reflect the dependent nature of the relationship between the two controlling variables.

Direct and Indirect Effects of MOs

Under the current MO conceptualization, the value-altering effect of MOs is an *indirect* effect in that no change in behavior can be attributed to the "value-altering effect" until the organism encounters the relevant consequence. In line with Killeen and Jacobs' (2017) call for consideration of the state of the organism in our accounts of behavior, the MO can be understood to change the organism in such a way that events function as more or less effective reinforcers or punishers, *if encountered* (Poling, Lotfizadeh, & Edwards, 2017).

Likewise, and contrary to the currently prevailing conceptualization, we suggest that MO effects that are currently referred to as "behavior-altering effects" are also *indirect* effects. Until a relevant discriminative stimulus is encountered, the effect is not likely to be revealed. Changes in behavior that are attributed to the "behavior-altering effect" occur in the absence of the relevant consequences (e.g., requests for water generally occur prior to contact with water), which has led some authors to the conclusion that they are evoked *directly* by the MO, but the behavior rarely occurs in the absence of relevant discriminative stimuli (e.g., we rarely make requests for water when no one else is present) and the specific discriminative stimuli that are present play a key role in determining the precise nature of the response (e.g., *agua* in the presence of a Spanish speaker). Therefore, we suggest that, in line with McDevitt & Fantino's (1993) analysis, rather than evoking behavior directly, EOs *potentiate* (i.e., increase the evocative potential of) relevant discriminative stimuli (AOs have the opposite effect). Put another way, EOs lower (and AOs raise) thresholds for action upon exposure to relevant discriminative stimuli.

The evidence reviewed by Lotfizadeh et al. (2012) suggests that this potentiation occurs in a graded (rather than an all-or-none) fashion and that there will likely be a broader degree of generalization around the discriminative stimulus as the degree of potentiation is increased (e.g., under extreme water deprivation, you might ask the chef for a glass of water when the server is unavailable). In addition to enhanced evocative functions, potentiated discriminative stimuli will serve as more effective conditioned reinforcers (e.g., the attention of a server will function as a reinforcer when a glass of water would function as a reinforcer). This implication follows from the reliable observation that discriminative stimuli function as conditioned reinforcers in a variety of experimental (e.g., observing response) and applied (e.g., chaining) procedures when the relevant primary (or terminal) reinforcer is effective. Most behavior of practical concern occurs under reliable stimulus control and, therefore, understanding that the effects of MOs are mediated by discriminative stimuli is likely to improve the precision with which we operate as applied behavior analysts.

There may be a direct effect of MOs on behavior, perhaps similar to "arousal" (i.e., general increases in activity associated with reinforcement) as proposed by Killeen, Hanson, and Osborne (1978). Such arousal may take the form of increased motor activity but, without any relevant discriminative stimuli to guide behavior, it may be difficult to distinguish between activation caused by one type of MO and by another type. Research on the influences of food deprivation on general activity levels (e.g., Finger, 1951), including research on "activity-based anorexia" in which rats' wheel-running increases with food deprivation even though wheel-running is not reinforced with food (e.g., Epling & Pierce, 1988), appears to provide support for such an effect. However, additional experimental work in this area is required.

There may also be a more specific type of direct activation. Under extreme deprivation, organisms may exhibit "vacuum activity," or fixed action patterns, in the

absence of one or more components of the appropriate stimulus context for such behavior. For example, chickens dust bathe in the absence of dust, raccoons "wash" food in the absence of water, and some birds "build nests" in the absence of nest-building materials (Gould, 1982). Consistent with Klatt and Morris' (2001) conceptual work linking response deprivation with MOs, these vacuum activities are typically observed after a period in which the appropriate stimulus context is unavailable or the response has otherwise been restricted. Although this activity appears to occur in the absence of any relevant stimuli, some aspects of the appropriate stimulus context are usually present. As Lorenz (1981) noted, "It is obviously impossible to say 'without any stimulation' because, as in the case of Craig's (1918) ring dove which directed its courtship behavior at the meeting point of three straight lines, a substitute object is easy to find, even if it is an extremely weak one" (p. 127). Thus, it may be more accurate to consider vacuum activity as an extreme form of stimulus generalization. That we find vacuum activity remarkable or unusual is a reminder of the ubiquity of stimulus control and its persistent relevance in guiding behavior associated with currently effective reinforcers.

