

← TRENDS IN BEHAVIOR ANALYSIS →

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Introduction

Some old and new trends in Brazilian Behavior Analysis.

João Claudio Todorov, Universidade de Brasilia, Brazil

Brazil has the largest number of undergraduate professional courses in Psychology in the world, so far more than 220. Of those, most offer Behavior Analysis courses, some only introductory disciplines, others a full training including practical work in the field. About 30 universities offer graduate courses, both basic and applied, with 15 of them leading to the PhD. This volume of activity, production and spreading of knowledge, has been going on for 55 years, since Professor Fred S. Keller went to the University of Sao Paulo as a Fulbright Scholar in 1961. Everything considered, Brazil is second only to the United States of America in both number of researchers and of publications on Behavior Analysis. All that notwithstanding, Brazilians are underrepresented in citations. That is understandable when we publish in Portuguese. Only people in Portugal (Europe), Angola, Mozambique, Cabo Verde (Africa), Timor East, Goa and Macau (Asia) can read what we publish in our common language (for the Asians, usually their second language). But Brazilians are also underrepresented even when publishing in English in major Behavior Analysis periodicals and books published in the US. Even Brazilian authors publishing there under cite Brazilian researchers. Citing is behavior, under the influence of all variables that influence choice. Having no way of directly control the environment of authors, we can at least enrich that environment. **Trends in Behavior Analysis**, Volumes 1, 2 and 3 are offered online, for download, as an opportunity to make the Brazilian production available internationally

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Can clinical behavior analysis be conducted without aversive control?¹

Non-punitive audience in behavior-analytic clinic
The myth of the exclusive non-punitive audience

Roberto Alves Banaco and Denis Roberto Zamignani

ABSTRACT

The non-punitive audience has been defended by authors who embrace behavior-analytic clinic as a requirement for the proper progress of the therapeutic process. This article aims to discuss the (in)feasibility of an exclusively non-punitive audience, as well as the aversive aspects involved and virtually all alternatives when it occurs, deliberately or not, in the therapeutic context. First, we present some limits adopting a non-punitive practice by behavior analysts, especially considering cultural aspects and the correspondence between what is said and what is done. The discussion turns to the practice of clinical behavior-analysis, considering situations in which the aversive stimulation occurs accidentally or due to the clinical condition, which sometimes requires the use of procedures with aversive components. It will also be discussed the possible aversiveness in the therapeutic relationship, which can sometimes be evaluated and inferred by the client's behavior of opposition or resistance in the face of prescriptive type interventions issued by the therapist. The multidimensional nature of therapeutic interactions is then referred to highlight the importance of non-vocal aspects in determining the degree of aversiveness of an intervention. Finally, aversive aspects related to the client's behavior are discussed, as well as management alternatives.

Key words: no punitive audience; aversive control; behavior-analytic clinic; therapeutic relationship; behavior analysis.

1. The authors would like to register and to thank the valuable contribution of Dr. Felipe d'Alessandro Corchs for the English version.

Academic training in behavior analysis in Brazil has a strong influence of Skinner and Sidman's traditions, including their fierce opposition to aversive control (Skinner,1953; Sidman,1989). The main arguments used to support this opposition are: a) aversive control does not have long-lasting effects and b) aversive control produces powerful and nefarious behavioral byproducts. Although they seem consistent and convincing, such statements became unquestionable truths by great by many behavior analysts, in detriment of one of the most fundamental principles adopted by science: the need for scientific evidence. The necessary research practice, unfortunately, was not adopted, thus leaving a lot to know about the aversive control of this subject, especially about punishment (Todorov, 2001).

This may have quite detrimental implications to the practice of behavior analysis, especially if it leads to a false conception that there are the enough studies about the subject (Sidman, 1989). According to Perone (2003):

Aversive control is an inherent part of our world, an inevitable feature of behavioral control, in both natural and contingencies in contrived ones. When I say that aversive control is inevitable I mean just that: Even the procedures that we regard the prototypes of positive reinforcement have elements of negative reinforcement or punishment imbedded within. (p.1)

This statement sets the tone of this article. Our argument is that even if there is a major effort of psychotherapists – especially the behavior analysts involved in clinical practice – to become a non-punitive audience (Skinner, 1953), exclusive control by positive reinforcement in clinical practice is a myth, because there are parts of the therapeutic relationship that have itself aversive aspects. It is also argued in this article that the study of potentially aversive aspects of various procedures and techniques we have used in analytical-behavioral therapy may be beneficial to a better understanding of the processes of change in Analytical Behavioral Therapy.

Some controversy over aversive control²

The aversive control of behavior is an issue that has divided theoretical positions in behavior analysis, especially when faced and compared with positive or appetitive control of the behavior.

Hineline (1984) states that, conceptually, aversive control domain is defined in terms of punishment and negative reinforcement, and these are the basis for specifying what we call as "aversive".

Skinner (1953) differentiates the processes contained in the negative reinforcement from those contained in the positive reinforcement stating that a stimulus is aversive when its removal is reinforcing "since it is the change from one situation to another which is effective, and this is the reduction of a condition prevailing before reinforcement" (p. 172).

However, this statement also applies to deprivation, which is inherent positive control, since it increases the impact of the reinforcers on the subsequent frequency of reinforced response, working to remove the deprived condition (Malott, Whaley & Malott, 1997). Skinner, despite a very similar argument when he says that "The presentation of the aversive stimulus therefore resembles a sudden increase in deprivation ", argues that "[as] deprivation and satiation differ in many respects from the presentation or removal of an aversive stimulus, it is advisable to consider the two kinds of operations separately "(p. 172).

According Hineline: "The addition of one event is the removal of another and vice versa: adding heat is removing cold, adding food is decreasing deprivation; adding a smile removes a frown" (p. 496).

Thus, there are two positions related to positive and aversive control of behavior: one proposes that both should be treated similarly and the other supports that they should be treated separately. Skinner even states, for example, that while

2. Disputes regarding this issue are diverse and a true "battle of giants" in terms of authors involved in it. All of them are excellent researchers and they make statements well-grounded experimentally. Several of the statements had to be left out, not because they are of minor importance, but because they divert much of the purpose of this work.

Extinction is an effective way of removing an operant from the repertoire of an organism. It should not be confused with other procedures designed to have the same effect. The currently preferred technique is punishment, which, [...], involves different processes and is of questionable effectiveness . (p. 71).

Catania (1999), in turn, focuses and describes reinforcement and punishment as mirrored processes,

a stimulus that reinforces responding when the responding produces it may serve the opposite function when responding removes it: Its removal may punish the responding. Inversely, a stimulus that punishes responding when the responding produces it may reinforce responding when that responding removes it."(p. 88).

