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Editorial: Emerging Cultural and Behavioral Systems Science

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Skinner (1948) imagined a world in which the natural science of behavior would be applied to free us from coercive cultural practices, and its applications could contribute to intentional cultural design to achieve that end. He elaborated on these ideas in several subsequent, nonfictional works (e.g., Skinner 1953, 1971, 1974, 1981, 1987). These works provided the conceptual and theoretical bases for many behavior scientists to begin to consider the evolution of cultures and the selection of cultural practices (e.g., Baum 2005; Couto and Sandaker 2016; Glenn 2004; Houmanfar et al. 2010; Malott and Glenn 2006) and to actively challenge behavior scientists to work toward mitigating some of the world's most pressing challenges (e.g., Biglan 2015, 2016; Biglan and Embry 2013; Dixon et al. 2018; Mattaini and Aspholm 2016; Wilson et al. 2014).

Cultural and behavioral systems science brings together a broad range of behavior scientists with different influences, specializations, and focus areas from within and outside of behavior science. Two fairly well-known examples of such work include Brethower's (1972) Total Performance System and Glenn's (1986) conceptualization of the metacontingency (see also Glenn et al. 2016 for the most recently agreed upon terms and definitions). Brethower's work was strongly influenced by general system(s) theory (e.g., von Bertalanffy 1968; cf. Brethower 2008) and is broadly applied by behavior scientists who consider their specialization behavioral systems analysis or organizational behavior management (e.g. McGee and Crowley-Koch, this issue). Glenn's seminal contributions to cultural and behavioral systems science were inspired by anthropology (i.e., cultural materialism; Harris 1964, 1979; see also Glenn 1988) and biology (cf., Glenn 1991; Hull et al. 2001) and is very influential with those behavior scientists who describe their specializations as cultural systems analysis and/or cultural selection. Even though many working in cultural and behavioral systems science identify with a specific lineage or claim a particular specialization, many also

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draw from multiple lineages and/or work across specializations. For example, collaborations between those interested in cultural selection/analysis and behavioral systems analysis (e.g., Houmanfar et al. 2010; Malott 2003; Malott and Glenn 2006; Sandaker 2009) have been forged in organizations in need of performance and systems change. Such change often entails an analysis of organization-specific networks of contingencies and the coordinated behaviors of individuals and their respective aggregate products, frequently the units of analysis in experimental microculture work in cultural analysis/selection. A task force for the Association for Behavior Analysis International (ABAI) recently adopted the phrase "culturo-behavior science" to capture the breadth of work focused on cultural and behavioral systems science.[1] Regardless of their specific lineage or influence, cultural and behavioral systems scientists are increasingly contributing to a better understanding of the selection and maintenance of cultural practices, the processes involved in dynamic systems, the interactions between and amongst complex systems (e.g., political, economic, educational, social, legal, religious), and the evolution of culture.

The push for behavior scientists to expand their focus to cultural issues gained momentum in the mid- to late 1980s with several behavior scientists issuing calls for behavior scientists to join forces with related disciplines (e.g., cultural materialism, institutional economics; Glenn 1985, 1988) and to engage in a radical behaviorist exploration of cultural analysis (Malagodi 1986). Preceded by the inaugural issue of the *Behaviorists for Social Action* (first pubslihed in 1978) journal (now *Behavior and Social Issues)* and perhaps accelerated by Glenn's (1986) first conceptualization of the metacontingency, behavior scientists began to publish a number of theoretical and conceptual accounts of Skinner's (1981) third kind of selection (i.e., cultural selection; see, for example, Advancing Cultural Analytic Science 2006) as well as applying the concepts put forth in interpretations of social and cultural issues (e.g., Lamal 1991, 1997; Mattaini and Thyer 1996). There was (and still is) much discourse regarding the appropriateness of pushing the boundaries of operant selection to that of cultural selection, the need for new units of analysis or basic processes to understand cultural phenomena (Marr 2006; Mattaini 2006; also see Zilio 2019, for a recent critical review), the critical and variable features of what these units and processes might include (e.g., Glenn et al. 2016; Houmanfar et al. 2010), as well as what units and processes are at play (e.g., systems principles or selection, differentiating between cultural selection and the selection of cultures; Couto and Sandaker 2016; Krispin 2016, 2017).

Even if heavily influential at the theoretical and conceptual levels, more than a decade passed before the first experimental analysis of the metacontingency was published (Vichi et al. 2009). Vichi et al. (2009) spurred a number of laboratory studies involving experimental microcultures aimed to mimic the contingencies in effect for individuals and coordinated behaviors of individuals regarding cooperation (e.g., Carvalho et al. 2017; Ortu et al. 2012; Sampaio et al. 2013; Smith et al. 2012), use of common-pool resources (e.g., Camargo and Haydu 2016), ethical self-control (e.g., Borba et al. 2014b, 2017), the role of verbal behavior (e.g., Smith et al. 2011), and more. Much of this research has been conducted in Brazil or in collaborations across Brazil, the United States, and Norway, and has resulted in several commonly employed

