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I. Artículos

The Selection Metaphor: The Concepts of Metacontingencies and Macrocontingencies Revisited

La metáfora de la selección: una revisión de los conceptos de metacontingencia y macrocontingencia

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Resumen

Las explicaciones tradicionales de la conducta cultural se fundamentan en una perspectiva seleccionista. Sin embargo, varias discusiones teóricas se han preguntado sobre la misma y sobre la identificación de unidades de selección. Argumentaré que, si bien las propuestas centrales de Glenn constituyen una extensión valiosa de los principios operantes, el enfoque seleccionista ha entorpecido el desarrollo conceptual y empírico de la teoría. Se presenta un examen de las nociones fundamentales de la teoría de la evolución cultural; específicamente, una revisión de los conceptos de metacontingencias, contingencias conductuales entrelazadas, macrocontingencias y productos agregados, en términos de su contribución a una explicación válida y significativa del comportamiento cultural. Se sugiere que se requieren análisis experimentales funcionales para identificar el control de la conducta por parte de contingencias individuales o grupales, incluyendo los productos acumulados y agregados.

Palabras clave: metacontingencia, macrocontingencia, contingencias entrelazadas, prácticas culturales, selección natural, selección cultural.

Abstract

Current mainstream accounts of cultural behavior are strongly founded on a selectionist perspective. However, more than a few theoretical discussions have emerged regarding the appropriateness of the subject matter and the identification of units of selection. I argue that although Glenn's central formulations constitute a valuable extension of operant principles, the selectionist approach has hindered the theory's conceptual and empirical development. An examination of the fundamental notions included in the theory of cultural evolution is presented. Specifically, we review the concepts of metacontingencies, interlocking behavioral contingencies, macrocontingencies, and aggregate products in terms of their contribution to a valid and significant account of cultural behavior. It is suggested that experimental functional analyses are required to identify control of behavior by local contingencies or group consequences including cumulative and aggregate products.

Key words: metacontingency, macrocontingency, interlocking behavioral contingency, cultural practices, natural selection, cultural selection

According to Skinner, the notion of selection may be used to describe biological, psychological and cultural change. Skinner defined a culture as a set of contingencies of reinforcement shaped and maintained by the members of a group (Skinner, 1974; 2001). From a selectionist perspective, a culture is said to evolve through the practices that promote its survival. From this theoretical framework, different authors have argued that the complexity entailed in the analysis of cultural phenomena justifies the introduction of new concepts such as metacontingency, interlocking behavioral contingency, macrocontingency and macrobehavior (Glenn, 2004; Glenn & Malott, 2004, Glenn, 2010; Houmanfar, Rodrigues & Ward, 2010; Malott, 2003). It is argued that these terms, describe functional relations including the interrelated behavior of two or more individuals and its controlling variables. However, the theoretical and practical value of these concepts has been debated but little consensus has been reached.

Before further elaborations to the theory are proposed I consider it essential to attempt to a conceptual analysis in order to clarify confusions with respect to the assumptions on which the theory is based. This in turn, will lead to the construction of a consistent theoretical system from which empirical investigations may be derived (Fryling & Hayes, 2011; Machado, Lourenco & Silva, 2000).

I propose we examine the selectionist account of cultural phenomena in terms of its validity or internal coherence, and its significance or the degree to which the system is congruent with other scientific enterprises (Kantor, 1958). The main goal of this analysis is to suggest a path towards simplicity. The fact that the phenomenon of interest may be judged as complex does not mean that the theoretical model used to describe it should be equally complex.

Because an account of cultural behavior cannot be provided unless a subject matter is clearly defined, the development of cultural-level units (e.g., metacontingency and macrocontingency), requires that we simplify definitions, get rid of unnecessary concepts and align theoretical assumptions with those of behavioral science. In my view, some of the difficulties in defining the unit of analysis and the unit of selection at the cultural level are evidenced when acknowledging the limitations of using the metaphor of natural selection.

The study of cultural entities such as organizations or cultural collectivities requires identifying some of the inconsistencies in the selectionist approach for the cultural phenomena, and examining the possible sources of such inconsistencies. Specifically, it seems important to clarify: (a) what is the unit of selection in an evolutionary theory of cultural practices, (b) if the study of interrelated behavior involves a subject matter different from the one of behavior science, (c) the definitions used to account for cultural practices of different sorts (i.e., metacontingencies, macrocontingencies, interlocking behavioral contingencies, aggregate products, macrobehavior, etc.) and (d) the functional nature of these relations. In the following pages I will address each of these concerns.