Dinsmoor, in 2001, highlights identical aspects of appetitive and aversive controls stating that both involve responses that generate a stimulation inherent to them – considered by him as internal stimulation. Although this stimulation is not under the experimenter's control, it is material and observable. Besides, he said, this stimulation cannot be ignored in any individual's relationship with the environment (pp. 327-328). Dinsmoor follows discoursing about the peculiarities of aversive control, stating that environmental aspects are positively correlated when aversive stimulation with no avoidance behavior occurs. In turn, when the avoidance response occurs, it is followed by a negative correlation between interoceptive stimuli generated by the avoidance response and an aversive stimulus. Dinsmoor ends his article defending the Two Factors Theory to explain the avoidance response³.

Entering in the field of analysis of avoidance, the conceptual battle intensifies. Sharp criticism appears from one side to another. For example,

3. According to the two-factor theory (Mowrer, 1939), classical conditioning is responsible for the acquisition of fear and operant conditioning by learning avoidance behavior (Emmelkamp, Bouman & Scholing, 1989).

Hineline criticizes the molecular explanation of this behavior 'Avoidance' has been taken as a special problem of explanation; even "purists" among behavior analysts have seen it as requiring special theorizing in addition to functional analyses. The apparently crucial, defining feature of avoidance is the absence of contiguous consequences of behavior that is clearly maintained by its remote consequences. And the task taken on by most avoidance theorists has been to supply plausible contiguous consequences that could be maintaining the behavior. (p. 501)

To take account of avoidance, without having to appeal to the individual internal variables, Hineline (1984) proposes a molar behavior analysis and introduces the concept of avoidance by its effect of lowering aversiveness. Based on Krasnegor, Brady and Findley (1971) and Sidman and Boren (1957a, 1957b) he suggests that the analysis of avoidance should follow this path:

We should continue to look for alternatives to shock, but the issue also needs to be addressed by asking more broadly what ranges of events and particularly, what arrays of or relations between events - may function as aversive. (p. 504)

Hineline (1984) draws the following principles from this literature:

1. Negative reinforcement should be understood in terms of transitions between situations;
2. The relative aversiveness of a situation (the degree to which it becomes aversive or reinforcing) depends only partially on the primary aversive stimuli that occur in this situation because;

3. The relative aversiveness of a situation depends substantially on (a) the contingencies in that situation and (b) contingencies contained in alternative situations, but...

4. Very importantly: the role of alternative situations depends on contingencies necessary to change that situation.

5. Having all the conditions been equalized [in a scale of aversiveness], the performance tends to stay in the situation next to the primary aversive events.

This relative aversiveness observed between situations is what allows some procedures taken as aversive to be seen as beneficial for some people who are going through deeper aversive situations (Banaco, 2004).

In the same vein, Richard Malott (in Malott, Malott & Whaley, 1997) presented some issues that Jack Michael had proposed to him, as his teacher, which troubled him deeply:

Can you really tell the difference between reinforcement by the presentation of reinforcers and reinforcement by removal of aversive conditions? [...] If you can't, then shouldn't you stop talking as if you can? Shouldn't you just talk about reinforcement contingencies and stop talking about two types of reinforcement contingencies – regular reinforcement contingencies and escape contingencies? (pp. 151-152).

Nevertheless, Malott itself points out that, intuitively, one can realize that the aversive control is bad, and the positive control is good (Malott, Malott & Whaley, 1997, p. 152). One could then try to isolate the aversive control from the positive control through behavioral effects of each of them have on organisms. According Sidman (1989), aversive control would have detrimental effects as by-products. Ferster (1967) stated, "It has been clear for

some time that many of the ills of human behavior have come from aversive control" (p. 341.). Perone, in turn, discussing exactly this excerpt from Ferster's text, argues that, although many human ills have originated from aversive control, not all have. He states further that "aversive control, in and of itself, is not necessarily bad; sometimes is good. Moreover, directly to the point, the alternative - positive reinforcement - it is not necessarily good; sometimes it is bad. "(p. 1)

Several other authors (including Skinner in 1987, see below) also report appetitive situations that take effect as pernicious as those observed in the aversive control of behavior do.

It is possible to take the points made by Sidman (1989) and compare the results reported above to the procedures of positive reinforcement and aversive control. For instance, Sidman states that the aversive control produces "intense emotional responses themselves aversive" such as anxiety and anger. Perone (2003), on the other hand, states:

A stimulus is aversive if its contingent removal, prevention or postponement maintains behavior – that constitutes negative reinforcement – or if its contingent presentation suppresses behavior - punishment. That is all there is to it. There is no mention in this definition, of pain, fear, anxiety, or distress, nor should there be. It is easy to cite instances of aversive control in which such negative reactions are absent .(p.1, emphasis added).

This author also cites trivial behaviors such as running away from the rain, loosen his tie, etc. in which, although there is clearly behaviors of escape or avoidance, there are no feelings of anxiety or fear, or anger produced. On the other hand, Skinner (1987) analyzes that positive reinforcement situations, where the contingency between response and production

stimuli is broken, produce feelings as bad and intense as anxiety and anger, such as boredom, laziness and depression.

The second point that is raised by Sidman as a pernicious effect of aversive control of behavior refers to escape and avoidance producing narrow repertoire (or decrementing behavioral variability). The same effect could be observed in reinforcing regardless of the responses (free reinforcement or extinction without reinforcers suspension), or satiation (Perone, 2003; Skinner, 1987). Perone points that the exclusive use of positive reinforcement can cause low frustration tolerance, in turn interpreted as "treat" (aggressive behavior), "boredom" (similar to dysthymia), "leisure" (which may be related to procrastination) and can even lead to behavioral excesses, which can have long-term negative consequences (e.g. drug addiction, obesity, hypertension, sexual excesses, due to idleness).

The third point raised by Sidman is that aversive control does not teach what should be done, just what should not be done. Even this criterion may be faced by the same examples of daily situations presented by Perone (2003). The aversive control involved in these cases do not teach anything but behavioral variability, until the aversive event is eliminated – which, by the way, also occurs with positive control – especially in differential reinforcement of certain topographies of behavior, as seen in athletes (see Millenson, 1967). Skinner (1987) also shows situations of positive reinforcement that teach the subject to do nothing or that anything needs to be done to release the reinforcer, with clear effects on the responding: waiting responses are reinforced and search for responses become unnecessary, occasions that the author name as “leisure”.