[1] https://www.abainternational.org/events/culturo-behavior-science-conference/conference-home.aspx

preparations based on social dilemma games often used in economics, played in an iterative fashion (multiple cycles) such that patterns of responding over time and how they shift in response to experimenter controlled variables can be examined (e.g., the Iterated Prisoners' Dilemma Game, the Public Goods game; see Camerer and Fehr 2004, for a brief overview). These studies, initially focused on demonstrating selection of coordinated behavior across two or more individuals (interlocking behavioral contingencies or socio-interlocked behaviors) and their associated aggregate products (the combination of which has been termed as a "culturant"; Hunter, 2012) by cultural consequences, have since explored the competition and concurrence between individual operant and cultural level contingencies (e.g., Borba et al. 2017; Costa et al. 2012; Tourinho 2013; Soares et al. 2018), parallels to operant processes at the cultural level (e.g., reinforcement, schedules of consequence delivery, punishment, variability; e.g., Guimarães et al. 2019; Soares et al. 2019). Likewise, a number of other groups of researchers have explored cooperation using similar experimental preparations but different explanatory frameworks (e.g., Baum et al. 2004; Locey et al. 2013; Locey and Rachlin 2012; Rachlin and Locey 2011). These researchers have sought to advance the basic science and to provide insight as to how to effectively produce desirable changes at the cultural level.

At the same time, another group of behavior scientists have found the theoretical and experimental work in cultural and behavioral systems science to be of particular pragmatic value to their work in organizations (e.g., Glenn and Malott 2004; Malott 2003). Although much of this work involves manipulations at the operant level, the findings are frequently discussed in terms of interactions between the organizational culture (systems and subsystems) and the coordinated responses of various individuals subject to such contingencies. In addition, many working in organizational settings combine principles from general system(s) theory with those from behavior analysis, behavioral systems analysis, and cultural selection in their conceptualizations of organizational change (see Diener et al. 2009; Malott 2003; Mawhinney 1992, 2009; McGee and Crowley-Koch, this issue; Rummler and Brache 1990, for examples). Others still have focused their efforts on systems and cultures with less clear boundaries than those found in traditional organizations—the community (e.g., Biglan 1995; Mattaini 2013), which is sometimes manifested in the efforts of community behavioral psychologists (e.g., Fawcett 1991; Watson-Thompson 2018; Watson-Thompson et al. 2017). Often grounded in efforts toward social justice and mitigating systemic challenges such as addictions (Biglan and Ryzin 2019; Silverman et al. 2019), violence (e.g., Aspholm and Mattaini 2017; Mattaini 2013), sustainability (e.g., Chance and Heward 2010; Grant 2011; Kaplan et al. 2018), and poverty (e.g., Brady and Burton 2016; Fava and Vasconcelos 2017; Valderlon and Elias 2019), the work in this area frequently considers the impact of intervening on one part of a system on the other parts of the system or the system as a whole (or the interdependencies between and across sectors; see Biglan 1995; Mattaini 2013).

In the midst of increasing concerns regarding climate change, violence, food and water security, political instability, human rights, to name only a few immediately pressing social issues, behavior scientists can and should be doing more to understand and affect change at the cultural and systems levels. One objective of this special section is to highlight the importance of behavior scientists' contributions to developing an understanding of and application to cultural and systems level phenomena. A second

objective is to present the diverse array of contributions of behavior scientists in these areas, illustrating the range of questions and influences needed to promote our understanding of cultural and systems level phenomena and the roles behavior scientists can fill in efforts toward improving the world in which we live. What follows is an introduction to the articles included in this special section that highlight the range of questions, research methods, topics, and applications of cultural and behavioral systems science to date.

We open the special section with the text of Mattaini's 2019 ABAI presidential address. Mattaini (this issue), citing limitations of behavior scientists' current approaches to understanding societal challenges, urges behavior scientists to adopt a transdisciplinary approach to cultural systems analysis. He contends that thus far our focus has been too narrow, emphasizing experimental microculture work, an emphasis on operant principles that can at best generate different macrobehaviors, and in general disregarding processes of cultural transmission outside of selection, as examples. He argues that cultural systems analysis is an ecological science (see also Baer 1974; Fantino 1985; Willems 1974) and provides a systematic approach to addressing societal challenges to advance our understanding of and interventions for major societal challenges. In particular, Mattaini suggests that expansions to our observational methods, the inclusion of conceptual analyses and natural experiments, as well as adopting new analytical tools can help us to achieve this goal. Mattaini's suggestions highlight two key issues: the place of experimental microculture work as analogues to societal challenges and the potential ramifications of changing one system component without regard to its role in the larger system.

Even if substantial work has been done in cultural and behavioral systems science, our understanding of practices within and/or interactions between or among dynamic systems, let alone our influence on changing ineffective practices, leaves much to be determined as is evidenced by a number of other recent calls for action (e.g., Biglan 2015, 2016; Biglan and Embry 2013; Dixon et al. 2018; Mattaini and Aspholm 2016; Wilson et al. 2014).

Basic Cultural Science Research

Turning our attention to such experimental work, Guimarães, Picanço, and Tourinho (this issue) arranged three experimental microcultures to examine the effects of negative punishment on culturants. Their preparation held operant contingencies constant throughout each experimental condition, such that the role of cultural consequences would be distinct from the processes operating at the operant level. Guimarães et al. (this issue) categorized responses as individual operant or culturant, and further subdivided each as impulsive or ethically self-controlled based on the contingencies in effect for each response type including the dimensions of immediacy or delay of the consequence as well as whether the payoff was most advantageous for the individual or the group. The cultural-level contingency manipulation included a condition that allowed for a subsequent condition in which negative punishment could be made contingent upon impulsive culturants. Their results suggest that negative punishment was not only effective in reducing the target culturant (i.e., impulsive) but also produced a corresponding increase in the ethically self-controlled culturants across all

three experimental microcultures. These results suggest how future research in this area might focus on everyday instances of cooperative behavior and in groups with a greater number of participants. Guimarães et al. (this issue) provide one exemplar of the types of questions asked in experimental microculture work aimed to advance our understanding of cultural selection and its role in aiding in our understanding of the processes involved in creating and changing cultural practices with metacontingency manipulations.

