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## **TARGETS OF INTERVENTION IN CULTURAL AND BEHAVIORAL CHANGE<sup>1</sup>**

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**ABSTRACT:** Behavior analysts implement different type of interventions in their efforts to bring about cultural change. In this article, we identify basic elements of interventions having such goals: the number of people whose behavior contributes to the product of interest, the variety of response topographies that help to generate the product, the intervention locus of change, and the selection contingencies involved in bringing about that change. Based on these elements, we distinguish interventions that target selection contingencies from those that do not; and we distinguish those selection contingencies where the locus of change is individual repertoires (operant contingencies and macrocontingencies) from those where the locus of change is cohesive cultural entities (metacontingencies). We illustrate each type of intervention with examples from the behavior analytic literature and discuss some conceptual, practical and methodological implications.

**KEYWORDS:** metacontingency, culture, macrocontingency, change, behavior

In August, 2005 in Campinas, Brazil, we participated with 16 behavior analysts from Brazil, Norway, Scotland, and the U.S. in a Think Tank on Metacontingencies and Cultural Analysis (Todorov & Malott, 2005). The think tank helped us appreciate that “culture” is a very large and complex domain. It brought home to us the many things behavior analysts are interested in when they attempt analysis of, or intervention in, cultural phenomena. We had the opportunity to review each others’ writings ahead of time and exchange our thoughts through five days of intensive discussions. We are most appreciative of the participants’ contributions as well as their reactions to ideas upon which we developed this paper. We came away with renewed commitment to look for common denominators in behavior analytic interventions that went beyond “the

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<sup>1</sup> Early versions of the manuscript were presented at the 31<sup>st</sup> Annual Convention of the Association for Behavior Analysis (Malott & Glenn, 2005). The authors contributed equally to this article. Correspondence can be directed to [mmalott@abainternational.org](mailto:mmalott@abainternational.org) or to [sglenn@unt.edu](mailto:sglenn@unt.edu).

immediate local contingencies of the individual case” (Malagodi & Jackson, 1989, p. 19).

This paper has three sections. In the first section we identify several elements that seem to help in distinguishing behavioral interventions and cultural interventions. (By behavioral interventions we mean those dealing with immediate local contingencies of individual organisms.) The elements we examine are the number of people whose behavior contributes to the product of interest, the variety of response topographies that help to generate the product, the intervention locus of change, and the selection contingencies involved in bringing about that change.

In the second section we delineate several types of interventions in terms of the elements described in the first section. We distinguish the interventions that target selection contingencies from those that do not. We also differentiate the interventions that target only behavior change (operant contingencies and macrocontingencies) from those that also target changes in cultural entities such as organizations (metacontingencies). Then we illustrate each type of intervention with a couple of examples from the behavior analytic literature. The final section briefly discusses the conceptual, practical and methodological implications of our analysis.

### **ELEMENTS OF INTERVENTIONS**

In order to provide a framework to help us distinguish between behavioral and cultural interventions, we begin by identifying some of the elements that appear to characterize studies that target something more (or in addition) to the local contingencies of individual cases. We do not suggest that the elements we identify exhaust the possibilities, but they are those that we have found helpful in trying to sort out the various ways behavior analysts have attempted to bring about behavioral and cultural change.

#### ***Behavioral Products (Non-aggregate vs. Aggregate)***

Operant behavior almost always involves a product and that product defines the specific operant that a behavioral intervention is designed to change (c.f., Lee, 1988). The reason for intervening to bring about behavior change is usually dissatisfaction with the product. Individuals may be dissatisfied with or threatened by their own behavioral products; for example, a student may be dissatisfied with his test grades. Alternatively, other people may be dissatisfied with the student’s behavioral products; for example, parents or teachers may be dissatisfied with a

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student's test grades. Whoever is dissatisfied may initiate an intervention to change the student's behavior so that the product is more satisfactory.

When the condition causing dissatisfaction or threat is the *aggregate product* of the behavior of many people, then the problem is considered a cultural problem and cultural intervention may be called for. Behavior change of a single individual will rarely have a discernible impact on the undesirable condition. For example, polluted waterways are the products of a variety of behaviors of many people, some functioning independently and others functioning as part of organizational entities such as manufacturing plants. Polluted waterways are a cultural problem, requiring cultural intervention. Although behavior is what must change to alter the aggregate product, successful intervention will not likely be a matter of observing each individual's behavior and manipulating the specific variables of which the behavior is a function on a case by case basis. Nevertheless, behavioral principles will be useful in designing a cultural intervention.

We distinguish here among three sources of aggregate products. First, they may be the sum of the products of people behaving individually. If the recurring behavior of many individuals contributes to an aggregate product, it may have significant impact on the culture. For example, cigarette smoking causes 87% of lung cancer deaths (Ries et al., 2004).

Another source of aggregate products is the interrelated behavior of many individuals, where each individual contributes to a unique product that is an end in itself. For instance, a congressional bill may be the result of a broad range of behaviors, often occurring only once per person, and involving many different people (staff, legislators, lobbyists, political party members, opposition members, representatives of organizations, etc.). The bill is the aggregate product generated by the behavior of many people working on the particulars of that legislation. Whether passage of a bill improves the well being of members of society is another matter, but the relevance of a bill to behavior change can be assessed (e.g., see Seekins, et al., 1988).

A third source of aggregate products is the organized and recurring interactions of multiple individuals whose interrelated behavior results in the aggregate product. In this case, the product requires not only the behavior of all the individuals but also the recurring interlocking contingencies maintaining the interrelations among behaviors of different people (Malott & Martinez, in press). An example is an assembly plant's production of automobiles. Ongoing assembly of the finished automobiles (aggregate product) could not happen without established and re-occurring interlocking operant contingencies affecting the interrelated behavior of those working in the plant.

