CULTURAL CONSEQUENCES AND INTERLOCKING
BEHAVIORAL CONTINGENCIES: SELECTION AT THE
CULTURAL LEVEL

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ABSTRACT: This article discusses experimental studies on cultural selection as well as some of their findings on the function of programmed events as cultural consequences. I argue first, that the experimental preparations developed in this context have been effective at isolating the functions of contingencies operating at both the cultural and individual-ontogenic levels, and second, that the results obtained so far challenge the notion that the behavior of members of a microculture evolve solely as a function of contingencies at the level of the individual. I also suggest that an event’s functioning as a cultural consequence may depend on its correlation with contingencies for individual members of the same microculture.

Key words: cultural selection, interlocking behavioral contingencies, metacontingencies, cultural consequences

In behavior analysis, the modification of cultures has been discussed in terms of selection by consequences, a process also present in biological evolution and in individual operant behavior (Skinner, 1981). However different structurally from phylogeny and ontogeny, cultural evolution involves variation and selection and, to this extent, is not supposed to involve a new type of evolutionary process (Glenn, 1991), although the scientific study of cultural evolution may require its own units of analysis (Glenn, 2004). In this article, I will discuss empirical studies that take the metacontingency (Glenn, 1988) as the unit of cultural selection and I will argue that at this level, cultural outcomes may operate in a particular fashion. The way they seem to operate is analogous to something that has also been observed with respect to contingencies operating at the individual or ontogenic level, but may be more prominent in the cultural domain: the correlation of cultural consequences with other consequences, in particular, ontogenic consequences.

The interpretation I offer for the mode of operation of consequences in cultural selection is based on data from recent experiments, many of them from laboratories in Brasil. These experiments were designed as a response to possible questions about the relevance of cultural-selection studies to the explanation of social behavior. One central issue addressed by the experiments is as follows: Do cultural consequences select behavioral phenomena that can only be defined at the group level, or do cultural phenomena consist only in the concatenation of operant processes defined at the individual level? The issue under examination is ultimately that of reductionism in the social sciences (e.g., List & Spiekermann, 2013). Regardless of the final answer, the empirical analyzes I discuss here should promote greater behavior-analytic attention to some unusual aspects of cultural behavioral processes. Rather than impugning the relevance of a particular unit of analysis to the study of culture, empirical
questioning could contribute to the development of behavior-analytic theory in relation to cultural evolution.

**Background**

The impetus for the empirical research reviewed here has been Glenn’s (1986, 1988, 1991, 2004) set of proposals about metacontingencies. In a phenomenon susceptible to cultural selection we can distinguish at least three distinct aspects: (a) *interlocking behavioral contingencies* that involve different individuals; (b) the *aggregate product* that results from these interlocking contingencies; and (c) the *cultural consequence* that is contingent on this product and thereby selects the interlocking contingencies (as well as their aggregate product) as a cultural unit. The selective relation between (a-b) and (c) defines a *metacontingency* as a cultural phenomenon (e.g., Glenn, 1988).

The latter contingency is dubbed *meta* because it operates on interlocking behavioral contingencies (a) and their aggregate product (b) together as a lower-order unit of selection. In a restaurant, for example, the coordinated actions of the cooks and waiters in preparing and serving food represent interlocking behavioral contingencies (hereafter, IBCs); the food being served is their aggregate product; and the cultural consequences of the latter include the clients paying the bill, coming back to the restaurant, and recommending it to other people.

Most studies conducted on cultural selection processes have sought to identify cultural analogs of what is known of reinforcement at the level of individual operant behavior. Among other findings, there is now clear evidence of selection of IBCs (e.g., Pereira, 2008; Vichi, Andery & Glenn, 2009; Ortu, Becker, WoeIz & Glenn, 2012), of the deterioration of interlocking responses with the suspension of their cultural consequences (e.g., Caldas, 2009), of the control of IBCs by antecedents (e.g., Vieira, 2010) and intermittent cultural consequences (Amorim, 2010; Vichi, 2012), of the “shaping” of IBCs through an analog of successive approximations (e.g., Cavalcante, Leite and Tourinho, 2014; Pavaneli, Leite & Tourinho, 2014), and even of “superstitious” IBCs selected by noncontingent cultural events (Marques, 2012).