A number of behavior scientists have utilized the concepts developed since Glenn's (1986) original proposal of the metacontingency to interpret cultural level phenomena and propose experiments to test such interpretations (e.g., Camargo and Haydu 2016; Velasco et al. 2012). Hora and Sampaio (this issue) expand the work in this area to the social problem of corruption. They propose that the units of analysis, from a culturo-behavioral perspective and important to understanding and mitigating corruption, are the operant, the culturo-behavioral lineage, the culturant, and macrobehavior (see Glenn et al. 2016). Hora and Sampaio provide a functional definition of each of these units as manifested in behaviors and practices described as corruption. They describe a set of studies on bribery and embezzlement conducted outside of behavior analysis and consider how the focus of these studies included or could be improved upon based on the previously identified units. They conclude that the general focus of work on corruption has not been on the culturo-behavioral lineages, the culturants, or the macrobehaviors. Based on this brief review and analysis they suggest that the experimental paradigm used by Borba, da Sliva, et al. (2014) and Borba et al. (2014, 2017) might provide a reasonable starting point for behavioral work on corruption. The preparation used in these studies allows for the manipulation of contingencies at the individual and cultural levels to promote or dissuade impulsive or ethically self-controlled responses, similar to the contingencies they suggest maintain corruption. Moreover, they note the importance of the use of experimental microcultures to study cultural phenomena (such as corruption) that are often difficult to study in the natural world due to their covert and socially unacceptable nature. Hora and Sampaio's analysis emphasizes the role such interpretive accounts have had in assisting behavior scientists to approach diverse areas of application. The question, however, remains as to what extent this work will result in tangible interventions that affect change for such adverse and harmful cultural practices.

In addition to experimental microculture work, cultural and behavioral systems scientists often conduct natural experiments and historical analyses (see also Todorov 2009). Both approaches to research allow for the extrapolation of important variables that might enter into functional relations responsible for cultural change. These are often employed under similar conditions to interpretive work—when direct manipulations of the variables of interest are not easily arranged. Malott's (this issue) historical analysis of the variables that brought about the Mexican Muralist Program is one example of such efforts to understand important cultural events. Malott describes how the establishment of the Mexican Muralist Program brought five individuals together, whose collective and recurring interlocking behavioral contingencies resulted in a social revolution. Malott's work shows how such analysis can enhance our understanding of events considered "cultural cusps." The cultural cusp has been proposed as a concept that encompasses such events that are the product of a unique combination of circumstances and individuals that do not recur but produce widespread and long-

lasting cultural change (e.g., Malott 2016a, 2016b). Malott's contribution to this special section serves as an example of how such concepts and analyses can help us to further understand cultural phenomenon that are the result of a unique combination of individual repertoires that interlock in new and unusual ways to advance cultural change. If sufficient exemplars can be found, it is possible that such works might allow behavior scientists to support the occurrence of such phenomena or capitalize on their effects to promote the adoption of beneficial cultural practices.

Analyzing Cultural Practices and Institutions

The diversity of influence on cultural and behavioral systems science is partly illustrated by the next two articles included in this special section. Simon and Mobbek (this issue) ground their analysis of the cultural practice of *dugnad*, which is prevalent in Norway, in Baum's (2012) concept of phylogenetically important events. *Dugnad* is a volunteer activity that typically involves cooperative interactions among a group of individuals that culminates in a social gathering or activity. Simon and Mobekk analyze *dugnad* in terms of its benefits to the culture and community, suggesting that it has served a key role in establishing an environment in which cooperative or prosocial behavior is supported and developed. They argue that *dugnad* is the product of the interactions among all three levels of selection—evolutionary, operant, and cultural—and emphasize the role of operant selection, which is often overlooked in evolutionary accounts of culture. Strand, Vossen, and Savage (this issue) emphasize the influence of attachment style on the formation of culture. They propose a bidirectional model of culture in which choice behavior determines culture and choice behavior is determined from schedule induced attachment styles rooted in child–caregiver interactions. To elaborate, Strand et al. suggest that it is through the child–caregiver interactions that children learn to respond to the contingencies in effect in their social environments, the contingencies of which are created from the caregivers' attachment styles. Moreover, they argue that because attachment patterns are the result of schedules of reinforcement, culture is emergent from attachment and attachment is schedule induced. Strand et al. go on to describe the implications of taking this perspective on how cultures are formed. In particular, they suggest that in order for cultural practices to be changed, child–caregiver interactions must change in order to produce different attachment patterns, taking a bottom–up rather than top–down perspective on producing cultural change.

These important contributions to cultural and behavioral systems science highlight the need to explore interactions among and across evolutionary, operant, and cultural levels of selection as we move forward in creating a comprehensive behavioral account of culture and an understanding of the formation, transmission, and selection of cultural practices.

Conceptual Extensions and Expansions

There is not yet agreement regarding the units of analysis, mechanisms, or processes that are necessary for a behavioral account of the evolution of culture or the selection of

cultural practices. The next two articles provide an alternative to the unit of selection at the sociocultural level (Aguiar, Oliveira-Castro, & Gobbo, this issue) and an expansion of the discussions regarding important processes to consider (Krispin, this issue).