### ***Functional Consequences (Behavioral vs. Cultural)***

In behavior analysis we start from the assumption that behavior is a function of the environment. A behavioral lineage, or operant class, exists when the relation between re-occurrences of behavior and consequent events alters the probability of subsequent re-occurrences of the behavior. We believe it is important to distinguish conceptually between the product of a response and its consequence, although they may sometimes be one and the same (Vaughan & Michael, 1982). The product of an operant response is a defining feature of the behavior of interest (cf. Johnston & Pennypacker, 1993, p. 67 on defining responses by their result). For example, only that lever pressing of Skinner's rats which closed an electrical circuit (the product or result of the movements) resulted in delivery of food (the consequence).

It is also important in applied interventions to distinguish between the product that often enters into the behavioral definition and the consequences manipulated by the intervener. For example, points or social approval may be delivered as a consequence of a child's washing the dishes, whereas the clean dishes are the product that defines the behavior of interest. When the product cannot be manipulated by the intervener, it does not qualify as an *independent* variable in an experimental analysis, even though it may have a function in the natural environment (Vaughan & Michael, 1982.) For instance, the clean dishes themselves may come to function as a conditioned reinforcer. A similar distinction between product and consequences has been made in the analysis of organizational change (Glenn & Malott, 2004b). For example, some products of a university are its graduates' repertoires and the publications of its faculty and students. The consequences associated with the quality and quantity of those products can include government funding and alumni donations as well as matriculation of a new generation of students.

### ***Number of People (One vs. Multiple)***

Cultural interventions virtually always entail changes in the behavior of more than one person because cultures are, by definition, the "customs", "practices", "beliefs", or "attitudes" of "a group" or a "society" (Encarta, 2003). However, changes in the behavior of multiple individuals do not necessarily constitute cultural intervention. For example, a multiple baseline across individual subjects would not typically be viewed as cultural intervention because the product of each individual's behavior is of interest in and of itself. The multiple individuals whose behavior is targeted in a cultural intervention are those whose behavior contributes to an unsatisfactory aggregate product. So it is not the number of

people whose behavior is targeted that designates an intervention as behavioral or cultural; rather it is whether the product of interest to the experimenters (and others) is the result of the behavior of one or multiple people.

***Variety of Behaviors (Same vs. Various)***

In addition to identifying the number of people whose behavior contributes to the product of interest to a community, it is also useful to consider the number of behavioral topographies/contingencies that contribute to that product or outcome. As we indicated in the section on products, sometimes an aggregate product is the result of many people doing the same thing under pretty much the same operant contingencies. An example is the prevalence of lung cancer (aggregate product) associated with smoking (behavioral topography) presumably maintained by physiological and social reinforcers. In this case an intervention could target the same topography of responses of an unspecified number of people. Other aggregate products are the result of many different behaviors. For example, a polluted river can be the result of many different activities (Todorov et al., 2004).

***Locus of Change (Operant vs. Cultural lineages)***

The subject matter of an operant analysis is re-occurring instances of the behavior of individual organisms and the environmental events functionally related to those re-occurring instances. Those reoccurring instances constitute an operant lineage, or response class. For example, a parent may find the sight of his son's unmade bed an unsatisfactory state of affairs and design an intervention to increase the frequency of that behavior. He could arrange matters so that if (and only if) Bobby operates on his bed linens in a way that results in a bed that meets criterion of "made bed" (product), then 25-cents is handed over (consequence). If the relation between Bobby's bed making and consequent quarters results in an increase in the frequency of the child's bed making, the relation can be designated as an operant selection contingency and the change in frequency of bed making is evidence of the behavioral process of reinforcement. So the locus of change in this behavioral intervention is Bobby's operant lineage of making the bed (re-occurrences of which include those activities having the product of a "made bed").

Cultural lineages are more complex than operant lineages because they comprise more than the operant lineages of a single individual. They also comprise more than unrelated replications of multiple operant lineages that contribute to an aggregate product (such as the operant lineages of the many people contributing to ozone depletion). Cultural lineages comprise interlocking

operant contingencies that involve multiple people and their re-occurring aggregate product. For instance, the printing of a particular newspaper on any given day requires the interrelated behavior of many individuals whose aggregate product is the daily newspaper. If the interrelations are reliable (that is if the interlocking operant contingencies are stable), the aggregate product can be consistently produced. Although behavior of the same people typically re-occurs, well established interlocking contingencies can remain intact (with variations) when one or a few people are replaced. If changes in personnel (or in the behavior of participating individuals) disrupt the interlocking operant contingencies enough to alter the aggregate product, the product may no longer meet the requirements of the external environment. In the newspaper example, the readership may stop subscribing if the content of the newspaper changes as a result of new personnel's failure to integrate its activities in the interlocking operant contingencies constituting the company. Alternatively, the requirements of the external environment may change, requiring alterations in the interlocking operant contingencies if their product is to meet the new requirements. Thus, the locus of any *cultural* change that occurs in this example is the interlocking operant contingencies that produce the newspaper day in and day out. In this example, the locus of change in cultural intervention is the re-occurrences of the interlocking operant contingencies and their daily product – the newspaper.

### CONTINGENCIES

We have distinguished between operant and cultural lineages and we also distinguished the products of individual behavior from the aggregate products that result from the behavior of many people. Here we relate those distinctions to the concepts of operant contingencies, macrocontingencies and metacontingencies (see Glenn, 2004, for further explication of these concepts). We do not suggest that these distinctions are the only ones possible. But they do help us to discriminate between interventions designed to change conditions produced by the behavior of one individual (behavioral interventions) and interventions designed to change conditions generated by the combined behavior of multiple individuals (cultural interventions). They also help us distinguish among some variations of cultural interventions.