The weakening of organisms subjected to intense deprivation as a form of control is the fourth item presented by Sidman. However, as argued above, deprivation, to some degree, is necessary to positive control or appetitive behavior as well and, therefore, if there is a pernicious effect, it can also be produced at some level – uncertain, undefined – deprivation, becoming, for this

reason, a matter of independent variable values and not about the behavioral process involved in the control of behavior

Finally, Sidman raises procrastination and laziness as byproducts of aversive control that would be secondary to the increased demand involved in the schedule of reinforcement or the increased response cost. However, both Skinner and Perone point the same effect because of positive reinforcement if little or no effort is necessary to produce the positive reinforcer.

There are still some arguments that need to be discussed. For example, the idea that the aversive control has little influence on the behavior and only comes into action in the presence of punishing agent (Skinner, 1953). Hine-line (1984) has argued that

Skinner has continued to argue – in the face of accumulating contrary data – that punishment procedures produce only indirect effects on behavior, and has emphasized temporary effects of punishment when punishment procedures are discontinued. (p. 496).

Therefore, for all these arguments, it seems that:

- (1) Aversive control is inevitable;
- (2) It is extremely difficult to observe differentiation in the type of the control – whether aversive or appetitive – except for the individual's behavior observation. In cases where there is avoidance or escape behavior, then it is a clearance stimulation source, therefore is aversive control. If there is permanence or approach behavior, can be positive control;
- (3) Aversiveness is relative: a bad situation can be better than a worse situation; and
- (4) There are situations where the use of aversive control can be beneficial to the individual, especially when it prevents an unwanted re-

sponse that is highly probable and sets the opportunity for a new response, which is still weak in the individual's repertoire, but that can be strengthened if emitted.

Aversive control and behavior analysts

The topic of aversive control has also been avoided systematically in behavior analysis meetings, with few exceptions. Perhaps the major aversiveness come from the fact that one does not escape, in any human activity, from aversive control (Perone, 2003). Therefore, the more we know about this topic the better.

One possible interpretation about why the topic has been so systematically avoided can be found in the text of Fantino and Silberberg (2010). The authors highlight that it is not easy to look at aversive stimuli, a reasoning that also applies to the behavior of behavior analysts: do not look with the same willingness to aversive control (our S-) as they look for the positive control. Todorov (2001) clearly shows that the study of punishment was relegated to secondary plans in the history of behavior analysis.

Probably because Skinner (1953) describes psychotherapy as a controlling agency, it was created in the imagination of some behavior analytic therapists the possibility of a real and comprehensive "non-punishing audience" in their professional practices. When Skinner addressed the practice of psychotherapy as a controlling agency, he made it clear that this was tailored to undo the harmful effects of aversive control exercised by other formal controlling agencies (notably, in its set of texts, the Government, Religion, Economy and Education). Skinner (1953) also stated that this practice aims to be free – or seek to be free – of aversive control. However, this is not the case. Although we are always required to exert positive control over clients' behaviors, we do not always get to exert it (Banaco, 2001) and, even worse, we go

on "as if" we really did not use aversive control just because we assumed Skinner's theory to be the basis of our therapeutic actions.

What about the behavior-analytic clinic?

From here, two situations fit their proper discussions. The first is: "is there unconscious or involuntary use of aversive control by behavior analytic therapists?" The other issue is "is the conscious, deliberate, planned use of aversive tactics for behavior control legitimate?" Should the behavior analytic therapists make use of this tool? In what situations? For what purposes?

Inadvertent use of punishment by the therapist: Each and every therapist certainly had a chance to look at some (if not several) episodes, typical signs that his/her client is responding to aversive stimulation after some intervention from him/her, even if the intervention was not intended to be a punishment. The use of praise, for example, can really "backfires". People whose history of praise was of the kind, for example, "this you have done is very good, but ..." usually respond poorly to them. Some attempts of incentive of the client's behavior by the therapist, such as performances achieved, reach them as if they were (and usually they are) increasing the response cost requirements for the next time. The therapist must evolve great sensitivity and clinical experience – in other words, become under control of the relevant control variables of the therapeutic relationship – to decide for this kind of intervention. More frequently, only after some time in the interaction with the client that these conditions are revealed. In this case, when the therapist be in touch with the client's avoidance or escape response, the first aversive episode has already occurred. (See examples in practical analytical behavioral therapists in Baptistussi, 2001; Garcia, 2001; Zamignani, 2001).

Baptistussi (2001), for example, recorded and analyzed the first 10 consecutive sessions of a therapeutic process of a 21-year-old client with anxiety complaint submitted to analytical-behavioral therapy conducted by a 28-

year-old therapist, formed three years earlier, and participant of a therapy-monitoring group led by a supervisor formed twenty years ago at that time. One of the therapeutic goals was to install a coping response to the problems through which the client had passed. Below are the reports of two passages of the therapeutic session in which the therapist emits the response classified by the researcher as "Encouraging the reporting of difficulties with coping responses" (shown in bold in the sections):

EXCERPT 1

41.C - "But I got sick in May. "

42.T - "So do not even come to a year, right.?"

43.C - "Yeah, I think I stopped working in July and stopped studying in the second half, I think in August. "

44. T - "Um, **I'm glad you sought quick treatment**, right, C? Usually people end up losing a lot, letting go spend time, spend time and do not seek help, **you've quickly realized that something was wrong, and properly sought treatment soon.** "(Encouraging the reporting difficulties of coping responses).

42. C- "No, I was going to college and I went to there crying, right? "

EXCERPT 2

139. C - "And I did not ever again ... But me, by myself alone cannot do sometimes... "

140. T- "I know."

141. C- "...stop something."

142. T- "Although, when you combine with someone you can put into practice? **Nice! This is good ... A good help to we can deal with.** "(Encouraging the reporting difficulties of coping responses).

143. C- "Yes, it is, but when I think something will happen from here in one week, then I cannot. But if I think in five minutes I can, but now if it is in one week ... "

Clearly, in both instances, the "incentives" of the therapist produced lines that can be identified as avoidances from the conclusion of achievement of therapeutic goals. One might infer that the utterances by the therapist would have reinforcing effects (as in the process it was observed increase in coping responses) and immediate aversive components that led to avoidance responses.

Therapeutic Procedures with aversive components: Let us focus on the second situation, but before it, a discussion is necessary. Two conditions can make the therapeutic setting aversive: (1) when faced with the variables of control of their behavior, the individual may experience (contact with) aversive feelings, "undesirable"; and (2) the use of procedures with aversive components can lead the client either to pain relief, weakening their avoidance responses, or through the respondent extinction. However, while implemented, they might increase the overall aversiveness of the session and even compromise the therapeutic relationship (Banaco, 2001, 2004).