Aguiar et al. (this issue) expand both Skinner's (1981) and Baum's (2000, 2005) work in the area. They review the discourse regarding the unit of selection at the sociocultural level. They propose that rules, when defined functionally in terms of their effect on another individual or group of individuals, serve as the unit of sociocultural selection. The foundation of their position rests on a recategorization of previous conceptualizations of the influence of rules in cultural evolution, proposing new functional categories of rule application, rule transmission, and rule creation. Aguiar et al. suggest that each of these functional categories of rule uttering interlock with each other to produce advantages for the members of the social environment in which they occur or contribute to the survival of the culture. Furthermore, they propose that the mechanism responsible for rule section is operant selection and consider the importance of controlling agencies in supporting their account.

Krispin (this issue) discusses cultural selection, selection of cultures, and the metacontingency in the context of the dynamics of self-organizing systems. Extending the conceptualization first formulated by Skinner (1981) and later expanded by Couto and Sandaker (2016) and Krispin (2016, 2017), here Krispin (this issue) describes the implications of adopting these processes as those critical to the selection of cultures. His formulation suggests that the metacontingency accounts for within-group processes of selection. Krispin (this issue) suggests that building in concepts from general system(s) theory, particularly the dynamics of self-organizing systems, provides an opportunity to consider an expanded understanding of feedback and proposes the concepts of culturant hypercycles, operant hypercycles, and in cases of the interaction between the two, culturo-behavioral hypercycles. Such a conceptualization provides an account that links the culturant to its evolutionary advantages, emphasizing the ways in which operants and culturants reinforce another operant or culturant in the system, thereby also affecting the system in which it occurs, positioning the metacontingency as the process that accounts for the selection of cultural practices.

Aguiar et al. (this issue) and Krispin (this issue) highlight important areas in cultural and behavioral systems science for which additional work remains to be done. For example, the role of verbal behavior in the creation and transmission of cultural practices is often assumed yet rarely studied (see Smith et al. 2011; Smith et al. 2012, as exceptions). Several studies highlight the importance of communication in coordinating responding across experimental microculture members (e.g., Sampaio et al. 2013; Vichi et al. 2009) and in the transmission of repertoires across generations (e.g., Benvenuti et al. 2018; Marques and Tourinho 2015). However, it is less common to see an analysis of the verbal behavior emitted in experimental work even if the role of communication has been emphasized in a subset of the literature emphasizing effective leadership practices (see Houmanfar and Mattaini 2018). In addition, the integration of systems and selection principles has yielded a reasonable amount of attention from cultural and behavioral systems scientists (e.g., Glenn and Malott 2004; Krispin 2017; Mattaini 2004; Sandaker 2009) but largely at the conceptual level. Both topics underscore the need for additional empirical work to untangle the complexity

and further refine the important concepts and processes in cultural and behavioral systems science.

Applications and Changing Cultural Practices

Although there is much work that is needed to fully determine the processes important to a comprehensive cultural and behavioral systems science, this has not prevented behavioral scientists from creating opportunities and taking steps to create change. The next two articles highlight the efforts of cultural and behavioral systems scientists in offering conceptually systematic recommendations for the arrangement of environments to promote effective action.

Lewon, Houmanfar, and Hayes (this issue) describe conditions that give rise to aggressive behavior, suggesting that aggressive behavior occurs when aversive conditions that function as motivating operations are in effect (e.g., Azrin and Holz 1966; Azrin et al. 1964; Hutchinson 1977; Sidman 1989). Labeled "aversion-induced aggression," Lewon et al. propose that these factors play a key role in evoking and managing conflicts between groups. Moreover, they suggest that leaders often capitalize on such conditions to achieve their own aims and that the best way to reduce violent conflict is to alleviate such aversive conditions, proposing ways in which behavior scientists can participate more effectively in addressing social problems like intergroup violence. Namely, they suggest that behavior scientists can conduct observations that result in theoretical accounts that can inform interventions that produce changes in cultural practices (e.g., nonviolent resistance), and evaluate the efficacy of such interventions.

Seniuk, Cihon, Benson, and Luke (this issue) describe how an analysis of the interdependencies among and across classes of actors, their practices, the motivating conditions, and consequences can be a tool for identifying ways to support and sustain different practices. The focus of their analysis, a product of their work with the Behaviorists for Social Responsibility Special Interest Group of ABAI, is to encourage more behavior analysts and behavior scientists to work in areas of social importance, highlighting how this might be done with the example of environmental sustainability. They provide tangible suggestions related to actionable steps that university behavior analysis programs, behavior analytic practitioners, faculty and researchers in behavior analysis and behavior science, and students of behavior analysis and behavioral science can take to realize this objective.