#### *Operant Contingency*

Operant lineages are the target of change when operant contingencies are manipulated. Although the intervention may be repeated with respect to additional lineages in the repertoire of that person or another person, each lineage changes as

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a function of the consequences contingent on responses of that lineage. An operant contingency comprises 1) recurring responses of an operant lineage as a target of change (e.g., operations on a bed having the made bed as product) and 2) recurring consequences (e.g., quarters) that are contingent on the bed making. The locus of operant contingencies is, by definition, the individual organism.

### ***Macrocontingency***

When operant lineages of enough people are similar enough in form or product, they may be called a cultural practice. If the behavior constituting a cultural practice has a product that can affect other people, then the aggregate product of the behavior can become a social problem. That is, the aggregate product is dangerous or detrimental to the health, safety or happiness of large numbers of people. The relation between the operant lineages of all people engaged in the cultural practice and the aggregate product is a macrocontingency. This term designates an if/then relation between the behavior of many people and the aggregate product of that behavior. It does not imply that the product functions as a consequence that maintains the behavior constituting the practice.

Consider an intervention to alter the relation in a macrocontingency in which drunk driving produces many injuries and deaths. The behavior constituting the practice is driving under the influence of alcohol and that behavior is targeted for any individual in a community who engages in that behavior; the behavioral consequence (e.g., a penalty) is the same for all of them as well. Because an aggregate product (decreased frequency of death and injury in the community) will determine the success or failure of the intervention, this can be viewed as a cultural intervention.

Because the cultural practice (drunk driving by many individuals) is not a cohesive whole, but a group of functionally unrelated behaviors, selection of the *practice* cannot occur. That is, the aggregate product of all drunk driving in the community cannot serve as a functional consequence for the *practice* and even if it could, the locus of change in the behavior constituting the cultural practice is operant lineages of individual organisms. The individual lineages of the various people can be selected by operant contingencies, but they must change one by one as a result of local contingencies applied to the relevant behavior.

### ***Metacontingency***

Most known human cultures include many complex organizations such as schools, unions, companies, non-profits, laboratories, restaurants, etc. The function of these organizations is to provide a product that satisfies requirements

of its recipients. The recipients may be external individuals or other organizations, or they may be the members of the organization itself. The product is an aggregate product that is the result of recurring interrelated operants of multiple individuals.

The recurring interrelations are due to operant contingencies in which the behavior of some people repeatedly functions as the environment in the operant contingencies maintaining the behavior of others. Call these interlocking operant contingencies. If the inputs that recipients provide contingent on the organization's product function to maintain the re-occurrences of interlocking operant contingencies and their product, cultural selection (analogous to operant selection) may be said to account for the cultural lineage of interlocking operant contingencies. The relation between the re-occurrences of the interlocking operant contingencies/their aggregate products and the maintaining inputs is a metacontingency. We call it a *metacontingency* for two reasons: it involves contingent relations analogous to those in a operant contingency and it contains many operant contingencies within itself.

A critical feature of interlocking operant contingencies is that they survive relatively intact even when some of the operant lineages of some of the participating individuals are altered and even when some of the participants themselves quit, die, retire, or get promoted to another unit within the organization. If the interlocking contingencies maintain enough of the recurring behavior of the changing participants to produce an aggregate product that satisfies its recipients (individuals or organizations), then the interlocking operant contingencies themselves continue undergoing selection.

To summarize, metacontingencies are contingent relations between re-occurring interlocking operant contingencies having an aggregate product and functional consequences based on the nature of the product. The repetitions of the interlocking operant contingencies of two or more people constitute a cultural lineage undergoing selection (for elaboration, see Glenn, 2004; Glenn & Malott, 2004b).

### ***No Selection Contingency***

Sometimes a unique aggregate product results from one or few re-occurrences of the interrelated behaviors of many people. The product may have great value in a culture, so behavior analysts may take some interest in how such a product can be made more likely. Although the behavior is operant, the specific behaviors contributing to the aggregate product may never occur again under similar conditions, so operant selection may not be involved. Of course, the origin of the novel behaviors that relate to one another in such unique formations is the

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histories of reinforcement of the people involved. But the interrelated behaviors form a kaleidoscope of activity that is not, and probably cannot, be repeated, therefore the locus of change is neither in behavioral or in cultural lineages. The locus of change is only in the environment that now includes the novel product of the non-reoccurring interrelated behavior.

We are distinguishing here between *re-occurrences* of interrelated behaviors that result in a novel aggregate product (produced by many people) and *re-re-occurrences of interlocking operant contingencies* that result in re-occurring aggregate products. The novel products of such interrelated behaviors may be organizational entities that, once formed, continue as cultural lineages whose re-occurrences enter into the metacontingencies that account for the stability of organizations that are major components of complex cultures

Table 1 summarizes the relations among the elements we have identified as they appear in various approaches to intervention. The table distinguishes between interventions aimed at re-occurrences that result from selection contingencies and interventions aimed at generating a unique product by the interrelated behavior of many people. It also distinguishes between interventions where the locus of change is re-occurrences of operant behavior (operant contingencies and macrocontingencies) and interventions where the locus of change is re-occurrences of interlocking operant contingencies (metacontingencies). The distinctions addressed in this section hopefully will help in sorting out the contingencies involved in behavioral and cultural interventions. These distinctions are further discussed in the following section.

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Distinguishing behavioral and cultural interventions is hard because all cultural interventions involve behavior change and much of the cultural environment of human behavior comprises the behavior of others. In this section, we draw on the behavior analytic literature to illustrate various approaches to the targets of behavioral and cultural interventions.

### ***Operant Contingency: Operant Lineages with Individual Products***

The hallmark of behavior analysis is the manipulation of operant contingencies to generate change in lineages of operant responses of single organisms. Its research literature is replete with reports of such interventions. Using two studies from that literature, we analyze them here to exemplify the elements of behavioral interventions as identified above (See Table 2).

TABLE 1. ELEMENTS OF BEHAVIORAL AND CULTURAL INTERVENTIONS.