Behavioral approaches to cultural phenomena: Some problems

The theory of biological evolution has had a profound impact on psychology in general and in the field of behavior analysis in particular. Namely, the logic underlying the process of natural selection provided a new philosophical frame for the understanding of causality relations between psychological events. With this new paradigm of causality, the logic of mechanistic causality derived from Newtonian physics was replaced (Machado, Lourenco & Silva, 2000).

In biological evolution, the theory of natural selection states that the phenotypes that prevail within a given population, are those that contribute to its adaptation and reproductive success. Thus, if some phenotypic traits prevail under certain environmental conditions it is because they have been selected. In extrapolating this logic to the process of operant conditioning, Skinner (1974; 1981; 1984) stated that behavior is selected by its consequences. Consequences that have survival value for the organism select the behaviors upon which they are contingent. As a result, those behaviors have a higher probability of occurrence under similar conditions. Similarly, at the cultural level the same reasoning is said to apply: the environment selects those practices that promote the survival and the well being of the culture (Skinner, 1974).

Further, Skinner (1974) states that there are three types of survival values: the survival of the species, the survival of the organisms and the survival of the cultures. Each of these values accounts for selection

processes at the phylogenetic, ontogenetic and cultural levels, respectively. Behaviors related to each of these values are maintained by contingencies of survival and contingencies of reinforcement.

Based on these views, Glenn (1988) formulated a more elaborated account of cultural evolution, which integrates some of the notions of cultural materialism (Harris, 1979, 2007) and Skinner's selectionist approach to the behavior of organisms. In this new theoretical framework the concepts of interlocking behavioral contingencies, metacontingencies and macrocontingencies were introduced to describe contingency relations associated with cultural practices (Glenn, 1988, 2004).

Let's review some of the ways in which terms have been used. A metacontingency is defined as a relation between two terms: (a) a recurring set of coordinated behaviors of two or more individuals, also called interlocking behavioral contingency (IBC), which results in a product, and (b) an environmental consequence that selects and maintains the IBC so that it is more likely to occur in the future (Glenn, 2004, 2010). As a unit that describes complex social environments such as organizations the metacontingency is defined as "a conglomerate of interlocking behavioral contingencies containing the behavior of multiple individuals, which generates a product that has a demand" (Malott, 2003, p. 39).

An interlocking behavioral contingency on the other hand, has been defined as a sequence of coordinated behaviors of several individuals in which any component of the behavioral contingency of one participant interacts with elements of the behavioral contingency of other participants (Glenn, 2004).

Since their introduction, several points with respect to these two concepts have remained unclear. As a result, divergent interpretations have been developed generating a fair amount of conceptual ambiguity. For example, there is currently a lack of consensus as to whether the unit of analysis is interlocked behavior or interlocked contingencies (see Glenn, 2010; Hayes & Houmanfar, 2004; Houmanfar et al, 2010). In relation to this it has been discussed whether the level of analysis of cultural phenomena is behavioral, cultural or sociological (Branch, 2006; Glenn, 2004, 2010; Houmanfar et al., 2010) and little consensus has been reached.

Another issue that lacks sufficient clarity is the functional role of the product in the metacontingency and the IBC.- How exactly is the product defined? -Is it functionally different from an environmental consequence? -Why has it become relevant only in the metacontingency and not in the behavioral contingency?

A macrocontingency on the other hand was originally defined as a set of behaviors of different individuals that although individually acquired, generate a cumulative product that is not part of a contingent relation with the behavior of each individual (Glenn, 2004). However, a few other definitions have been proposed. Branch (2006) for example, defined macrocontingencies as individual contingencies applied to large numbers of people. Ulman (2006) on the other hand described macrocontingencies as conjoint and sequential actions of two or more individuals under common contingency control. In this view, Glenn's metacontingency may be considered as a type of macrocontingency (Ulman, 2006).

As I see it, a behavioral analysis of complex social environments won't be possible as long as theoretical and empirical investigations are furthered where there are philosophical and conceptual inconsistencies (see Machado et al, 2000). Clearly, until questions are answered and definitions unified, the value of these concepts for a cultural analysis will remain uncertain (Hobbs, 2006; Mattaini, 2006), and the production of experimental research on metacontingencies and macrocontingencies will continue significantly limited. I will show that in general, most of the inconsistencies result from difficulties with respect to: (a) the use of the selection metaphor and (b) the definition of a unit of analysis that accounts for socio-cultural events. I will discuss why these issues have been problematic and suggest ways in which the problems may be overcome.