Concluding Remarks

Culturo-behavior science and cultural systems analysis are only just emerging as central and critical approaches for addressing serious societal and global issues—all of which are primarily grounded in human, and in particular collective human behavior. There is much still to be done in shaping and sustaining communities characterized by human and environmental justice, and in responding to climate change. Not everyone included in this special section agrees as to the optimal conceptual frameworks or research methodologies. This is as it should be in a fledgling science; there is a need to maintain an open perspective and to avoid premature closure. As is true of all sciences, there is,

not surprisingly, wide acceptance in the behavioral community of the need for further research (as is true of all sciences). The need for rigor and thoughtful prioritization of research opportunities is perhaps more crucial than is the case in other disciplines, given the severity of current challenges. Several important directions appear to be particularly important. Behavior science does not "own" any of the issues discussed in this special section; as a result, effective skills in transdisciplinary collaboration and a respectful approach to forming the needed cooperation are core requirements. Such collaboratory skills are operants (and in some cases cultural practices), and therefore can be taught or learned. Laboratory simulations and observations need to meet the requirements of open science (Gilroy and Kaplan 2019), and to ask meaningful questions; these efforts should in almost all cases avoid questions with near-certain results (for example, replaying studies done in social psychology), and should be designed to be potentially valuable for translational research. Applied research should prioritize areas where the need is greatest, often translating basic research findings into practical approaches for social reform. And all such work requires taking the issues seriously; scientists carry moral and ethical responsibilities in the broader society that have supported their own development, and often carry knowledge and skills that are essential for addressing societies' most challenging collective struggles.

References

Advancing cultural analytic science. (2006). [special section]. *Behavior & Social Issues, 15*(1).

Aspholm, R. R., & Mattaini, M. A. (2017). Youth activism as violence prevention. In P. Sturmey (Ed.), *The Wiley handbook of violence and aggression*. Hoboken: John Wiley and Sons.

Azrin, N. H., & Holz, W. C. (1966). Punishment. In W. K. Honig (Ed.), *Operant behavior: Areas of research and application* (pp. 380–447). New York, NY: Appleton-Century-Crofts.

Azrin, N. H., Hutchinson, R. R., & Sallery, R. D. (1964). Pain-aggression toward inanimate objects. *Journal of the Experimental Analysis of Behavior, 7*(3), 223–228. https://doi.org/10.1901/jeab.1964.7-223.

Baer, D. M. (1974). A note on the absence of a Santa Claus in any known ecosystem: A rejoinder to Willems. *Journal of Applied Behavior Analysis, 7*(1), 167–169. https://doi.org/10.1901/jaba.1974.7-167.

Baum, W. M. (2000). Being concrete about culture and cultural evolution. In F. Tonneau & N. S. Thompson (Eds.), *Perspectives in ethology*. Boston, MA: Springer. https://doi.org/10.1007/978-1-4615-1221-9

Baum, W. M. (2005). *Understanding behaviorism: Behavior, culture and evolution* (2nd ed.). Oxford: Blackwell.

Baum, W. M. (2012). Rethinking reinforcement: Allocation, induction, and contingency. *Journal of the Experimental Analysis of Behavior, 97*(1), 101–124. https://doi.org/10.1901/jeab.2012.97-101.

Baum, W. M., Richerson, P. J., Efferson, C. M., & Paciotti, B. M. (2004). Cultural evolution in laboratory microsocieties including traditions of rule giving and rule following. *Evolution & Human Behavior, 25*(5), 305–326. https://doi.org/10.1016/j.evolhumbehav.2004.05.003.

Benvenuti, M. F. L., de Toledo, T. F. N., Velasco, S. M., & Duarte, F. M. (2018). Behavior and illusions: A model to study superstition in a participant replacement experiment. *Psicologa: Reflexão e Crítica, 31*, 1–9. https://doi.org/10.1186/s41155-018-0097-9.

Biglan, A. (1995). *Changing cultural practices: A contextualist framework for intervention research*. Reno: Context Press.

Biglan, A. (2015). *The nurture effect: How the science of human behavior can improve our lives and our world*. Oakland: New Harbinger.

Biglan, A. (2016). The need for a more effective science of cultural practices. *The Behavior Analyst, 39*(1), 97–107. https://doi.org/10.1007/s40614-016-0051-z.

Biglan, A., & Embry, D. (2013). A framework for intentional cultural change. *Journal of Contextual Behavioral Science, 2*(3–4), 95–104. https://doi.org/10.1016/j.jcbs.2013.06.001.

Biglan, A., & Ryzin, M. J. (2019). Behavioral science and the prevention of adolescent substance abuse. *Perspectives on Behavior Science*. https://doi.org/10.1007/s40614-019-00217-y.

Borba, A., da Silva, B. R., Cabral, P. A. d. A., de Souza, L. B., Leite, F. L., & Tourinho, E. Z. (2014). Effects of exposure to macrocontingencies in isolation and social situations in the production of ethical self-control. *Behavior & Social Issues, 23*, 5. https://doi.org/10.5210/bsi.v23i0.4237.

Borba, A., Tourinho, E. Z., & Glenn, S. S. (2014). Establishing the macrobehavior of ethical self-control in an arrangement of macrocontingencies in two microcultures. *Behavior & Social Issues, 23*, 68–86. https://doi.org/10.5210/bsi.v23i0.5354.

Borba, A., Tourinho, E. Z., & Glenn, S. S. (2017). Effects of cultural consequences on the interlocking behavioral contingencies of ethical self-control. *The Psychological Record, 67*, 399–411. https://doi.org/10.1007/s40732-017-0231-6.

Brady, D., & Burton, L. M. (Eds.). (2016). *The Oxford handbook of the social science of poverty*. Oxford: Oxford University Press.

Brethower, D. M. (1972). *Behavioral analysis in business and industry: A total performance system*. Kalamazoo: Behaviordelia.

Brethower, D. M. (2008). Historical background for HPT certification standard 2, take a systems view, part 2. *Performance Improvement, 47*(4), 15–24.