Type of Contingency Intervention	Number of People Contributing to Product (one vs. multiple)	Variety of Topographies Contributing to Product (same vs. various)	Product of Interest (non-aggregate vs. aggregate)	Selecting Consequence (behavioral vs. cultural)	Locus of Change (operant or cultural lineage/ Behavioral or cultural product)
Operant Contingency	One	Same or Various	Non-Aggregate	Behavioral	Operant Lineage/Behavioral Product
Macro-Contingency	Multiple	Same or Various	Aggregate	Behavioral	Operant Lineage/Cultural Product
Meta-contingency	Multiple	Various Interrelated Behaviors	Aggregate	Cultural	Cultural Lineage/Cultural Product
None	Multiple	Various Interrelated Behaviors	Aggregate	None	No Lineage/Cultural Product

TABLE 2. OPERANT CONTINGENCIES TARGETING INDIVIDUAL BEHAVIOR CHANGE.

Reference	Number of People Contributing to Product (single vs. multiple)	Variety of Topographies Contributing to Product (same vs. various)	Product of Interest (non-aggregate vs. aggregate)	Selecting Consequence (behavioral vs. cultural)	Locus of Change (operant or cultural lineage/ Behavioral or cultural product)
Kladopoulos & McComas (2001)	Single	Same: Correct Form of Shooting Baskets	Non-aggregate: Baskets Made by Each Subject	Behavioral: Feedback	Operant Foul Shooting/ Baskets Made by Each Specific Subject
Dorsey, Iwata, Ong & McSween (1980)	Single	Same: One for Each Subject (Mouthing, Skin Tearing, Head Banging)	Non-aggregate: Physical Injuries for Each Subject	Behavioral: Water Mist	Operant Mouthing, etc. /Physical Injuries to Each Specific Subject

TABLE 3. OPERANT CONTINGENCIES TARGETING CULTURAL CHANGE: MACROCONTINGENCIES

Reference	Number of People Contributing to Product (single vs. multiple)	Variety of Topographies Contributing to Product (same vs. various)	Product of Interest (non-aggregate vs. aggregate)	Selecting Consequence (behavioral vs. cultural)	Locus of Change (operant or cultural lineage/Behavioral or cultural product)
Jason, Billows, Schnopp-Wyatt & King (1996)	Multiple	Same: Selling Cigarettes to Minors	Aggregate: Prevalence of Teenage Smokers/ Associated Health Risk	Behavioral: Penalty for Illegal Cigarette Sales	Operant Lineages of Non-specific Individuals/ Health Risk
Van Houten & Melenfant (2004)	Multiple	Same: Yielding to Pedestrians	Aggregate: Fatalities and Injuries	Behavioral: Verbal Warning or Citation	Operant Lineages of Non-specific Individuals/ Pedestrian Casualties

TABLE 4. CULTURAL CONTINGENCIES TARGETING CULTURAL CHANGE: METACONTINGENCIES

Reference	Number of People Contributing to Product (single vs. multiple)	Variety of Topographies Contributing to Product (same vs. various)	Product of Interest (non-aggregate vs. aggregate)	Selecting Consequence (behavioral vs. cultural)	Locus of Change (operant or cultural lineage/Behavioral or cultural product)
Nevin, J. A. (2005)	Multiple	Various Interrelated Behaviors: Organizing, Planning, Recruiting, Soliciting	Aggregate: Death, Injury, Damage	Cultural: Government Retaliation	Lineages of Interlocking Operant Contingencies of a Terrorist Group/ Damage to Targets
Mace, et al. (1992)	Multiple	Various Interrelated Behaviors: Blocking, Shooting, Assisting	Games Won/Lost Cumulative Score Toward the NBA Finals	Cultural: Funding, recruits	Lineage of Interlocking operant contingencies of Basketball Team/ Games Lost or Won in Competition

TABLE 5. CULTURAL INTERVENTIONS TARGETING ONE-TIME PRODUCTS

Reference	Number of People Contributing to Product (single vs. multiple)	Variety of Topographies Contributing to Product (same vs. various)	Product of Interest (non-aggregate vs. aggregate)	Selecting Consequence (behavioral vs. cultural)	Locus of Change (operant or cultural lineage/ Behavioral or cultural product)
Johnston & Shook, 1987	Multiple	Various Interrelated Behaviors: Monitoring, Writing, Networking	Aggregate: Certification Rule in the State of Florida	None	No Lineage/ Novel Product
Creation of ABA Peterson, et al. (1979)	Multiple	Various Interrelated Behaviors: Negotiating, Soliciting, Presenting, Planning	Aggregate: Formation of MABA	None	No Lineage/ Novel Product

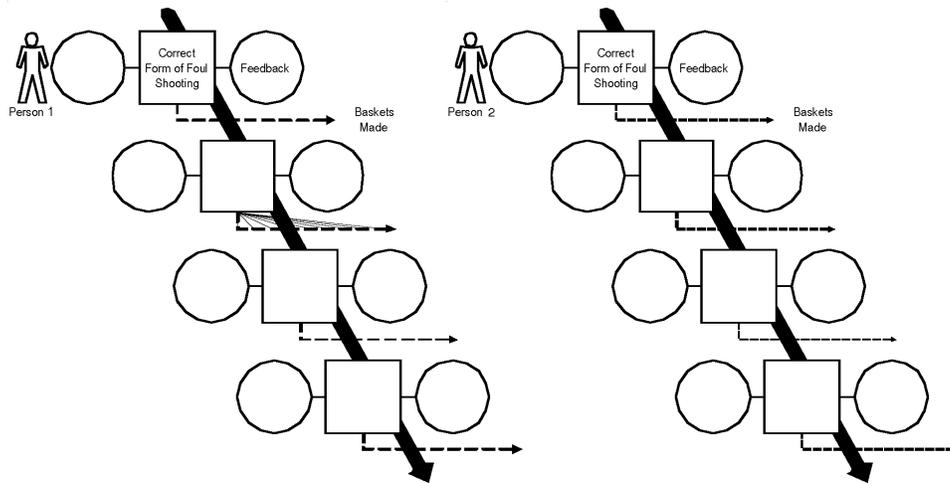


Figure 1. Single behavioral lineage.