Aversive experience in non-aversive procedures: To discuss this first situation, we will take as an example a person who was exposed to a long history of bullying. In his story, there was a history in which certain classes of people (for example, teenage boys) were paired with episodes of violence, rejection and abuse. Subsequently, the person may experience respondents of the same class when exposed to people who share some property (physical or behavioral) with those who bullied them. In therapy, whereas the verbal response to bullying can be part of the same class of (for relational structuring) concrete event stimuli, talking about the bullying experience can elicit a similar set of respondents as those who were elicited by the original situation. There are reports that these kind of respondents are aversive themselves – linked to emo-

tions of fear, anger, sadness, anxiety (as Cassado, 2012; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). In therapy, respondents are elicited by the conditioned stimulus (verbal response), but there is not the presentation (s) of stimulus (i) aversive (s) original (s). On the contrary, the context resembles host, care, protection, and affection. Repeated presentation of the CS (conditional stimulus - verbal response on bullying) without the US that elicit it (unconditional aversive stimuli present in the bullying situation) can lead, among other processes, to respondent extinction. In this case, the feelings that the individual experiences are aversive (private stimuli elicited by the event report), but the procedure itself does not involve punishment. Anyway, what is observed is a momentary increase in overall aversiveness of therapeutic situation together with bodily sensations and extinction of the pairing the aversive stimulus with the “talking about it”. Remember that the therapist should be very careful when addressing this type of issue because if there is not a sufficiently strengthened therapeutic relationship that provides the necessary context of reception and care. The response of “going to therapy” could be inhibited and have as a result the exposure to conditional aversive stimuli, setting up a punishment contingency. The result in this case could be the abandonment of therapy and even the refusal to seek help in the future (Luciano & Hayes, 2001). Therefore, in our opinion, these responses classes of the therapist should be issued only when one observes that there will be a transition to a less aversive (as the principles extracted from Hineline in 1984, exposed previously).

As the example shown, many other aversive situations, when reported in therapy, can elicit aversive respondents – stories of sexual abuse, abandonment, rejection, etc. – and can evoke escape or avoidance and even aggressive responses by the client. The management of each of these situations depends on the identification of contingencies in and out of the session and responsible use of therapeutic strategies (Kohlenberg & Tsai, 1991).

The deliberate use of aversive procedures. Following the reasoning that therapy should provide the least possible contact with aversive stimulation, we must to

consider that there are instances in which the therapist declared and deliberately uses aversive techniques to improve the repertoire of his client and improve his quality of life (Banaco, 2004). When this is the case, the impression one gets is that the knowledge of control aversive makes its use perverse and unnecessary (Banaco, 2001, 2004; Kohlenberg & Tsai, 1991).

Two examples that clearly involve aversive stimulation are the procedures of systematic desensitization and exposure with response prevention (strategies with massive evidences of effectiveness - see Ferraz, 2004; Savoia, 2004; Wielenska, 2004; Zamignani, 2004 for more complete review). On exposure with response prevention, the individual is exposed to a conditioned aversive situation, in order to promote habituation to the conditioned stimulus and respondent extinction, reducing the complex of unwanted responses termed as anxiety. Similarly, systematic desensitization involves the gradual exposure to conditioned stimuli, in this case by pairing these stimuli with relaxation exercises aimed at reciprocal inhibition (Wolpe, 1958). All manuals have these techniques warn care in constructing a suitable addressing hierarchy as well as a good therapeutic relationship, to ensure that aversive stimulation does not overlap the desired therapeutic effect (for example, Abreu & Guilhardi, 2004; Caballo, 1996). Additionally, there are well conducted studies showing that exposure with response prevention per se has partial results, not so persistent with the passage of time and that these results are greatly improved if positive reinforcement is applied to the target responses (Jones & Friman, 1999).

Banaco (2001, 2004) discussed the risks and the use of aversive techniques in analytical-behavioral therapy, warnings of its pros and cons, and recommends that they should be avoided as much as possible. Other aspects not directly discussed in these articles were addressed by Moriyama, Fernandes and Tomazella (2014), in a brief rationale regarding such techniques which block avoidance responses (Tsai et al., 2009), or even how aversive may be a therapeutic relationship given the increase in intimacy created in the session (Cordova & Scott, 2001). One can also consider the technique of "crea-

tive hopelessness" – an ACT (Acceptance and Commitment Therapy) component – as an aversive technique. It is described as follows: It is proposed a problem for the client, picked up among his complaints, and while (s)he did not issue a new answer and goes towards its solution, the therapist signals to the client how ineffective his/her control strategies are. This kind of intervention may have a punitive function on any other verbal response to keep "in place" where (s)he is – no wonder, the effect is called "creative hopelessness" – and, at the same time, establishes a class of responses that will be negatively reinforced, if emitted (Hayes, 1987).

All these strategies, to some extent, can be considered aversive, since they deliberately expose the client – and, to some extent, the therapist him/herself – to aversive situations. A careful analysis of advantages and benefits in adopting such procedures, as well as more research comparing them with equivalent procedures that are not aversive, such as the techniques of differential reinforcement of alternative responses – DRA – and differential reinforcement of other responses – DRO, should be considered, seeking to maximize strategies based on positive reinforcement, avoiding the strengthening of the preconception that associates behavior analysis with aversive strategies (Banaco, 2001). In Sidman's words (1989):

Behavior analysts, and therapists of all kinds, would serve themselves best, and at the same time contribute uniquely to society, by inviting restrictions on the use of punishment within the profession. Instead of demanding that a justifiably skeptical public permit us to do what we please, we would do better both for ourselves and the general public by advocating, publicizing, and teaching the alternative methods of education and treatment that our science has made available. (p. 8).

Prescriptive interventions, client resistance and aversiveness

Studies have shown that certain classes of therapist's behaviors in the session are typically followed by oppositional behavior by the client or, according

to the traditional literature, client resistance (Ablon & Jones, 1999; Beutler, Miller, & Talebi, 2002; Bischoff & Tracey, 1995). These classes of behavior are usually prescriptive interventions; they involve teaching, confronting, approving, and disapproving client's behaviors. It can be inferred that a procedure that evokes this kind of client response (clearly escape, avoidance or counter control⁴ involves some degree of aversiveness.