Camargo, J., & Haydu, V. B. (2016). Fostering the sustainable use of common-pool resources through behavioral interventions: An experimental approach. *Behavior & Social Issues, 25*, 61–76. https://doi.org/10.5210/bsi.v25i0.6328.

Camerer, C. F., & Fehr, E. (2004). Measuring social norms and preferences using experimental games: A guide for social scientists. In J. Henrich, R. Boyd, S. Bowles, C. Camerer, E. Fehr, & H. Gintis (Eds.), *Foundations of human sociality: Economic experiments and ethnographic evidence from fifteen small-scale societies*. New York: Oxford University Press.

Carvalho, L. C., Couto, K. C., Gois, N. d. S., Sandaker, I., & Todorov, J. C. (2017). Evaluating effects of cultural consequences on the variability of interlocking behavioral contingencies and their aggregate products. *European Journal of Behavior Analysis, 18*(1), 84–98. https://doi.org/10.1080/15021149.2016.1231003.

Chance, P., & Heward, W. L. (2010). Climate change: Meeting the challenge. *The Behavior Analyst, 33*(2), 197–206. https://doi.org/10.1007/bf03392219.

Costa, D., Nogueira, C. P. V., & Abreu-Vasconcelos, L. (2012). Effects of communication and cultural consequences on choices combinations in INPDG with four participants. *Revista Latinoamericana de Psicología, 44*(1), 121–131.

Couto, K. C., & Sandaker, I. (2016). Natural, behavioral and cultural selection-analysis: An integrative approach. *Behavior & Social Issues, 25*, 54–60. https://doi.org/10.5210/bsi.v25i0.6891.

Diener, L., McGee, H., & Miguel, C. (2009). An integrated approach for conducting a behavioral systems analysis. *Journal of Organizational Behavior Management, 29*(*2*), 108–135. https://doi.org/10.1080/01608060902874534.

Dixon, M. R., Belisle, J., Rehfeldt, R. A., & Root, W. B. (2018). Why we are still not acting to save the world: The upward challenge of a post-Skinnerian behavior science. *Perspectives on Behavior Science, 41*(1), 241–267. https://doi.org/10.1007/s40614-018-0162-9.

Fantino, E. (1985). Behavior analysis and behavioral ecology: A synergistic coupling. *The Behavior Analyst, 8*(2), 151–157. https://doi.org/10.1007/BF03393147.

Fava, V. M. D., & Vasconcelos, L. A. (2017). Behavior of Programa Bolsa Família Beneficiaries: A behavior analytic perspective on fulfillment of education and health conditionalities. *Behavior & Social Issues, 26*, 156. https://doi.org/10.5210/bsi.v26i0.7825.

Fawcett, S. B. (1991). Some values guiding community research and action. *Journal of Applied Behavior Analysis, 24*(4), 621–636. https://doi.org/10.1901/jaba.1991.24-621.

Gilroy, S. P., & Kaplan, B. A. (2019). Furthering open science in behavior analysis: An introduction and tutorial for using GitHub in research. *Perspectives on Behavior Science, 42*(3), 565–581. https://doi.org/10.1007/s40614-019-00202-5.

Glenn, S. S. (1985). Some reciprocal roles between behavior analysis and institutional economics in post-Darwinian science. *The Behavior Analyst, 8*, 15–27. https://doi.org/10.1007/bf03391909.

Glenn, S. S. (1986). Metacontingencies in *Walden Two*. *Behavior Analysis and Social Action, 5*(1–2), 2–8. https://doi.org/10.1007/bf03406059.

Glenn, S. S. (1988). Contingencies and metacontingencies: Toward a synthesis of behavior analysis and cultural materialism. *The Behavior Analyst, 11*(2), 161–179. https://doi.org/10.1007/bf03392470.

Glenn, S. S. (1991). Contingencies and metacontingencies: Relations among behavioral, cultural, and biological evolution. In P. A. Lamal (Ed.), *Behavioral analysis of societies and cultural practices* (pp. 39–73). Washington, DC: Hemisphere Press.

Glenn, S. S. (2004). Individual behavior, culture, and social change. *The Behavior Analyst, 27*(2), 133–151. https://doi.org/10.1007/bf03393175.

Glenn, S. S., & Malott, M. E. (2004). Complexity and selection: Implications for organizational change. *Behavior & Social Issues, 13*(2), 89–106. https://doi.org/10.5210/bsi.v13i2.378.

Glenn, S. S., Malott, M. E., Andery, M. A. P. A., Benvenuti, M., Houmanfar, R. A., Sandaker, I., et al. (2016). Toward consistent terminology in a behaviorist approach to cultural analysis. *Behavior & Social Issues, 25*, 11–27. https://doi.org/10.5210/bsi.v25i0.6634.

Grant, L. K. (2011). Can we consume our way out of climate change? A call for analysis. *The Behavior Analyst, 34*, 245–266.

Guimarães, T. M. M., Leite, F. L., de Carvalho Neto, M. B., Tourinho, E. Z., & Tonneau, F. (2019). The effects of punishment in laboratory microcultures. *Behavior & Social Issues.* https://doi.org/10.1007/s42822-019-00004-z.

Harris, M. (1964). *The nature of cultural things*. New York: Random House.

Harris, M. (1979). *Cultural materialism*. New York: Random House.