A Selectionist approach

The notion of selection, frequently used in the social sciences, is a complicated one (Glenn, 2010). Scientists from different fields often disagree with respect to the ways in which the logic of natural selection should be applied to the understanding of their subject matters (see Hull, Langman & Glenn, 2001). Thereby, the task of describing how the selection process operates across different scientific domains and levels of analyses is not

without difficulties. For example, as noted by Hull et al, (2001) in operant learning and cultural phenomena, selection occurs only with respect to sequences of interactions; while in biological evolution, the process of selection operates upon numerous concurrent alternatives. Because it is only in natural selection that several replicators are simultaneously available, determining the value of the presently occurring behaviors relative to the not prevailing ones may be problematic (Houmanfar, Hayes & Fredericks, 2001; Hull et al, 2001).

In addition, inconsistencies regarding to how the selection process operates at each level of analysis are evidenced when testing the point-to-point correspondence between biological, operant and cultural evolution. When describing how selection accounts for patterns of relations at each of these levels, authors have sought to isolate and identify the interactors in the relevant event-environment relationships, namely, the selector, the necessary conditions for selection, and the unit that evolves as a result of the process of natural, behavioral or cultural selection. Disagreements in the descriptions provided within levels of analyses abound.

In biological evolution, consensus with respect to the primary units of selection has not been reached. While Dawkins (2008) contends that the units of selection are genes, in Mayr's view (1997), the units of selection are organisms. At the ontogenetic level of analysis the unit of selection is the operant (Hayes & Houmanfar, 2004) or in Glenn's (2004, 2010), terms response lineages, while in cultural evolution, authors have proposed a variety of views. The subject of cultural selection has been identified as the practices of the group (Skinner, 1974), the IBCs and the aggregate product (Houmanfar & Rodrigues, 2006 Malott, 2003; Glenn, 2004; Glenn & Malott, 2004).

Further problems arise when the rest of the elements that complete the selection process have to be articulated into a coherent description. The agent of selection for the above identified selection units at all three levels is the environment. However, while in operant conditioning, the selector is clearly defined as a reinforcing consequence, in cultural evolution the environment has been identified as the receiving system (Glenn & Malott, 2004), as the product of interrelated behavior (Malott & Glenn, 2006), and as consequence, external to the IBC's and its product (Glenn, 2010).

Continuing with the parallel, in cultural evolution a selection process is said to have occurred if it results in the success of the group. According to Skinner, a culture evolves when practices of individuals contribute to the success of the group in solving its problems (Skinner, 1974, 1981); but what determines the success of the group has not been clearly specified (Mattaini, 2006). Recent accounts applied specifically to the evolution of organizations have replaced the success of the organization as the evidence of selection, by the generation of a satisfactory product (Malott & Glenn, 2006; Houmanfar & Rodrigues, 2006). However it is not clear if and how a satisfactory product is related to the success of the group.

Finally, the entity that evolves as a result of the selection process is the species, and response lineages in biology and psychology respectively. In cultural selection different entities have been proposed. Thus, according to some authors, what evolves as a result of selection are the IBCs or cultural-behavioral lineages (Glenn, 2004; Glenn & Malott, 2004), and according to others it is the organization/culture as a whole (Houmanfar & Rodrigues, 2006).

Notice that in individual and cultural selection the unit of selection and the evolving entity happens to coincide (operants/IBC's/the organization). In other words, what is selected is the same thing as that which evolves as a result of the process. By contrast, in natural selection, what are selected are genotypes or phenotypes and what evolves are the species or populations.

As I have briefly shown, the metaphor of selection has been used to describe how different subject matters are related to their particular contexts. Within each particular domain, alternative formulations of how selection occurs, and what elements are involved in the process seem to vary according to vantage points, interpretations, and theoretical bias. The paradigm of selection has been used as a discourse applicable to any arrangement of event-environment relations. Its practical value for the understanding of the variables that allow for prediction and control of subject matters in different domains is questionable if using the analogy results in a level of conceptual confusion that threatens theoretical formulations.

Is the selection metaphor really useful?

Darwin introduced the notion of natural selection as a metaphor to explain how a great variety of species

evolved from a few common ancestors. To review, his theory states that certain phenotypes produced by random mutations in the gene-pool, become more prevalent within a population, given their contribution to the adaptiveness of organisms having those traits. In a continuously challenging environment, the likelihood of survival and hence of reproductive success is increased in some of those genetically changed organisms only. A laboratory experiment could show the evolutionary process if in place of natural variation and mutation, an experimenter artificially produced these genetic mutations and put them to the test with also designed particular environmental threats.