In analytical behavioral therapy, contingency analysis is the basic tool of the therapist's work. Often, the therapist presents his analysis to the client in the form of an INTERPRETATION⁵, explaining the responses emitted by the client and the environment variables related to it. In other cases, the therapist may recommend alternative actions directly or the search for environments that provide new opportunities to respond. The latter is probably the more "directive" and perhaps that would produce the necessary change more quickly, reinforcing therefore the therapist's responses of RECOMMENDATION. Both INTERPRETATION and RECOMMENDATION are classes of behaviors involving rules seeking (Matos, 2001) – tracking and pliancy (Hayes, 1987). In the case of INTERPRETATION, the therapist describes the relationships of the contingency in a particular context, and, by doing so, produces such consequences, characterizing descriptive rules. In RECOMMENDATION, (s)he emits prescriptive rules (Chase & Danforth, 1991): "in this situation, do it and you will produce such consequences." Both are considered to be prescriptive interventions (policies) in clinical research literature and are highly related to (1) client resistance, (2) negative results, and / or (3) discontinuation of therapy (Ablon & Jones, 1999; Beutler, Miller, & Talebi, 2002; Bischoff & Tracey, 1995). In a review of 20 studies on the differential effects of the therapist's directivity, Beutler, Miller and Talebi (2002)

4. "Countercontrol" is a term which refers generally to a class of responses that occur under the control of negative reinforcement (escape or avoidance) and has the function to eliminate or minimize the aversive control exercised by a controller agent (Sidman, 1989; Skinner, 1953). The term seems to be maintained in our area for their usefulness to establish a bridge with the social and political sciences.

5. Classes of responses by therapist and client spelled in capital letters from this section are defined in Zamignani and Meyer (2011) and Zamignani and Meyer (2014).

found that policy interventions worked better among clients with low resistance, while among clients those with higher degrees of resistance, non-directive interventions worked better. Client's responses of **OPPOSITION** in such cases are probably due to the prescriptive character of the intervention: rules, even when descriptive, suggest a direction to be followed and the client may or may not agree with the suggested direction. If the rule is presented by the therapist without a constructed analysis implied, the rule can just match the variables accessible to the therapist and not necessarily to the client's accessible variables. The following rule also requires acquiescence repertoire (pliancy) of the client, unlikely with an opponent client or with a client that does not have access to the variables of control that gave rise to the rule (Rodrigues et al., 2014).

As an alternative to policy interventions, some authors suggest the use of reflexive strategies, involving preferably therapist's actions aimed to evoke responses of self-observation and promote the construction of self-rules by the client (Zamignani, 2007; Zamignani & Meyer, 2011). Thus, the therapist encourages, through questions, that the client presents his/her own analysis and proposed changes (Vermes, Kovac & Zamignani, 2007), preventing the occurrence of **OPPOSITION**. In the field of analytical-behavioral therapy, the debate between prescriptive / directives versus reflexive interventions is of great importance. In the beginning of the applied behavior analysis to the clinical context, there was an emphasis on strategies of governing nature, and only in recent decades, some authors have proposed reflective strategies (e.g., Kovac, Zamignani, & Avanzi, 2009; Medeiros, 2012; Medeiros & Medeiros, 2012; Vermes, Kovac, & Zamignani, 2007; Zamignani, 2007).

Confrontation as a therapeutic technique

Confrontation is a technique in which the therapist points out inconsistencies and discrepancies that the client may not recognize in their behavior, either verbal and / or nonverbal, in an attempt to lead the client to face his/

herself in an accurate, honest, and realistic way (Leaman, 1978; Harrow, 1995; Bakes, 2012). As pointed out above, the contact with some variables of control of the behavior in analysis – which is exactly what confrontation does – can be a quite aversive experience (Hayes, 2004; Kohlenberg & Tsai, 1991; Perez-Alvarez, 2006; Roberts et al., 2014).

According to Young (2009), there are commonly six types of discrepancies that are observed in client behavior: (1) The first is a discrepancy between verbal and nonverbal messages, when the client orally says one thing, but their nonverbal facial expressions or body language suggests otherwise. (2) The second is when the client's report shows incongruity between their personal beliefs and experiences. (3) The third discrepancy is the incongruity between the system of client's personal values and their behavior. (4) The fourth occurs when there is incongruity between what the client says and how he/she behaves. (5) The fifth discrepancy is between the client's previous life experiences and their plans, usually when the client plans to make choices similar to those that have proven fruitless. (6) Finally, the sixth discrepancy is an incongruity between what the client states at different times of the session or process. The way these deviations are recognized and addressed may vary depending on which theoretical orientation is applied.

Bakes (2012) points out that, despite the benefits of this technique, and that confrontation is used in one way or another by therapists of all theories, the term “confrontation” can invoke negative emotions for many people, especially therapists in training stages. This is supposed to be due, at least in part, to be the association between the term and negative experiences when confronted or criticized. Students are usually afraid that their speech sounds critical or offensive or make a mistake in confronting.

The fact is that, culturally, confrontation refers to judgment or criticism and these experiences can evoke emotional responses or even responses of **OPPOSITION** or aggression by the client. Depending on the descriptiveness of the therapist's verbalization of confrontation, it can assume the function

of INTERPRETATION (less likely to evoke OPPOSITION) or of disapproval (which typically leads to OPPOSITIONAL replies). In addition, behavior is multidimensional, and non-vocal properties of the therapist's behavior may exert influence over the aversiveness of the intervention. To minimize the critical nature of this kind of intervention, it is recommended especial attention to the topography of therapist's speech, which includes the tone and volume of his/her voices and non-vocal verbal responses. These points are addressed in the next topic of this discussion.

Multidimensionality of therapeutic interaction and aversiveness

The intensity of the aversive stimulation during a therapeutic interaction depends not only on the content of the emitted verbalization, but non-vocal behavior also play an important role. To illustrate this point, just think about a fairly simple verbalization we emit in our daily lives: "I see", depending on the properties its emission (intonation, volume, inflection), facial expression and speaker's gesture, it can be a simple description ("You already know this information" - "I know"), or FACILITATION (client reports and therapist seek the reporting saying "I know" in order to "get it, continue"), may also indicate sarcasm (- "I'm great in chemistry" - "I know ... I know ..."), denial or challenge ("tomorrow I will quit smoking" - "I know!").

It is for this reason that therapists are taught to behave in quite restrained mode during the therapeutic session. Your emotions can be demonstrated, but always in a "low volume" because their behavior must signal the minimum aversiveness as possible, with serenity and consistency. Banaco in 1993, has said that any strong emotion experienced by the therapist in the session may indicate problems - part of this problem is the reaction of counter control that the demonstration of emotion by the therapist can evoke in the client behavior.