Definition of Motivating Operations

The MO concept provides a framework for understanding changes in the reinforcing and punishing effectiveness of events as consequences, which is critical to predicting when reinforcement or punishment will occur and, therefore, it is a useful addition to the larger conceptual framework of behavior analysis. The "value-altering effect" appears to capture this core element of the MO concept, but this specific terminology (value-altering) may be unnecessary.

When the reinforcing or punishing effectiveness of an event has been altered, functions of antecedent stimuli related to that event also change, including the evocative function of discriminative stimuli, the degree of stimulus generalization around relevant S^Ds,

and changes in the reinforcing or punishing effectiveness of relevant S^Ds. The "behavior-altering effect" does not seem to accommodate these effects and may imply that MOs always (directly) evoke behavior in the absence of mediation by relevant discriminative stimuli (i.e., stimuli correlated with the differential, response-dependent likelihood of the event with altered reinforcing or punishing effectiveness). Therefore, it may be helpful to remove the "behavior-altering effect" from the definition of the MO concept. Although there may be a potential direct effect of MOs, as noted, additional experimental and conceptual work relevant to such an effect is required, and such an effect appears to be significantly less important to meaningful behavioral prediction and control than those behavioral changes that are mediated by enhanced or reduced stimulus control.

We put forward the following suggestion for a refinement of the MO definition. *Motivating operations modulate the reinforcing or punishing effectiveness of particular kinds of events and the control of behavior by discriminative stimuli historically relevant to those events.* These changes are evident in behavioral dimensions that index reinforcing or punishing effectiveness and antecedent stimulus control, including, but not limited to, speed of response acquisition, response rate, response magnitude, choice, elasticity of demand, behavioral momentum, and progressive-ratio breaking points. Establishing operations (EOs) increase reinforcing or punishing effectiveness, abolishing operations (AOs) reduce it.[4]

Implications of Reconceptualization

[4] Michael (e.g., 1993) emphasized the "momentary" nature of MO effects in his conceptualization to distinguish MOs from other operations, such as conditioning procedures. Although the term "momentary" is somewhat imprecise and non-momentary operations that appear to otherwise qualify as MOs can be identified (e.g., castration), the qualification that MOs are "momentary" (or perhaps some improved variant of this qualification) may still be useful. As Sundberg (1993) pointed out, this qualification "suggests that the reinforcing effectiveness is transient, and in order to use the EO as an independent variable, the applied behavior analyst must either capture or contrive the reinforcing effectiveness of an event" (p. 211).

We cannot dictate terminological practices or conceptual analyses, but we are hopeful that researchers and practitioners will find our recommendations useful. We suggest that this alternative conceptualization of the MO accomplishes everything that the original conceptualization accomplishes, but with greater precision. This reconceptualization does have significant implications for the concept of the mand, as described previously. For practitioners, it should draw attention to the antecedent stimuli associated with mand training, thereby leading to more effective training procedures.

This reconceptualization also has some implications for the concept of "conditioned motivating operations" (CMOs), which Michael (1993) described as "stimuli that were motivationally neutral prior to their relation to another [MO] or to a form of reinforcement or punishment" (p. 198). Michael provided three examples of CMOs, two of which ("reflexive" and "transitive") account for MO effects that arise from a relationship between previously neutral stimuli and reinforcers or punishers. By incorporating the influences of MOs on discriminative stimuli into the MO definition, these effects are accounted for without the need for the cumbersome language associated with the CMO concept.