These studies are representative of a research agenda that takes culture as a legitimate subject matter for behavior analysis, while seeking dialogue with other intellectual traditions (see Andery, 2011). We are far from understanding cultural selection to the extent that we understand operant processes, but we have been advancing at a rapid pace since Glenn’s seminal work (e.g., 1986, 1988). Developments in the field have led to novel interpretations of cultural phenomena (e.g., Todorov, 1987) and pioneering experiments that specifically target cultural selection (e.g., Vichi, Andery, & Glenn, 2009). Whereas most of the results call for additional research efforts, they speak collectively in favor of the validity of the metacontingency as a unit of analysis.

As a type of phenomenon with respect to which appropriate research preparations are still being developed or refined, studies of cultural selection unsurprisingly raise various doubts and questions. These include the idea that the phenomena observed in these experiments may be explained solely as the result of lower-order operant processes. A critic may legitimately question whether a consequence delivered during a cultural-selection experiment
actually functions as a cultural outcome rather than as an individual operant reinforcer. Here, “functioning as a cultural outcome” means being functionally dependent on IBCs and affecting their recurrence, whereas “functioning as an operant consequence” means being functionally dependent on individual responses and affecting the recurrence of individual responses by group members.

In the pioneering metacontingency experiment by Vichi, Andery, and Glenn (2009), for example, there was no distinctive individual operant consequence, and the consequences deemed “cultural” were tokens exchangeable for money. These tokens were delivered to the group at the end of each trial cycle, contingent on a specific interaction pattern in the previous cycle (namely, participants chose rows in a stimulus matrix and had to distribute their gains in a particular fashion). Can one say with confidence that these tokens were not consequences operating individually, as reinforcers that kept the group members working with one person’s responses under the discriminative control of other people’s behavior?

Later studies by the same research group (e.g., Amorim, 2010; Brocal, 2010; Bullerjhann, 2009; Caldas, 2009; Dos Santos, 2011; Magalhães, 2013; Pereira, 2008; Teixeira, 2010; Vieira, 2010) addressed this issue with an experimental preparation in which group- and individual-level consequences were distinct. Participants were exposed to a four-column stimulus matrix with computer-generated numbers in the first row. Each participant’s task was to write a number under one of those generated by the computer. Depending on the sum of the numbers in a column, an individual response produced tokens or points exchangeable for money. An interlocking response pattern (related to the sum of the numbers across columns) also produced points for the group. Each participant was therefore able to produce his or her own operant consequences regardless of the pattern of responses at the group level; likewise, any participant could produce consequences for the group independent of his or her own points. Even though individual and cultural consequences were of the same kind (points exchangeable for money), the delivery of a group-level consequence required group interlocking. In these studies, however, group gains were divided among participants, which still feeds into the assumption that cultural consequences operate only as individual reinforcers.

A series of other studies (e.g., Borba, 2013; Cavalcanti, Leite, & Tourinho, 2014; Marques, 2012; Pavanelli, Leite, & Tourinho, 2014; Soares, Cabral, Leite, & Tourinho, 2012; Soares, Martins, Leite, & Tourinho, 2014; Vichi, 2012) employed a matrix with ten columns and ten rows of different colors. In these studies, individual consequences were contingent upon the selection of odd rows, whereas cultural consequences depended on group-level patterns of colors across rows. Unfortunately, these procedural changes still do not ensure that something more than individual-level operant selection is underway. A participant’s choosing a color different from those of the other group members may be nothing more than an operant response under the control of compound stimulus patterns and maintained by individual reinforcers, as in standard operant studies of cooperation (e.g., Schmitt, 1987).
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Newer Studies