Tone, gesture, and facial expression can soften or minimize aversive function of certain inevitable utterances of the therapist. Sometimes it is necessary that the therapist disapprove specific client's action (such as the story of a father who beats his son). But depending on how this DISAPPROVAL appears, the likelihood of aggressive responses by the client or of feeling criticized by the therapist is smaller. For instance, – if the therapist demonstrates that (s)he understands and validates the reasons why the client acts that way (demonstrating acceptance and empathy), (s)he can circumvent the possible aversiveness found in the his/her verbalizations, that may resemble criticism often paired with punishment in the history of the client. That means, despite disagreeing, verbalizing it with in a soft and restrained voice, with an understanding facial expression, may shows acceptance but demands changing.

Praise functioning as signal of rising cost of response or change in the criteria of reinforcement

A class of behaviors that has been very present in the formation of behavioral therapists and today has been questioned by its governing character is APPROVAL, which has praise as one of its forms. Behavioral therapists tend to prefer interventions based on positive reinforcement and, for this purpose, sometimes they present subsequent praise to the client's desired behaviors, assuming that they would have reinforcing function. They forget, however, some basic principles:

(1) What is a reinforcer must be defined for each response emitted from each person, in each context. A verbalization of praise will not always have reinforcing function for a particular client and the same consequence can have an effect on a class of responses and not on another. Besides, it may have different effects on the same class of responses in different contexts.

(2) Praise, in general, if really working as a reinforcer, will do as an extrinsic reinforcer and may only enhance the reporting response and not necessarily the final response desired by the therapist. Praise should have, at best,

temporary role in the installation and maintenance of the repertoire (as well as the "starlets" used as arbitrary reinforcer in child therapy), because what should maintain the behavior of the client are the inherent consequences present in his/her environment. Therapeutic interventions based on praise or rewards (widely used in more directive therapeutic processes) thus involve the provision of extrinsic / arbitrary reinforcing, increasing the probability of avoidance responses and counter control (seen here in behaviors classified as **OPPOSITION**). Intrinsic (natural) reinforcers are produced by direct interaction with the natural environment of the subject, not depending on a controlling agent that mediates access to the reinforcer (Ferster, Culbertson, & Perrot-Boren, 1968). Instead, extrinsic (arbitrary) reinforcers, to be effective, require the intervention of another part. In psychotherapy, the effectiveness of interventions based on instructions (rules) and social reinforcement (extrinsic) provided by the therapist in session has been questioned. Responses maintained by extrinsic reinforcement tend to (a) present limited and specific features, considered necessary to presenting / removing reinforcers by the controlling agent; (b) occur only in the situation in which it occurred previously; and (c) occur only in the presence of the controlling agent (Andery & Serio, 2009). When acting under the control of extrinsic reinforcement, such as praise from the therapist, one risk is that, the client can respond to please the therapist. In cases like that, the acting apparently met immediately the therapist's needs (controlling agent) – and possibly for this reason, Ferster, Culbertson and Perrot-Boren (1968) suggest that the control of responding by extrinsic reinforcing tends to generate **OPPOSITION** among those involved, i.e., the one who emits the response and the one who control the reinforcers. We can understand this **OPPOSITION** as a form of counter control: the one whose responding is subject to extrinsic reinforcement emit responses that reduce or eliminate the control exercised by the controlling agent.

Kohlenberg and Tsai (1991), aware of the undesirable effects of control by extrinsic reinforcement, argue that social reinforcers arranged by the therapist would be more effective if they were more similar to the natural conse-

quences produced by that behavior outside the office. Praise, therefore, would be more effective if they contained just a description of the response emitted by the client and the consequence achieved in the natural environment;

(3) Finally, and most importantly in the context discussed here, praise is an intervention that gives the therapist the status of someone who can judge the behavior of the client. In this sense, it is part of the same class of events than DISAPPROVAL: in DISAPPROVAL, the therapist is someone willing to judge the behavior as "inadequate", "inappropriate", or "wrong" and verbalize it, while the praise he also keeps judging, in the case what is "appropriate" or "desired" or "right" – two sides of the same coin. As a class of stimuli, the verbalization, either PRAISE or REPPROVAL, share a common property, which suggests aversive control – the same way that the therapist approves some answers, (s)he can reprove others. If we consider the relationship of opposition "APPROVAL–REPPROVAL" as part of the same relational frame in a deictic relationship (Hayes, Barnes-Holmes & Roche, 2001), it is possible that, while praising, the therapist evokes the same escape-avoidance or counter control responses evoked in episodes of criticism or DISAPPROVAL. More than this, if the therapist usually uses praise for the "good" behavior, its absence became DISAPPROVAL, in other words, aversive control.

Of course, we cannot forget the exceptions. In some situations in which the client has clearly achieved some goal or is experiencing a special occasion, the therapeutic situation should reproduce what occurs in natural environment. Congratulating, in this case, would be the natural consequence to the report emitted by the client.

Clients exerting aversiveness on the therapeutic relationship

Some clients, due to idiosyncrasies of their life story, require a stricter procedure by the therapist. For example, young offenders establish rigid rules

– especially which recognized as unwanted responses by the adolescents themselves, and the previously combined aversive consequences to then could be applied (da Rocha & Meyer, 2014). The aversiveness may still occur in the therapeutic relationship starting from the client's behavior directly. The cases of clients who need to "beat" the therapist to allow themselves to be helped are common (Oshiro & Meyer, 2014). The situation of going to psychotherapy, for some clients, expose their vulnerable condition, which can be experienced as humiliation or submission, making the psychotherapist someone threatening, and, at the same time, his/her hope of help. In this conflict – “to be helped, reveal my weakness, and I feel humiliated by this” – the aggression or critical response toward the therapist seems to have a compensatory function by "decreasing" the therapist's role on the therapeutic relationship and making the client feel less vulnerable. The experienced therapist knows that this condition is temporary and should not be shaken, welcoming and “translating” the client's aggression as a revelation of his weakness – so the client experience the care and understanding that the therapy must provide, he/she will no longer need to attack. However, if the therapist, in turn, takes this behavior as personal and intimidating and respond with aggression, there is high chance of failure of that therapy (Banaco, 1993, 1997).

There are many other situations in which aggression can come from the client and, like any class of behavior, it must be analyzed and its function in the therapeutic relationship should be identified for an effective intervention.

Therefore, can analytical-behavioral therapist waive aversive control? ...