The first example of behavioral intervention is based on Kladopoulos & McComas (2001). They investigated the effects of instruction and feedback on the proper form of foul-shooting performance in three players of a women's NCAA Division II college basketball team. Each player demonstrated correct form more frequently and increased the percentage of baskets made as a result of instruction and feedback. In that study, one behavior was targeted for each of the three players and a operant contingency was implemented between that behavior (foul shooting in correct form) and a functional consequence (feedback). The product of interest was baskets made by each player's foul shooting, so the products were not aggregate. The loci of change were the three independent operant lineages of the three players (see Figure 1).

Another study exemplifying behavioral intervention was implemented by Dorsey, et al. (1980). They applied a fine mist of water to the face of each of seven persons with retardation contingent upon a specific behavioral topography (mouthing, hand biting, skin tearing, or head banging) that generated physical damage as a product. They found substantial reductions in the self-injurious behavior of all subjects. Although several subjects participated in the study, Table 2 shows that the product was not aggregate and that the number of people contributing to a product was one. That is, the product of interest to the experimenters was the injuries resulting from that one individual's responses.

Similarly, although operant lineages involving various topographies were targeted in this study, Table 2 shows the topography as “same” because the product in each of the 7 interventions was physical injury produced by one topography. We are distinguishing the relation between one or various topographies and the product that justified intervention. (See Figure 2.)

***Macrocontingency: Operant Lineages with Aggregate Product***

A macrocontingency is a relation between the recurring behavior of multiple individuals and a state of affairs (product) resulting from the sum of the individual behavioral products. Macrocontingencies define many cultural problems and attempts to solve these problems can reasonably be deemed cultural interventions. In macrocontingencies, the situation justifying intervention is an aggregate product of the behavior of many people and, therefore, the behavior of many people must change in order to rectify that situation. Although interventions designed to alter aggregate products may be cultural interventions, the only *selection* contingencies involved in a macrocontingency are operant contingencies. Table 3 shows two examples of interventions on macrocontingencies.

A study by Jason et al. (1996) illustrates an intervention targeting the behavior in a macrocontingency—that between selling cigarettes to minors and the health risks to teenagers in a local community. The researchers reduced the number of cigarette sales to minors by monitoring such sales in local establishments and implementing civil penalties for selling to minors. The dependent variable in the study was the monthly aggregate sales to minors. The intervention did not target the selling behavior of specific individuals; rather the authors monitored the behavior of any sales clerk in any retail establishment included in the study. This study is a clear example of using behavioral procedures to alter the behavior of multiple, unspecified individuals, with the expected effect of bringing about a change in aggregate health risks to teenagers (see Figure 3).

Research by Van Houten and Malenfant (2004) also addresses the relations in a macrocontingency. These researchers targeted the lawful behavior of yielding to pedestrians on the reasonable assumption that a relationship exists between drivers yielding to pedestrians and pedestrian casualties. The researchers used an enforcement program that included decoy pedestrians, feedback flyers, written and verbal warnings for failing to yield, and saturation enforcement for a 2-week period in two high-crash corridors of Miami Beach. During baseline, data were

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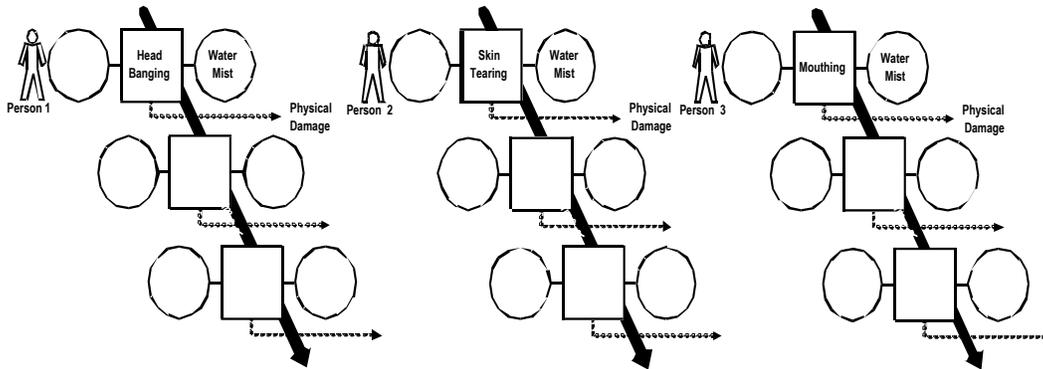


Figure 2: Multiple operant lineages.

collected on the percentage of drivers yielding to pedestrians. The intervention was introduced first at selected crosswalks without traffic signals along one corridor. A week later, enforcement was shifted to crosswalks along the second corridor. Results indicated that the percentage of drivers yielding to pedestrians increased following the introduction of the enforcement program in each corridor and that these increases were sustained for a period of a year with minimal additional enforcement. Such results suggest that large scale interventions along the same lines would allow testing of the assumed relation between drivers' yielding and pedestrian casualties.

In this study the number of people involved in the intervention was multiple and the individuals were unspecified. The same behavior (yielding to pedestrians) was monitored for all the people. The dependent variable was the percent of all the drivers yielding to pedestrians. The aggregate product of ultimate cultural interest was the reduced incidence of fatalities and injuries. The functional consequence of breaking the law was a verbal warning or citation. Given the result, we (as well as the authors) must assume that there were changes in the operant lineages of the individuals whose behavior was consequated and probably the behavior of others who heard about the enforcement activities.

### ***Metacontingency: Interlocking Operant Contingencies with Aggregate Product***

In a metacontingency intervention, the target of interest is not specific operant lineages but rather the recurring interlocking operant contingencies that produce aggregate products resulting in inputs that maintain the re-occurrences.