Some recent studies that use the matrix preparation (Borba, 2013; Cavalcanti, Leite, & Tourinho, 2014; Marques, 2012; Pavanelli, Leite, & Tourinho, 2014; Soares, Cabral, Leite, & Tourinho, 2012; Soares, Martins, Leite, & Tourinho, 2014; Vichi, 2012) or the writing of numbers as responses (Magalhães, 2013) have introduced an important modification, however. In these studies, individual and cultural consequences are not only programmed according to different schedules, but are also of different types. Whereas the individual consequences remain tokens exchangeable for money, the cultural consequences consist of stamps exchangeable for items to be donated as a kit to schoolchildren. These items do not stay with the participants, who are told that they can accompany the experimenter the day the kit is delivered to the children.

Various processes may underlie the interlocking production of cultural goods. First, the production of an item correlated with a cultural good may in and by itself strengthen behavioral interlocking. Second, what strengthens interlocking may be not the item itself, but a later outcome that affects other members who engage in a cultural practice (as when collecting and donating food eventually reduces the number of beggars on the street). Finally, an even more remote consequence (such as a lesser need for social expenditures) may impact a culture a few generations removed from those who first replicated the cultural practice. Cultural goods sometimes work that way, in which case they are hardly “consumed” by the people who produce them; contact with, and consumption of, the goods so produced may occur in a generation subsequent to that responsible for their production.

In studies that employ the colored stimulus matrix and cultural consequences different from individual ones, the participants generally start to respond in interlocking patterns, although individual consequences do not depend on the latter. The frequency of these IBCs decreases when cultural consequences are suspended (e.g., Caldas, 2009; Vichi, 2012), although the decrease may take a few cycles to occur. The IBCs can be prevalent even when their cultural effects compete with individual reinforcers (cf. Borba, 2013). Thus, the latter do not entirely suffice to explain the recurrence of IBCs; their explanation must in one way or another refer to cultural factors. At this point, it is important to note that although they have the possibility to do so, most of our participants do not attend the ceremony at which the kits are delivered to the schools. Clearly, the variables relevant to the selection and maintenance of IBCs should be sought within the experimental session itself.

The Role of Verbal Behavior

As we have seen, some of our studies (e.g., Borba, Silva, Cabral, Souza, Leite, & Tourinho, 2014; Borba, Tourinho, & Glenn, 2014) involve competition between individual- and group-level contingencies. In these conditions, responding engendered by the metacontingencies may be described as a form of ethical self-control (cf. Jones & Rachlin, 2006) because participants respond in accordance with a group-level, delayed consequence that competes with more immediate, individual consequences. Some of the
conditions manipulated by Borba, Silva, et al. (2014) had the participants (a) respond without knowing what the others did, (b) respond in the presence of others but without interacting verbally with them, or (c) respond and interact verbally with the other participants. The results suggest that ethical self-control prevails only when the participants interact verbally with one another.

From Harris’ (1975) analysis of cultural practices, we know that there often is a large gap between the actual metacontingencies that hold in a society and the rationalizations people offer about their own behavior. Accordingly, when we speak of the importance of verbal behavior in ethical self-control (and more generally, in cultural selection), we are not necessarily assuming that people describe the prevailing metacontingencies accurately. What we assume instead is that the effectiveness of a cultural outcome may depend on its correlation with verbal events (including, but not limited to, approval and disapproval); this is usually the case when metacontingencies conflict with operant contingencies operating at the individual level. The verbal events that acquire a behavioral function through their relation to cultural outcomes are, of course, wide-ranging. For example, they include medical or scientific statements about the perils of different types of food or substances; in response to these statements, social groups may encourage consumer responses toward alternative products.