In a context where religious notions were dominant and a superior intelligence was thought to be responsible for the existence of all things, naturalistic postulations were difficult to understand. Although Darwin illustrated the evolutionary process using examples of artificial (man-produced) selection, he was careful to highlight the absence of an intentional design that produced those mutations thereby guiding the process of speciation in particular ways. With no experimenter deliberately producing environmental threats or changes in the anatomy of organisms, the process was described as a type of design without a designer, or *natural* selection.

The notion of selection refers to a process and an outcome. However, in its original formulation the concept was used as a metaphorical extension in which causal relations between agents and subjects of selection were used to explain the prevalence of some phenotypes among others.

Throughout the development of sciences, the metaphor of natural selection has been used to account for processes relative to different disciplines (e.g., behavioral psychology, cognitive neurosciences, cultural materialism, systems analysis, and sociology). Metaphors are useful when a complete account of the phenomenon under study has not been reached, or as an instrument to facilitate the understanding of abstract concepts by using more familiar ones.

Although the knowledge brought about by the use of a metaphor may throw some light on the phenomenon under investigation, conceptual problems arise when most or all of the characteristics of the original event are extrapolated to those of the subject matter being explained

by means of the metaphor. Unfortunately, the risk of doing so is particularly high given that the practical validity of the metaphor increases as a function of the number of elements susceptible to extrapolation. Therefore, in attempting to increase the comparability of the two events (and thus, the value of the metaphor), the probability of making erroneous assumptions increases and the value of the metaphor may be as a result, undermined.

The use of natural selection as a metaphor to provide a philosophical and theoretical foundation for psychology and other related disciplines has had an ill impact on the consistency of its theoretical, conceptual and investigative systems and it has originated and maintained unnecessary controversies within other scientific fields.

Both behavior analysis and Behavioral Systems Analysis, have been concerned with finding an appropriate fit between the assumptions pertaining to their subject matter and those of natural selection. Significant time and effort has been invested in trying to reach a consensus with respect to the identification of the units of selection, the conditions under which selection occurs, and the entities that evolve as a result of selection. Further, because there is more than one approach to evolutionary theory, the proposed parallels between biological and other types of selection often reveal a muddle of philosophical assumptions. Theoretical discomfort is often solved, by relaxing the boundaries of conceptual precision. The result, a gain in generality at the expense of accuracy, diminishes the validity and significance of the scientific account.

Not few conceptual and theoretical problems in psychology have arisen from the inclusion of metaphors and borrowed terms (from other disciplines or from colloquial language) as conceptual categories in our scientific system. Although historically behavior scientists have criticized the use of this practice by other psychological approaches, it is not foreign within the behavior analytic literature. Borrowed from physiology, the concepts of stimuli and responses have implied a characterization of psychological events in terms of categories pertaining to biological events. Similarly, theoretical formulations such as behavioral momentum and behavioral economics are described using a conceptual logic originated in other disciplines.

Some of the terminology from evolutionary theory is now commonly used in operant conditioning descriptions.

Terms such as response lineages, cultural lineages (Glenn, 2004), populations of responses (Hull et al; 2001), and replicators (Glenn, 2004, Glenn & Madden, 1995; Hull, et al., 2001; Malott & Glenn, 2006), are often used in selectionists models of cultural behavior. In my view, if the concepts generated within a discipline sufficiently account for their referents, the introduction of borrowed or new terminology is hardly justified.

Skinner used the metaphor of natural selection to explain that behavior- environment relations are functional and not causal in a mechanistic sense (Chiesa, 1994). Unfortunately, where the importance of this new kind of causality (to use Skinner's terms) is neglected, mechanistic worldviews continue to predominate in behavioral formulations. Descriptions of functional relations in terms of linear temporal sequences that suggest a mechanistic causality (antecedents, behavior, consequences) are not uncommon in applied behavior analysis (Fryling & Hayes, 2011). Nevertheless, and regardless of the causal philosophical assumptions adopted, the selection metaphor continues to be used with an increasing number of terms from evolutionary theories.

The root metaphor of the mechanistic perspective is the machine and the functioning of its parts, having a specific location in space and time (Pepper, 1970). Thereby, identifying agents of replication, agents of selection, subjects of selection, etc. (see Glenn, 2004, Malott & Glenn, 2006) is consistent with the mechanistic goal of identifying loci of action. From the worldview of functional contextualism, behavior- environment relations are best understood as functions in a mathematical sense of the term (see Fryling & Hayes 2011). Thus, concepts such as *stimulus* and *environment* do not correspond to certain objects or events occurring before or after a point of reference, or being external or internal with respect to that point. Specified reinforcers, EOs or discriminative stimuli in models of cultural phenomena prior to experimental evaluation, is not consistent with the logic of a functional analysis but with the logic of a mechanistic, linear philosophy (see for example Houmanfar et al., 2010).