For all the arguments presented here, this question deserves a negative response. Whether choosing, be inadvertently using aversive techniques of intervention, we agree with Perone (2003): "Even the procedures that we regard as prototypes of positive reinforcement have elements of negative reinforcement or punishment imbedded within them." (p.1).

Obviously, the approach outlined here is that the therapist – and all behavior analysis as a Science – should continue to seek the reduction of the client’s suffering and the increase of their psychological flexibility, i.e., develop an adaptive repertoire to current social contingencies (Pérez Alvarez, 2006).

Behavioral therapies have undergone profound changes in their ways of looking at the human problem and expanded the way to observe the construction and solution of the problems that come with them. Thus, from the 80s, there was a gradual migration of interventions that previously occurred on a specific complaint (a class of responses that should be abolished, or another it should be installed) to interventions that take into account the repertoire as a whole. This happened due to the incorporation of the concept of repertoire made possible by the Matching Law (Herrnstein, 1970; McDowell, 1988), which enabled the concepts of differential reinforcement of other responses (DRO), or alternative responses (DRA), putting in place other proper behaviors, instead the use of the extinction and punishment procedures to change undesirable behavior. This theory also enabled the interpretation by Baum (1973), recovered by Hineline (1984), which modified the entire conceptualization of aversiveness to be understood through a more molar and relative analysis, taking into account the situation as a whole to determine whether any proposal can be considered aversive or not. These proposals should be evaluated seriously, through conceptual and experimental research, but it does not exempt therapists from observing their practices and the results of their own interventions. Also, from the same period (80’s), therapists stopped seeking interventions and techniques that would act on discrete responses and started looking for an expansion of the understanding about the client’s behavioral complaint, including the one as having “possible verbal” avoiding function⁶ (Zamignani & Nico, 2007). Hence, the incorporation of studies of

6. Much of this discussion can be found in papers that describe the study of self-injury repertoire as having verbal function in patients with atypical development (eg, Carr, Levin, McConnachie, Carlson, Smith, & Kemp, 1994).

verbal and social behavior into understanding the therapeutic relationship as an important context for client's behavioral change (Kohlenberg, & Tsai, 1991).

Another striking feature of the current clinical practice in behavior analysis is the questioning of cultural values that tend to pathologize quotidian life problems (Faria, & Freitas, 2017). Our culture is so intolerant with unpleasant experiences, that it causes people who suffer with them to tend to eliminate them by escaping and avoiding responses: the main pattern is to avoid contact with the variables of control of behavior that can be aversive in most cases that come to therapy (Pérez-Álvarez, 2006). To deal with problems, the therapist should drive his/her client to make contact with these variables of control and to be able to meet his/her values (Hayes, 2004).

Apparently, the best way to do this, since the process itself already carries some level of aversiveness, would be through REFLECTION REQUEST responses by the therapist, accompanied by a good deal of FACILITATION and EMPATHY (Rodrigues et al., 2014).

Finally, one should remember that the analytical-behavioral therapy is a fairly recent therapeutic modality – has less than fifty years – and much of its knowledge and technology is still under construction. As well as a better understanding about the processes involved in aversive control is needed, a lot is still to be unraveled about the therapeutic process. We should continue to seek the enhancement of analytical-behavioral therapeutic process based on knowledge produced by research of process and outcome in psychotherapy.

That is the natural way of science: the evidence outweighs the tacit knowledge with data that sometimes surprise, sometimes outweigh, and sometimes corroborate what the experience would seem to indicate. As therapists, we should be attentive to the contributions of research, that each day presents us with new and exciting findings about human behavior.

References

- Ablon, J. S., & Jones, E. E. (1999). Psychotherapy process in the National Institute of Mental Health Treatment of Depression Collaborative Research Program. *Journal of Consulting and Clinical Psychology, 67* (1), 64-75.
- Abreu, C. N. e Guilhardi, H. J. (2004). *Terapia Comportamental e Cognitivo-comportamental: Práticas Clínicas*. São Paulo: Editora Roca.
- Andery, M. M. & Sérgio, T. M. (2009). Reforçamento extrínseco e intrínseco. Em M. A. P. A. Andery, T. M. A. P. Sérgio & N. Micheletto (Orgs.), *Comportamento e causalidade* (pp. 10-22). Recuperado de http://www.pucsp.br/pos/experimental/graduacao/Downloads/comportamento_causalidade_2009.pdf
- Bakes, A. (2012). Helpful strategies for teaching effective confrontation skills. *Ideas and Research You Can Use: VISTAS, 1* (1), 1-2.
- Banaco, R. A. (1993). O impacto do atendimento sobre a pessoa do terapeuta. *Temas em Psicologia, 2*, 71-79.
- Banaco, R. A. (1997). O impacto do atendimento sobre a pessoa do terapeuta 2: experiências de vida. In M. Delitti (org.). *Sobre Comportamento e Cognição. Vol. 2*; Santo André: Arbytes. 174-181.
- Banaco, R. A. (2001). Alternativas não aversivas para o tratamento de problemas de ansiedade. In M. L. Marinho e V. E. Caballo (Orgs.). *Psicologia Clínica e da Saúde* (pp.197-212). Londrina: Editora UEL; Granada (Espanha): APICSA.
- Banaco, R. A. (2004). Punição positiva. In C. N. Abreu; H. J. G.(Orgs.). *Terapia comportamental e cognitivo-comportamental: Práticas clínicas*(pp. 61-71).Santo André: ESETec.
- Baptistussi, M. C. (2001). *Comportamentos do Terapeuta na Sessão que Favorecem a Redução de Efeitos Supressivos sobre Comportamentos Punidos do Cliente*.

- Dissertação de mestrado, Programa de Psicologia Experimental: Análise do Comportamento, Pontifícia Universidade Católica de São Paulo.
- Beutler, L. E., Moleiro, C., & Talebi, H. (2002). Resistance in psychotherapy: what conclusions are supported by research. *JCLP/In Session: Psychotherapy in Practice*, 58, 207-217.
- Bischoff, M. M. & Tracey, T. J. G. (1995). Client resistance as predicted by therapist behavior: A study of sequential dependence. *Journal of Counseling Psychology*, 42, 487-495.
- Caballo, V. E. (1996). *Manual de Técnicas de Terapia e Modificação do Comportamento*. São Paulo: Editora Santos.
- Carr, E. G., Levin, L., McConnachie, G., Carlson, J. I., Smith, C. E. & Kemp, D. C. (1994). *Communication-based Intervention for Problem Behavior*. Baltimore: Paul H. Brookes.
- Cassado, D. C. (2012) *Linguagem, Sofrimento e a Teoria dos Quadros Relacionais*. (Online) Disponível em <http://www.comportese.com/2012/10/linguagem-sofrimento-e-a-teoria-dos-quadros-relacionais/>. Recuperado em 05/06/16.
- Catania, A. C. (1999). *Learning*. (4thed.). Cornwall-on-Hudson: Sloan Publishing.
- Chase, P. N. & Danforth, J. S. (1991). The role of rules in concept learning. In L. J. Hayes & P. N. Chase (Orgs.), *Dialogues on verbal behavior* (p. 205-225). Hillsdale: Lawrence Erlbaum.
- Cordova, J. V., & Scott, R. L. (2001). Intimacy: A behavioral interpretation. *The Behavior Analyst*, 24, 75-86.
- da Rocha, G. V. M. e Meyer, S. B. (2014). Alguns apontamentos sobre psicoterapia analítico-comportamental com jovens em conflito com a lei. Em D. R. Zamignani & S. B. Meyer (orgs). *Estudos a partir do Instrumento*