Houmanfar, R. A., & Mattaini, M. A. (Eds.). (2018). *Leadership and cultural change: Managing future well-being*. New York: Taylor & Francis.

Houmanfar, R. A., Rodrigues, N. J., & Ward, T. A. (2010). Emergence & metacontingency: Points of contact and departure. *Behavior & Social Issues, 19*, 78–103. https://doi.org/10.5210/bsi.v19i0.3065.

Hull, D. L., Langman, R. E., & Glenn, S. S. (2001). A general account of selection: Biology, immunology, and behavior. *Behavioral & Brain Sciences, 24*(3), 511–528. https://doi.org/10.1017/s0140525x0156416x.

Hunter, C. S. (2012). Analyzing behavioral and cultural selection contingencies. Revista Latinoamericana de Psicología, 44(1), 43–54.

Hutchinson, R. R. (1977). By-products of aversive control. In W. K. Honig & J. E. R. Staddon (Eds.), *Handbook of operant behavior* (pp. 415–431). Englewood Cliffs: Prentice Hall.

Kaplan, B. A., Gelino, B. W., & Reed, D. D. (2018). A behavioral economic approach to green consumerism: Demand for reusable shopping bags. *Behavior & Social Issues, 27*(1), 20–30. https://doi.org/10.5210/bsi.v27i0.8003.

Krispin, J. V. (2016). What is the metacontingency? Deconstructing claims of emergence and cultural-level selection. *Behavior & Social Issues, 25*(1), 28–41. https://doi.org/10.5210/bsi.v25i0.6186.

Krispin, J. V. (2017). Positive feedback loops of metacontingencies: A new conceptualization of cultural-level selection. *Behavior & Social Issues, 26*, 95–110. https://doi.org/10.5210/bsi.v26i0.7397.

Lamal, P. A. (Ed.). (1991). *Behavioral analysis of societies and cultural practices*. Washington: Hemisphere Publishing.

Lamal, P. A. (Ed.). (1997). *Cultural contingencies: Behavior analytic perspectives on cultural practices*. Westport: Praeger.

Locey, M. L., & Rachlin, H. (2012). The temporal dynamics of cooperation. *Journal of Behavioral Decision Making, 25*(3), 257–263. https://doi.org/10.1002/bdm.729.

Locey, M., Safin, V., & Rachlin, H. (2013). Social discounting and the prisoner's dilemma game. *Journal of the Experimental Analysis of Behavior, 99*(1), 85–97. https://doi.org/10.1002/jeab.3.

Malagodi, E. F. (1986). On radicalizing behaviorism: A call for cultural analysis. *The Behavior Analyst, 9*, 1–17. https://doi.org/10.1007/bf03391925.

Malott, M. E. (2003). *Paradox of organizational change: Engineering organizations with behavioral systems analysis*. Reno: Context Press.

Malott, M. E. (2016a). Selection of business practices in the midst of evolving complexity. *Journal of Organizational Behavior Management, 36*(2–3), 103–122. https://doi.org/10.1080/01608061.2016.1200511.

Malott, M. E. (2016b). What studying leadership can teach us about the science of behavior. *The Behavior Analyst, 39*(1), 47–74. https://doi.org/10.1007/s40614-015-0049-y.

Malott, M. E., & Glenn, S. S. (2006). Targets of intervention in cultural and behavioral change. *Behavior & Social Issues, 15*, 31–56. https://doi.org/10.5210/bsi.v15i1.344.

Marques, N. S., & Tourinho, E. Z. (2015). The selection of cultural units by non-contingent cultural events. *Behavior & Social Issues, 140*, 126–140. https://doi.org/10.5210/bsi.v.22i0.4283.

Marr, M. J. (2006). Behavior analysis and social dynamics: Some questions and concerns. *Behavior & Social Issues, 15*(1), 57–67. https://doi.org/10.5210/bsi.v15i1.345.

Mattaini, M. A. (2004). Systems, metacontingencies, and cultural analysis: Are we there yet? *Behavior & Social Issues, 130*, 124–130.

Mattaini, M. A. (2006). Will cultural analysis become a science? *Behavior & Social Issues, 15*(1), 68–80. https://doi.org/10.5210/bsi.v15i1.380.

Mattaini, M. A. (2013). *Strategic nonviolent power: The science of satyagraha*. Edmonton: AU Press.

Mattaini, M. A., & Aspholm, R. (2016). Contributions of behavioral systems science to leadership for a new progressive movement. *The Behavior Analyst, 39*(1), 109–121. https://doi.org/10.1007/s40614-015-0043-4.

Mattaini, M. A., & Thyer, B. A. (1996). *Finding solutions to social problems: Behavioral strategies for change*. Washington, DC: APA Books.

Mawhinney, T. C. (1992). Evolution of organizational cultures as selection by consequences: The Gaia hypothesis, metacontingencies, and organizational ecology. *Journal of Organizational Behavior Management, 12*(2), 1–26. https://doi.org/10.1300/J075v12n02_01.

Mawhinney, T. C. (2009). Identifying and extinguishing dysfunctional and deadly organizational practices. *Journal of Organizational Behavior Management, 29*(3–4), 231–256. https://doi.org/10.1080/01608060903092094.

Ortu, D., Becker, A. M., Woelz, T. A. R., & Glenn, S. S. (2012). An iterated four-player prisoner's dilemma game with an external selecting agent: A metacontingency experiment. *Revista Latinoamericana de Psicología, 44*(1), 111–120.