Glenn described the metacontingency as a kind of selection, that is to say, a contingency relation between a set of interlocking behavioral contingencies (and its aggregate product) and a consequence (Glenn, 2004; 2010).

Before complex models involving contingencies of more than two terms may be considered (e.g., Houmanfar et al., 2010) systematic empirical research examining simple IBC-environment relations needs to be conducted (e.g., Vichi, Andery & Glenn, 2009).

In my opinion, the value of the selection metaphor in an account of behavioral/cultural phenomena remains debatable. The availability of tacting terms for contingency relations (whether the unit is molar as in IBCs, or molecular as the behavior of single organisms) without reference to the terminology used in evolutionary theories, render the use of this terminology unnecessary.

In addition, because the metaphor is problematic even in gene-based accounts, developing a consistent selectionist account of cultural phenomena may be theoretically fruitless and empirically impractical. The conceptual struggles generated by selectionism may be avoided by investigating cultural phenomena using the conceptual repertoire of a functional analysis of behavior.

An appropriate unit of analysis

Having set aside the discussion regarding what is selected and what is not, we now turn to the second source of controversy: identifying the subject matter in a cultural-behavioral analysis. We will also examine the adequacy of the current conceptual system by revisiting the notions of macrocontingencies, metacontingencies, aggregate products, and interlocking behavioral contingencies. I will discuss the coherence and utility of these terms and propose that only the simplest definitions be maintained.

With respect to the subject matter or unit of analysis appropriate for the study of cultural practices, a few questions come to my mind: should behavior analysts be concerned with cultural phenomena? Does this interest lie outside the boundaries of our subject matter? Because the subject matter of behavior science is the behavior of single organisms with respect to stimulating environments, the ways in which cultural events may be approached from a behavior analytic perspective have not been altogether clear (Houmanfar & Rodrigues, 2006; Malott & Glenn, 2006).

The study of human behavior is also the study of cultural behavior. As Kantor (1982) asserts it is difficult

to differentiate between cultural behavior and non-cultural human behavior. I Therefore, not all human behavior is cultural behavior, the latter may be conceptualized as a category, which includes all instances of human behavior that are not shared with non-human animals.

The culture however, may be construed as an event, independent from the interrelated behaviors of its members, and individual behavior may be understood as the substrate of cultural practices (Glenn, 1988; 1991). Although controversial, the notion of emergence has been used to describe interrelations of events across levels of analysis. Thus, a culture is said to emerge from the interrelated behavior of individuals just as behavior may be considered to emerge from physiological activity. Even though a new unit of analysis or subject matter emerges from processes at other levels of analysis, events at more molar levels are not reducible to events at more molecular levels (Houmanfar & Rodriguez, 2006; Houmanfar et al., 2010). Specifically, cultural events cannot be reduced to psychological events (Glenn, 2004; Houmanfar & Rodrigues, 2006) and psychological events are not reducible to physiological events. Each level constitutes an independent scientific domain wherein the conceptual categories and methods used to describe a subject matter cannot be used to describe units pertaining to a different level.

Although most would agree with the above statements, an interest in studying interrelationships between the science of contingency relations and cultural phenomena has remained (Ulman, 2006). Attempts at this aim have involved applying the logic of the operant contingency for the description of complex relations in societies and organizations. However, if cultural phenomena cannot be reduced to the interrelated behavior of its members, how could a behavioral analysis be achieved?

Because of the multiplicity of variables involved in the study of complex systems such as organized social environments some authors considered useful integrating some of the assumptions from general systems theory with those of behavior analysis. Initially, the Behavioral Systems Analysis (BSA) perspective focused on three units of analysis: the system as a whole, the metacontingency, and the behavioral contingency (Malott, 2003). BSA's main objective is the analysis of complex systems in general, and organizations in particular. However, describing

the behavioral relations that take place in that system is considered a crucial aspect in the understanding of the system as a whole.

From a BSA perspective, an organization is a system comprised of a network of interrelations among its constituent elements or a network of interlocking behavioral contingencies. This view emphasizes targeting the interdependent relations among the parts or subsystems of the organization, rather than the behavior of each individual member (Malott & Martinez, 2006). It contends that the analysis of the variables controlling individual behaviors seems to fall short of an accurate account of the potential problems of an organization given its complexity. This logic corresponds to a molar view in which units of analysis constitute composites of simpler elements, and units of measurements and observation comprise larger time scales.