For example, Michael's well-worn example of a "transitive CMO" (CMO-T) in which an appropriate screwdriver becomes a reinforcer upon the sight of a slotted screw, does not require any new concepts if we acknowledge the evocative and conditioned reinforcing properties of discriminative stimuli in a behavioral chain that terminates with a currently effective reinforcer. By breaking the chain down further, we see that manipulation of one operandum, the flathead screwdriver, is reinforced in the presence of a slotted screw and not in the presence of a different screw. We also know that stimuli associated with the operandum (i.e., the sight of the appropriate screwdriver) will function as both a conditioned reinforcer for the behavior that has produced the stimulus, such as looking around or asking an assistant, and as a discriminative stimulus for grasping the screwdriver and orienting it

such that turning the screwdriver will turn the screw (i.e., the next link in the chain). This is a straightforward example of conditional discrimination, which is a well-established and useful concept. Michael acknowledged that the transitive CMO could be accounted for with the existing concepts of conditional conditioned reinforcement and conditional discrimination but said that, "this general approach…fails to implicate the evocative effect which is the main topic of the present paper and thus seems less satisfactory than the new terminology" (p. 154). We have also noted that the CMO concept lacks the precision of the conditional discrimination explanation in that the CMO account does not specify how such effects come about, whereas the conditional discrimination account specifies this information.

One procedure that is commonly referred to as a CMO-T has been demonstrated to be effective for mand training. This procedure, the "interrupted chain procedure," involves removing an operandum that is required to advance toward the terminal reinforcer in an operant chain (e.g., the spoon is hidden when the trainee is preparing hot cocoa), and an appropriate mand is required to produce access to the operandum (e.g., Albert, Carbone, Murray, Hagerty, & Sweeney-Kerwin, 2012). Rather than describing this procedure as a CMO-T, which does not clarify the conditions responsible for the procedure's effectiveness, we can conceptualize the procedure as a "chain extension procedure" in which an additional link is inserted into the chain. The new link consists of a compound S^D (e.g., the jar of cocoa is open, no spoon is present, and the researcher who has previously provided access to spoons or similar items following an appropriate mand is present), a response (e.g., "spoon please"), and a conditioned reinforcer (e.g., the sight of the spoon), which is also the S^D for the next response in the chain.

As for the "reflexive CMO" (CMO-R), the existing conceptual framework associated with the effects of termination of conditioned reinforcing and punishing stimuli (conditioned negative punishment and conditioned negative reinforcement, respectively) is already

adequate to account for behavior under such conditions. The "CMO-reflexive" concept emphasizes that, for a stimulus to be removed, it must first be presented, which is a logical necessity but of no value in predicting whether a given stimulus will serve as a negative reinforcer for the behavior of a given organism in a particular situation. Although researchers have attempted to make use of the CMO-R concept when conducting research that involves the presentation and removal of conditioned aversive stimuli (e.g., Kettering, Neef, Kelley, & Heward, 2018), the CMO-R concept complicates what would otherwise be a straightforward description and does not improve our ability to predict and control behavior. Therefore, the concept is of no practical or conceptual value.

Given that the third CMO subtype, the "surrogate CMO," has little empirical support and seems to fall within the domain of respondent conditioning (see Laraway et al., 2014), we suggest that the CMO concept be re-evaluated and that researchers and practitioners consider additional ways of describing effects that might be described as CMOs. Further conceptual and experimental work is required to clarify the mechanisms that underlie changes in reinforcer or punisher effectiveness that result from verbal behavior (e.g., "rule-governed behavior"; see Hayes, Zettle, & Rosenfarb, 1989; Schlinger & Blakely, 1987). Such changes require previous "conditioning" in the same sense as the conditioning invoked in the CMO concept, but the CMO terminology does not appear to be helpful in clarifying these processes.

There is an important distinction between discriminative stimuli and MOs, as explained by Michael (1982, 1993). However, it is clear that one of the most important effects of MOs is that they reliably influence the evocative function of relevant discriminative stimuli. The difference between the current conceptualization of the MO and the suggested reconceptualization outlined herein is the difference between lumping "asking nicely" and self-injurious behavior into the same response class (e.g., those responses maintained by access to food items) and the meaningful distinction between inappropriate behavior and

functional communication. These are important topographical differences in behavior that can readily be brought under stimulus control. Although most researchers and practitioners are undoubtedly aware of the importance of stimulus control, directly acknowledging the role of stimulus control in our account of the MO may lead to more effective practice and help to stimulate meaningful research in this area.

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