Rachlin, H., & Locey, M. (2011). A behavioral analysis of altruism. *Behavioural Processes, 87*(1), 25–33. https://doi.org/10.1016/j.beproc.2010.12.004.

Rummler, G. A., & Brache, A. P. (1990). *Improving performance: How to manage the white space on the organization chart*. San Francisco: Jossey-Bass.

Sampaio, A. A. S., Araújo, L. A. S., Gonçalo, M. E., Ferraz, J. C., Alves Filho, A. P., Brito, I. S., et al. (2013). Exploring the role of verbal behavior in a new experimental task for the study of metacontingencies. *Behavior & Social Issues, 22*, 87–101. https://doi.org/10.5210/bsi.v.22i0.4180.

Sandaker, I. (2009). A selectionist perspective on systemic and behavioral change in organizations. *Journal of Organizational Behavior Management, 29*(3–4), 276–293. https://doi.org/10.1080/01608060903092128.

Sidman, M. (1989). *Coercion and its fallout*. Boston: Authors Cooperative.

Silverman, K., Holtyn, A. F., & Toegel, F. (2019). The utility of operant conditioning to address poverty and drug addiction. *Perspectives on Behavior Science, 42*(3), 525–546. https://doi.org/10.1007/s40614-019-00203-4.

Skinner, B. F. (1948). *Walden Two*. New York: Macmillan.

Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.

Skinner, B. F. (1971). *Beyond freedom and dignity*. Indianapolis: Hackett.

Skinner, B. F. (1974). *About behaviorism*. New York: Random House.

Skinner, B. F. (1981). Selection by consequences. *Science, 213*, 501–504. https://doi.org/10.1126/science.7244649.

Skinner, B. F. (1987). Why we are not acting to save the world. In B. F. Skinner (Ed.), *Upon further reflection* (pp. 1–14). Upper Saddle River: Prentice Hall.

Smith, G. S., Houmanfar, R., & Louis, S. J. (2011). The participatory role of verbal behavior in an elaborated account of metacontingency: From theory to investigation. *Behavior & Social Issues, 20*, 112–145. https://doi.org/10.5210/bsi.v20i0.3662.

Smith, G. S., Houmanfar, R., & Denny, M. (2012). Impact of rule accuracy on productivity and rumor in an organizational analog. *Journal of Organizational Behavior Management, 32*, 3–25. https://doi.org/10.1080/01608061.2012.646839.

Soares, P. F. R., Rocha, A. P. M. C., Guimarães, T. M. M., Leite, F. L., Andery, M. A. P. A., & Tourinho, E. Z. (2018). Effects of verbal and non-verbal cultural consequences on culturants. *Behavior & Social Issues, 27*, 31–46. https://doi.org/10.5210/bsi.v27i0.8252.

Soares, P. F. R., Martins, J. C. T., Guimaraes, T. M. M., Leite, F. L., & Tourinho, E. Z. (2019). Effects of continuous and intermittent cultural consequences on culturants in metacontingency concurrent with operant contingency. *Behavior & Social Issues*. https://doi.org/10.1007/s42822-019-00004-z.

Todorov, J. C. (2009). Behavioral analysis of non-experimental data associated with cultural practices. *Behavior & Social Issues, 18*, 10–14. https://doi.org/10.5210/bsi.v18i1.2756.

Tourinho, E. Z. (2013). Cultural consequences and interlocking behavioral contingencies: Selection at the cultural level. *Behavior & Philosophy, 41*, 60–60.

Valderlon, Y., & Elias, L. R. (2019). The Bolsa Família Program and cultural design: Behavioral interpretations of cultural interventions. *Behavior & Social Issues*. https://doi.org/10.1007/s42822-019-0003-9.

Velasco, S. M., Benvenuti, M. F. L., & Tomanari, G. Y. (2012). Metacontingencies, experimentation and nonhumans: Searching for conceptual and methodological advances. *Revista Latinoamericana de Psicologia, 44*(1), 25–34.

Vichi, C., Andery, M. A. P. A., & Glenn, S. S. (2009). A metacontingency experiment: The effects of contingent consequences on patterns of interlocking contingencies of reinforcement. *Behavior & Social Issues, 18*, 41–57. https://doi.org/10.5210/bsi.v18i1.2292.

von Bertalanffy, L. V. (1968). *General systems theory*. New York: George Braziller.

Watson-Thompson, J. (2018). The road taken: Contributions to advancing community-engaged scholarship. *Metropolitan Universities, 29*(4). https://doi.org/10.18060/22837.

Watson-Thompson, J., May, M. J., Jefferson, J., Young, Y., Young, A., & Schultz, J. (2017). Examining the contributions of a community coalition in addressing urban health determinants. *Journal of Prevention & Intervention in the Community, 46*(1), 7–27. https://doi.org/10.1080/10852352.2018.1385936.

Willems, E. P. (1974). Behavioral technology and behavioral ecology. *Journal of Applied Behavior Analysis, 7*, 151–165.

Wilson, D. S., Hayes, S. C., Biglan, A., & Embry, D. D. (2014). Evolving the future: Toward a science of intentional change. *Behavioral & Brain Sciences, 37*(4), 395–416. https://doi.org/10.1017/s0140525x13001593.

Zilio, D. (2019). On the function of science: An overview of 30 years of publication on metacontingency. *Behavior & Social Issues, 28*. https://doi.org/10.1007/s42822-019-00006-x.