Establishing a unit of analysis that reflects BSA's main objectives (i.e., the analysis of complex systems in general, and organizations in particular), and remains coherent with the basic tenets of behavior science has been a challenging task. In addition, manipulating consequences involving markets, consumers, the society, etc (the receiving system) may be problematic. In general, it is not clear how entire organizations or societies could be subject to procedures that involve observation and data recording for purposes of conducting experimental analyses (Ulman, 2006).

The confusion between levels and units of analysis is eliminated when we remain at the individual/behavioral level. From this standpoint we can describe and manipulate contingencies to show orderly patterns in the behavior of individuals and their interactions (Marr, 2006), we can observe interrelated behavior in IBCs, as well as the recurrence of these IBCs over time, and we can manipulate consequences in order to accurately determine controlling variables (Branch, 2006; Vichi, Andery & Glenn, 2009). A behavioral analysis of cultural phenomena should not entail adopting a new subject matter or unit of analysis or changing the set of assumptions on which behavior science rests. Psychology is concerned with responses of individuals to stimuli, which we may be characterized as cultural whereas the study of interactions of groups-environment interactions corresponds to the domain of sociology (Houmanfar et al, 2001; Kantor, 1982; Vargas, 1985).

An examination of terms: Contingencies within contingencies

Thus far I have suggested that in studying cultural behavior, we keep the analysis behavioral and analytical (see Baer, Wolf & Risley, 1968), and focus on the contingencies accounting for the interrelated behavior of individuals without reference to a selectionist terminology. The notions of IBC, metacontingency, macrocontingency and macrobehavior, have been proposed to describe the occurrence of behavior patterns among members of a group. I will review the definitions of these concepts and examine their utility for a science of behavior. For this purpose it is important to determine if the processes these concepts describe can be fully explained by already existing concepts or principles. The use of the constructs will be justified to the extent that they refer to new types of interactions characterizing cultural events.

Metacontingencies and IBCs

As defined by Malott (2003) an interlocking behavioral contingency involves an interaction of two or more individuals. In this interaction, any element of an individual behavioral contingency functions as an environmental event for the behavior of another individual. More simply stated, an interlocking behavioral contingency is a set of interrelated behaviors of several individuals, which often results in an aggregate product. As in the case of a behavioral chain or a complex operant, we could say that all the behaviors in the IBC are part of the same operant class. In the IBC the behavior of each individual is shaped and maintained by conditioned reinforcers (any element of the individual contingency), and ultimately, by a terminal reinforcer.

A molar perspective would not require identifying the controlling variables accounting for each single occurrence of behavior, only the consequence maintaining the whole set of coordinated behaviors. This corresponds to Glenn's (2010) notion of a metacontingency (recurrent IBCs maintained by a consequence). Notice that as the terminal reinforcer is contingent upon the behavior of all the group members, each individual behavior could be maintained by that consequence. This could be evaluated by arranging a circumstance where the behavior of only one of the members of the group is prevented from contacting the contingency. If behavior rate decreases to operant levels

(possibly affecting the recurrence of the interlocking behavioral contingency), then the terminal reinforcer may be controlling individual behavior more strongly than the local components of the interlocked contingency. Control by immediate contingencies rather than by the consequence of the IBC would be demonstrated if behavior rate remained unaltered.

The classical example is an assembly line. All members of an assembly line engage in behavior that we may call collaborative: it is due to their conjoint performances that a product or consequence follows. If each member receives a paycheck contingent on the completion of the aggregate product, each individual behavior could be sufficiently described in terms of an individual operant contingency. If a member of the group continued to participate in the chain without receiving a paycheck, the maintaining variables for the behavior of that participant would need to be identified. Another useful example, also mentioned by Glenn (2010) is the coordinated behaviors of the members of a football team. Winning a game shapes and maintains the behavior of each of the members of the team as the consequence is contingent upon the behavior of all the members of the group. As illustrated in these examples, the consequences may be of two types: immediate (conditioned reinforcers), or remote (terminal reinforcers). Identifying predominant control by one type of consequence above the other constitutes an empirical question and should be assessed and not merely assumed.

At any rate, a sequential IBC could be viewed as an analog of a behavioral chain in which components are responses of different individuals in a group. This difference alone may be enough to justify the introduction of the notions of IBC and metacontingency. The analysis of such coordinated behavior could be molar, molecular, or both if the goal is a more accurate functional assessment. While a molecular analysis targets the individual contingency, a molar one targets the metacontingency i.e., the relation that specifies the recurrence of IBCs over time, and its controlling variables (Glenn, 2010). The metacontingency allows for the prediction and control of the behavior of a single individual with respect to a social environment, and of the interrelated behaviors of the group.