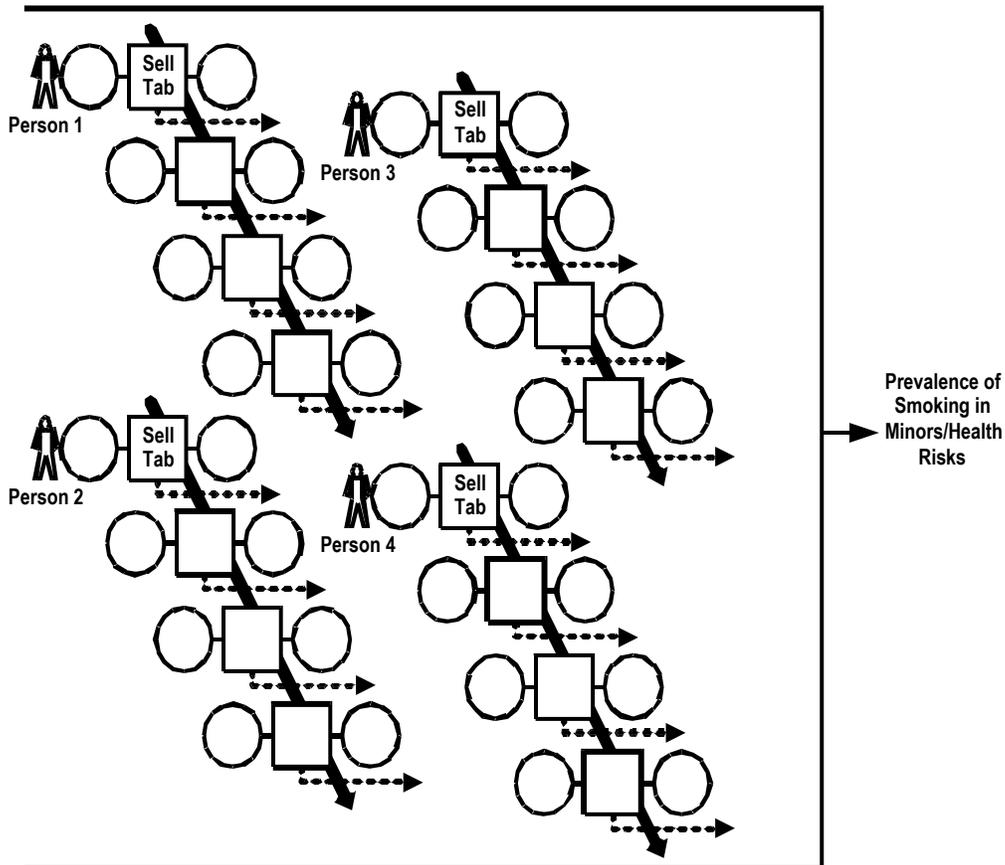


Figure 3. Macrocontingency: Multiple operant lineages with aggregate product.

Here the locus of change is the lineage of interlocking operant contingencies with variations of re-re-occurrences over time. Table 4 shows two examples of what we believe are metacontingency relations.

The first example is based on Nevin's (2003, 2004) analysis of the relationship between terrorist attacks and government retaliation across several terrorist organizations: various Jewish terrorist groups vs. British authorities (Palestine in 1945-48); Istiqlal vs. French authorities (Morocco 1953-56); FLN vs. French authorities (Algeria 1954-56); IRA vs. British authorities (Northern Ireland, 1971-73); Basque ETA vs. Spanish authorities (Spain, 1973-83); Tamil LTTE vs. Sri Lankan authorities (Sri Lanka 1983-87) and Shining Path vs. Peruvian authorities (Peru 1991-93). Nevin's lagged correlational data suggest

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that government retaliation “has no effect on the rate or severity of terrorist attacks across several different cultures and time frames” (Nevin, 2004, p. 159).

Of course, organizations can't be punished or reinforced any more than people can be; and it is hard to imagine how government retaliation could function as a reinforcer or punisher for the behavior of individuals in a terrorist organization because the retaliatory actions are not well correlated with the operant lineages of any individual members. Although the retaliation could evoke rule statements about avoiding death and enhance the likelihood of some individuals deserting the organization, the organization itself is not likely to go away. Nevin pointed out that what does appear to reduce the frequency of (but not necessarily eliminate) the attacks is the achievement of the organization's political goals. (See also Dixon, et al., 2003.)

What keeps the organization alive and its attacks continuing for years or decades while there is little or no evidence that they are achieving that goal? An attack carried out by a terrorist organization involves planning, organizing, recruiting, training, rehearsing, and no doubt any number of other activities that involve the behavior of many people. As long as the aggregate products of these activities (damage to the targets) result in inputs of money, recruits, equipment, etc., the activities resulting in that product seem likely to continue until the goal is met. But that which continues is more than operant lineages of the participants. The re-occurring interlocking operant contingencies must continue achieving the damage that results in inputs from the external environment. If the organization comprises systematic and recurring relations among the operant contingencies supporting the behavior of its individual members, then the attacks are likely to become increasingly successful due to the continuous selection of those interlocking contingencies having the product selected by the external environment.

It may be worth noting that a lone individual committing one or a series of terrorist attacks, like a lone bank robber, can cause serious damage, including human casualties. But when terrorist attacks (or bank robberies) are carried out by effective organizations, the problem is of a different magnitude. The difference lies in the potential longevity of the entity producing the recurring attacks—much longer than the lifetime of any individual. We suggest that the behavior of the individuals in terrorist organizations is maintained by the social and other reinforcers provided by other members. What keeps the organization functioning as a cohesive whole is the metacontingency between the interlocking operant contingencies and the inputs from the external environment. Figure 4 illustrates this type a metacontingency, which involves repetitions of multiple interlocking contingencies of various behaviors.