This mode of operation of cultural outcomes warrants closer examination. In some circumstances, social approval/disapproval may reinforce individual operant behavior but still fail to maintain interlocking. The coordinated responding of workers in a market production unit, for example, often suffers when buyers stop delivering cultural consequences to the group (cf. Glenn & Malott, 2004). Our studies with metacontingencies exemplify the same phenomenon—the likelihood of IBCs usually decreases when cultural consequences are suspended. In other cases, however, a group keeps responding in an interlocking fashion (under operant contingencies of approval/disapproval at the individual level) even after the correlation with cultural outcomes breaks down. In this case, correlation with a cultural outcome may be responsible for the initial occurrence of an IBC but not for its persistence. When interlocking persists in the absence of the cultural outcome, IBCs become nonfunctional from the cultural standpoint—a phenomenon that Glenn (1986) once discussed under the heading of “ceremonial” metacontingencies (as opposed to “technological” metacontingencies).

Of course, we know of other cases in which correlations among events are paramount to the explanation of behavior. We presumably learn to respond to private stimuli through their correlation with public events (Skinner, 1945), for example. This happens when we see a child crying with one hand on her chin and then take her to the dentist; in these circumstances, the child learns to say that she “has a toothache.” When a person describes a “toothache” under the control of bodily stimulation, the functionality of this description depends on the correlation between private stimulation and public stimuli—a correlation on the basis of which the verbal community differentially reinforces verbal responses descriptive of the “toothache” (Skinner, 1945; Tourinho, 2006). Other cases of events acquiring behavioral functions through their relation to other events can be observed in stimulus equivalence and similar phenomena (cf. Hayes, Barnes-Holmes, & Roche, 2001; Sidman, 1994). In the case of
private events and stimulus equivalence, however, the correlated events operate on only one level of selection, that of individual operant behavior.

Conclusion

Experiments on cultural evolution remain insufficient in number to precisely establish its most relevant dimensions. They do provide evidence, however, of human behavioral phenomena that require more than a summary reference to phylogeny and ontogeny for their explanation. Our survey of the experimental results leads us to five provisional conclusions.

First, individual operant reinforcers are insufficient to explain the selection and maintenance of IBCs among members of microcultures. There is some evidence that IBCs are selected only when cultural consequences (in addition to individual reinforcers) are contingent on interlocking. When cultural consequences are suspended, the likelihood of interlocking is often reduced, although cases of persistent IBCs have also been observed in these circumstances.

Second, the effectiveness of cultural outcomes in the establishment and maintenance of IBCs seems to depend, at least in some circumstances (for example, those with metacontingencies and operant contingencies in conflict), on their correlation with operant social consequences at the level of the individual—usually approval or disapproval of people’s behavior. In the absence of this correlation, group members are less likely to maintain a pattern of interlocking, coordinated responses.

Third, although stimulus correlations are crucial to the explanation of various behavioral phenomena (for example, conditioned operant reinforcement and Pavlovian conditioning), cultural selection seems unique in that the effectiveness of a cultural outcome in maintaining interlocking behavioral patterns depends on its correlation with events that occurs at another level of selection—namely, individual operant selection.

Fourth, Glenn’s (1991) statement that verbal behavior is the “glue” of culture may be taken at face value, meaning that the relation between cultural and individual outcomes is mediated by language. We may find it convenient to assume that individual reinforcers suffice to explain cultural behavior; the fact remains, however, that the maintenance of interlocked behaviors by social reinforcers tends to break down in the absence of overarching metacontingencies.

Finally, to address the issue implicit in my title, cultural consequences do affect the likelihood of interlocking behavioral patterns, but they do so in a way that seems unusual. The search for analogs of operant processes at the cultural level has been useful so far, but uncovering features specific to the cultural level remains a possibility worth considering. Viewing cultural evolution as the mere transposition of operant selection to culture hinders our recognition that something more—not a new process, but a new set of features of selection processes—may take place when social groups interact in complex ways.
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References


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[Selection of interlocking behavioral contingencies by intermittent cultural consequences]. Unpublished paper.
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