It is also important to clarify the role of the product of the IBC and how it differs functionally from its consequence as a maintaining variable. Glenn (2010) parallels the product

of the IBC in the metacontingency to the closing of a switch after a lever press, in the operant contingency. However, the product of behavior is not often considered in a functional analysis unless it alters behavior probability. In fact, not all behavior results in a product, and the same may be true in the case of the metacontingency. If an IBC does result in a product, its functional properties need to be identified. Applied and basic experimental research on IBCs and the metacontingencies needs to be conducted to provide empirical support for these notions. Until a consistent pool of data is obtained, research questions should focus on models involving the two-term contingency only (Glenn, 2010).

Macrocontingencies

In a metacontingency, different topographies are emitted by individuals participating in an IBC. However in some other cases several individuals in a group may emit the same topography. There are two possibilities for the last scenario: (a) the same consequence maintains the behavior of each individual in the group, and (b) individual behavior is acquired and maintained by independent individual contingencies. The former case is a description of a group contingency; the latter corresponds to Glenn's (2004) definition of a macrocontingency. Related to the macrocontingency is the term macro-behavior, which is defined as the behaviors of many individuals having similar topographies that produce an effect at the level of the culture (Glenn, 2004).

In the macrocontingency the aggregate sum of all the consequences constitutes a different outcome that cannot be produced by each individual behavior. Interestingly though, this cumulative effect is not part of a contingent relation with any individual behavior. It is important to notice that in the absence of a contingent relation between behavior and consequence the term macro-contingency is hardly justified. In addition, it is not clear how the introduction of the term macrobehavior could be useful for purposes of application or description. If, as specified in the definition of macrocontingencies, the maintaining consequences are different for each individual behavior, the topographies would not be part of the same operant class and therefore, the notion of macro-behavior could not be used.

Behaviors such as smoking, overeating or contaminating the environment are described as examples of

macrocontingencies. Presumably, they are acquired and maintained by different and independent individual contingencies. Nonetheless, when emitted by several individuals, such behaviors result in a consequence, which is the cumulative product of the non-related behaviors of the group members (Glenn, 2004).

Macrocontingencies differ from metacontingencies in the following fundamental aspects; (a) behaviors in macrocontingencies are not transmitted inter-individually; (b) the behavior of one individual does not depend on, or is related to the behavior others, (c) the behavior of individuals in the group is not oriented towards a common goal, and (d) the cumulative product of macrocontingencies does not have an effect on individual behaviors. We will now discuss which social practices conform to these characteristics.

I will make the case that in most examples of macrocontingencies behaviors are transmitted interindividually. For example, many social practices are acquired, learned and transmitted through observational learning. This is illustrated by Kawai's (1965) research cited by Pierce and Cheney (2004):

"The researchers had spread grains of wheat in a sandy beach that the monkeys often visited. Each monkey picked the grains from the sand and ate them one at a time. Then a young monkey learned to separate the sand from the wheat more efficiently by tossing a handful of mixture into the water. When this happened the sand sank to the bottom and the wheat floated to the top. Using this technique the monkey obtained more wheat with less effort. Other members of the troop observed this behavior and were soon imitating this new method of feeding. Kawai indicated that observational learning transmitted many other novel behaviors, including washing the sand off of sweet potatoes and swimming in the ocean" (Pierce & Cheney, 2004, p. 297).

Behaviors such as feeding or harvesting may be controlled by individual contingencies as well as by the additive effect generated by the behaviors of several individuals. The example above shows that the practice that led to a more effective way of feeding was in fact "transmitted" inter-individually. An organism imitates another's behavior because it is likely that the same consequences will follow (Skinner, 1974).

The same could be argued in the case of cultures. Although the time-span in which similar behaviors may occur is much larger and variable than in the case of non-human animals, the requisite of spatial and temporal contiguity that characterizes contingency relations is transcended by the acquisition of a verbal repertoire. Further, accessibility to information through technology facilitates contact with a large range of cultural practices that are susceptible to be imitated if the consequences constitute sources of reinforcement. Smoking, obesity or unsafe sexual practices leading to epidemics in a population may be explained in a similar manner. If the consequence of a teenager's smoking behavior is peer acceptance, any other member of the group is likely to be susceptible to the same source of reinforcement.