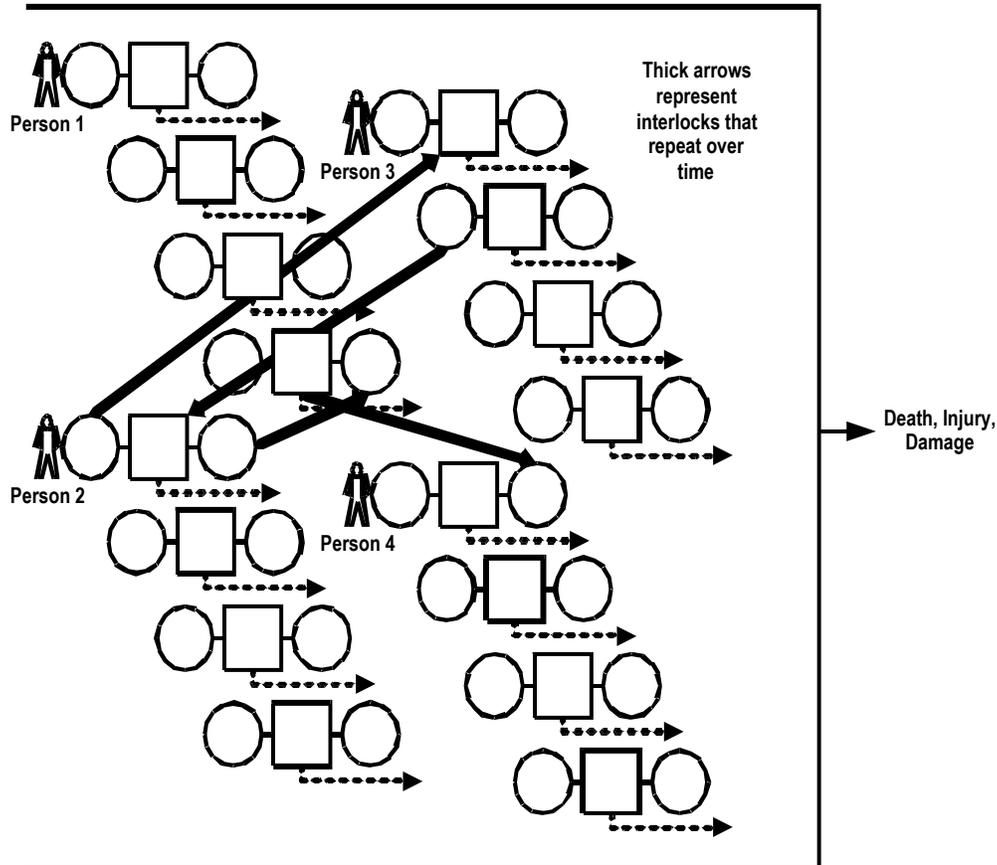


Figure 4. Metacontingency: Repetitions of multiple interlocking contingencies of various behaviors.

Another example of research that we believe implicitly addresses metacontingencies is a study by Mace, et al., (1992). They scored three classes of events from videotapes of 14 college basketball games during the 1989 National Collegiate Athletic Association tournament: reinforcers (such as points and favorable turnovers), adversities (such as missed shots, unfavorable turnovers, and fouls), and responses to adversities (favorable or unfavorable outcomes of the first possession of the ball following an adversity). They performed within-game and within-team analyses of these data supported the following three findings: First, a team's favorable response to an adversity increased as the rate of reinforcement increased three minutes preceding the adversity; second, basketball coaches called time-out from play more often when being outscored by their opponents; and

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third, calling time-outs from play was an effective strategy for reducing an opponent's rate of reinforcement.

Although the results of the study were discussed in terms of behavioral momentum it is not incompatible to consider the likely relation between the interlocking operant contingencies with their points earned/games won (products) and the results of such products for maintaining the team's integrity throughout beyond the series under study. Consider the elements in Table 4. Each team had multiple players. The behavior of each player was affected in systematic ways by the behavior of the others on their team in the group effort to score against the other team and block the other team's scoring. Behaviors, such as driving the lane, blocking shots, in bounding the ball, shooting foul shots, setting picks, assisting other players to make a basket occurred repeatedly under recurring stimulus conditions and the aggregate products were the team's wins/losses and their record in the National Collegiate Athletic Association tournament. The importance of that product to the future of the team was not discussed in the article, but one could expect that resources such as player and coach recruits and external funding would be affected by that product. The locus of change was in lineages of interlocking operant contingencies for each particular game.

### ***No Contingencies: Interrelated Non-recurring Behaviors with Aggregate Product***

There are cultural interventions that generate significant change as measured by an aggregate product, but the target of the intervention is not operant lineages or lineages of interlocking operant contingencies. These interventions often involve many interrelated behaviors of a configuration of many people behaving in unique circumstances. Table 5 shows two examples of this type of intervention.

The first example is the creation of the behavior analyst certification program in Florida (Johnston & Shook, 1987; Shook, 1993; Shook & Eyer, 1995; Starin, et al. 1993). The conditions of the creation of the original program were unique and various people with special repertoires behaved in novel ways. The aggregate product was the certification system in the State of Florida, the first in the U.S.A. The repertoires of operant lineages of most of the individuals involved probably didn't change much. Nor were there systematic re-occurrences of interlocking operant contingencies related to a recurring aggregate product. Therefore there is no known lineage to account for and no evidence of selection. The interrelated behavior and its one-time product were unique. As pointed out by Starin et al. (1993), there are over 1,000 professions regulated in one or more of the 50 US States, and although establishing a certification process might be similar from one

discipline to another, each process is unique and involves different people and circumstances.