Obesity may be the result of the way the physical environment is arranged. If a particular population has easy access to food and if, most of this food is high in caloric value, this population would tend to be obese compared to others living under different conditions. However, overeating may also involve interrelated behavior, e.g., when a child learns unhealthy eating habits from his parents through observational learning, or when eating is functionally related to a social consequence (eating, drinking and smoking are usually settings in which social interactions occur). From this perspective social practices (not just those accounted for by metacontingencies), entail interrelated behavior. Behaviors such as smoking, drinking, overeating, etc., are the result of social contingencies; as such, they are acquired inter-individually.

Another suggested difference between a macrocontingency and an interlocking behavioral contingency is that in the latter, the behaviors of all individuals are intentionally coordinated, such that they result in a product. However, goal orientation or intentionality in behavior science, refer to control by rules describing, the contingency between the consequence and/or product, and coordinated behavior. Therefore is no reason to assert that IBCs are goal oriented while other social types of social behavior are not.

Finally, I contend that the cumulative product of social practices does affect individual behavior. Cumulative outcomes such as contamination, violence, crime, problems of public health, or even traffic at rush hour, constitute sources of stimulation that may exert consequential control on future behavior probability. The corresponding

rules specifying those contingencies may also function as discriminative/delta stimuli altering behavior probability. Foxal's (1999, 2001) Behavioral Perspective Model for example includes consequential control by symbolic (i.e., socially attributed) properties of stimuli as an important variable in the prediction of consumer's behavior.

Summing up, the metacontingency and the macrocontingency describe relations that allow for the prediction and control of behavior with respect to social environments. Three types of contingencies may be differentiated: (a) the metacontingency, (b) the macrocontingency, and (c) group contingencies. However, if we agree that the cumulative product does exert control over behavior, it seems impractical and unnecessary to differentiate between macrocontingencies and group contingencies. As in the case of metacontingencies, individual contingencies or cumulative outcomes may exert differential control on behavior.

Discussion

Confusions raised by the identification of units of analysis and units of selection may be solved by approaching the study of cultural phenomena from a behavioral perspective. This implies that the formulation of theoretical models must be consistent with the philosophical assumptions of radical behaviorism, and that the subject matter does not need to be questioned. Cultural behavior is not different from other types of behavior to the extent that a new subject matter and a new discipline are required to account for cultural practices in a comprehensive manner. As behavior analysts we are interested in the analysis of human behavior and, as human behavior is mostly (if not entirely) cultural, interrelated behavior is itself our dependent variable and subject matter.

Skinner (1981, 1984) paralleled operant conditioning with natural selection to stress that in a functional analysis, a mechanistic type of causality does not adequately describe relations among events. However, selectionism has come to acquire a predominant role in our verbal repertoire. Formulations are accommodated to the logic and terminology of natural selection, even if their philosophical assumptions seem more consistent with a mechanistic type of causality. In my opinion, the analogy with natural selection has added little to a theoretical account of cultural behavior. On the contrary, it has constituted a source of

unnecessary conceptual confusion that may have slowed the progress in the understanding of complex phenomena by creating a significant amount of controversy while hindering empirical research. Sciences and technologies should be cautious when introducing constructs as part of developing theoretical formulations. Scientific explanations should strive for economy and simplicity, and avoid redundancy and rhetorical intricacies.

An examination of some of the concepts used in behavioral analyses of cultural phenomena suggests that macro-contingencies may not differ substantially from the group of contingencies. I contend that the cumulative product may have an effect on individual behavior, and that a completely separate and independent acquisition of each behavior is arguable. Similarly, in a contingency group a common consequence is contingent upon the behaviors of the members of the group (Cooper, Heron & Heward, 2007).

Consequences of the interrelated behavior of all the members of a group may have reinforcing or punishing functions; and this applies equally to metacontingencies and group contingencies. In both types of cultural contingencies, behaviors may be controlled by individual and/or by group consequences, which may include cumulative effects, or aggregate products of recurrent IBCs. Group contingencies however involve similar topographies under common contingency control. By contrast, metacontingencies describe consequential control over IBCs which in turn, refer to the coordinated different topographies of the members of a group. As such, IBCs may be construed as an operant class.

Empirical research on metacontingencies and the design of cultural practices should begin by addressing the two-term relations involved in metacontingencies before more complex models are proposed (Glenn, 2010). As Glenn (2004) asserts, the effects of the added behaviors of several individuals are relevant for the well-being of the culture. Many of the problems that threaten the well-being of cultures are cumulative effects of this sort. Smoking, drug addiction, alcoholism and obesity are the result of practices that require a re-design of cultural-behavioral contingencies. Smaller-scale research projects may target some of these social phenomena in small groups or communities.

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