Another example familiar to many behavior analysts is the formation of the Midwestern Association for Behavior Analysis (MABA), later renamed the Association for Behavior Analysis (ABA). (See Peterson (1978); Morris, et al. (2001); Malott et al. 2002). Again unique circumstances and unique repertoires of key individuals combined to result in the formation of the Association. No lineage of recurring interlocking operant contingencies accounted for the formation of the organization. And much of the behavior that resulted in that formation occurred only once, so operant lineages weren't altered by selection contingencies either. See Figure 5 for a representation of an intervention that involved multiple interrelated behaviors of various individuals but no evident systematic change in operant or cultural lineages.

Once an organization is formed, then cultural selection processes involving metacontingencies can account for recurring interlocking operant contingencies with their aggregate products. For instance, once the certification system existed, its interlocking operant contingencies continued, evolving slowly as a result of the acceptability of its products to its individual constituents and other organizations. ABA too has been evolving as the interlocking operant contingencies constituting its governing body and administration adapt to requirements of its members, donors and other organizations.

### IMPLICATIONS

At least since the publication of *Science and Human Behavior* (Skinner, 1953), behavior analysts have related the behavioral principles derived from the experimental analysis of behavior to human cultures. Many societal problems have been identified as relevant targets for applied behavior analysis, including terrorism, violence, pollution, malnutrition and substance abuse and many have called for behavior analysts to address socially significant problems (e.g., Glenn & Malott, 2004a, 2004c; Hawkins, et al., 1995; Mattaini, 2003a, 2003b, 2004, Rumph, et al., 2005; Pennypacker, 2004; Sidman, 2003; Skinner, 1953; Todorov et al., 2004; Ulman, 2004; among many others).

There may be many reasons why few behavior analysts have responded to those calls for action. They are relatively few in number and they often are committed to pursuing other activities. Even so, it is lamentable that behavior analysts are rarely consulted in major news programs as experts on topics of social importance. Instead, people with no background in behavioral sciences, for instance, politicians, business leaders and economists, are viewed as frontrunners of major societal changes.

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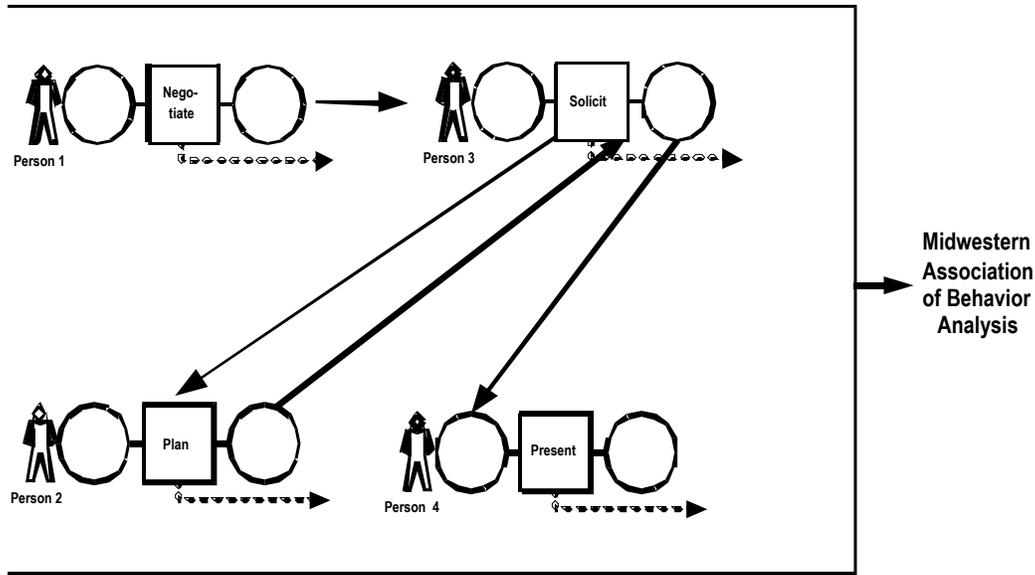


Figure 5. Various interrelated behaviors of multiple individuals.

We believe that our almost nonexistent participation may also be partly due to the lack of clarity among behavior analysts as to how to tackle cultural phenomena while remaining committed to a behavior analytic framework. There seems to be considerable confusion and perhaps frustration among those wishing to address these issues.

Because behavior analysts are most familiar with operant contingencies, many of the efforts to accomplish cultural intervention attempt to change the behavior of one individual at a time. Focusing on single operant lineages of specific individuals will not get us very far, however, if the goal is to impact the aggregate products in the community at large, such as prevalence of illness or incidence of homicides.

Larger scale interventions such as those on seat belt use (Geller & Lehman, 1991; Geller, et al., 1985) have taken us a giant step forward in dealing with cultural level problems. The concept of macrocontingencies suggests that these interventions will more likely be viewed as important by the larger culture if researchers measure the impact of the intervention on the aggregate product that is of ultimate concern to society.

Adapting organizations better to the external environment requires considering the elements of the metacontingencies in effect: interlocking operant

contingencies with imbedded operant contingencies and aggregate product, and requirements of the external environment. Altering these relations necessitates systems analysis methodologies, involving tools such as process maps, organizational charts and the total performance system (Gilbert, 1996; Malott, 1999, 2001, 2003; Rummel & Brache, 1995). In contrast, to be effective in intervening in macrocontingencies, we don't need to address consistent interactions among participants.

We have also identified situations, like program formation and passing legislation that by their very nature are not subject to single-subject methodology. In such cases we should expect to bring together people who have unique repertoires to accomplish one-time goals. For these types of interventions, systems analysis tools, similar to the ones used to study metacontingencies could be helpful. These types of interventions do not target repetition; they merely focus on interrelated behavior and an aggregate product.

In this article, we have attempted to classify various types of interventions and to identify their defining characteristics. We hope it improves understanding among behavior analysts interested in cultural interventions and generates interest in others. We thank the participants of the Think Tank on Metacontingencies and Cultural Analysis for their input and look forward to our continued collaboration and discussion.

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