SiMCCIT – Sistema Multidimensional para a Categorização de Comportamentos na Interação Terapêutica. São Paulo: Paradigma.

Dinsmoor, J. A. (2001) Stimuli inevitably generated by behavior that avoids electric shock are inherently reinforcing. *Journal of the Experimental Analysis of Behavior*, 75, 311-333.

Emmelkamp, P. M., Bouman, T. K. , Scholing, A. (1989). *Anxiety disorders: A practitioner's guide.* Chichester: John Wiley & Sons.

Fantino, E., & Silberberg, A. (2010). Revisiting the role of bad news in maintaining human observing behavior. *Journal of the Experimental Analysis of Behavior*, 93, 157-170.

Faria, G.S.S. e Freitas, S.T. (2017). Roberto Banaco: a despatologização da doença mental. *Revista Expressão*, 1, 22-25. Recuperado de <http://apps.unibrasil.com.br/revistaexpressao/index.php/REVEXP6/article/view/229>, em 20/12/2016.

Ferraz, M. R. P. (2004). Dessensibilização sistemática por imagens. In C. N. Abreu; H. J. G. (Orgs.). *Terapia comportamental e cognitivo-comportamental: Práticas clínicas* (pp. 177-185). Santo André: ESE Tec.

Ferster, C.B. (1967). Arbitrary and natural reinforcement. *The Psychological Record*, 17, 341-347.

Ferster, C. B., Culbertson, S. & Perrott-Boren, M. C. (1968). *Behavior principles.* New York Appleton-Century-Crofts.

Garcia, M. R. (2001). *Uma Tentativa de Identificação de Respostas de Esquiva e da Utilização do Procedimento de Bloqueio de Esquiva Através da Análise de uma Relação Terapêutica.* Dissertação de mestrado, Programa de Psicologia Experimental: Análise do Comportamento, Pontifícia Universidade Católica de São Paulo.

Harrow, J. (1995, December 15). *Confrontation: The dark mirror.* (online) Disponível em: <http://proteuscoven.org/proteus/confront.htm>

- Hayes, S.C. (1987). A Contextual approach to therapeutic change. In N. Jacobson (Ed.) *Psychotherapists in clinical practice: Cognitive and behavioral perspectives* (pp. 327-387). New York: Guilford Press.
- Hayes, S. C. (2004). Acceptance and commitment therapy, relational frame theory, and third wave of behavioral and cognitive therapies. *Behavior Therapy, 35*, 639-665.
- Hayes, S. C., Barnes-Holmes, D. & Roche, B. (Orgs.) (2001). *Relational Frame Theory: A Post-Skinnerian Account of Human Language and Cognition*. New York: Plenum Press.
- Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Emotional avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*, 1152-1168.
- Herrnstein, R. J. (1970). On the law of effect. *Journal of the Experimental Analysis of Behavior, 13*, 243-266.
- Hineline, P. N. (1984). Aversive control: A separate domain? *Journal of the Experimental Analysis of Behavior, 42*, 495-509.
- Jones, K. M & Friman, P. C. (1999). A case study of behavioral assessment and treatment of insect phobia. *Journal of Applied Behavior Analysis, 32*, 95-98
- Kohlenberg, R. J., & Tsai, M. (1991). *Functional Analytic Psychotherapy: creating intense and curative therapeutic relationships*. Nova York: Plenum press.
- Kovac, R., Zamignani, D. R., & Avanzi, A. L. (2009). Análise do comportamento verbal relacional e algumas implicações para a clínica analítico-comportamental. Em R. C. Wielenska (Org.), *Sobre comportamento e cognição: Desafios, soluções e questionamentos, vol. 24* (pp. 314-324). Santo André: ESETec.

- Krasnegor, N. A., Brady, J. V., & Findley, J. D. (1971). Second-order optional avoidance as a function of fixed-ratio requirements. *Journal of the Experimental Analysis of Behavior, 15*, 181-187.
- Leaman, D. (1978). Confrontation in counseling. *Personnel and Guidance Journal, 56* (10), 630-633.
- Luciano, C. & Hayes, S. C. (2001). Trastorno de Evitación Experiencial [Experiential avoidance disorder]. *International Journal of Clinical and Health Psychology, 1*, 109-157.
- Malott, R. W.; Whaley, D. L., & Malott, M. E. (1997). *Elementary principles of behavior*. New Jersey: Prentice-Hall. Chapter 9. Unlearned reinforcers and aversive conditions (pp. 143-153)
- Matos, M. A. (2001). Comportamento governado por regras. *Revista Brasileira de Terapia Comportamental e Cognitiva, 3*(2), 51-66. Recuperado em 14 de outubro de 2015, de http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1517-55452001000200007&lng=pt&tlng=pt.
- McDowell, J. J. (1988). Matching theory in natural human environments. *The Behavior Analyst, 11*, 95-109.
- Medeiros, C. A. (2012). A relação terapêutica na terapia comportamental pragmática. In E. E. Nogueira, E. C. Almeida Neto, M. E. Rodrigues, & N. B. Araripe (Orgs.), *Terapia analítico-comportamental: Dos pressupostos teóricos às possibilidades de aplicação* (pp. 81-103). Santo André, SP: ESETEC.
- Medeiros, C. A. & Medeiros, N. N. F. A. (2012). Psicoterapia comportamental pragmática: Uma terapia comportamental menos diretiva. In C. V. B. B. Pessôa, C. E. Costa & M. F. Benvenuti (Orgs.), *Comportamento em foco, vol. 1*(pp. 417-436). São Paulo, SP: ABPMC.
- Millenson, J. R. (1967). *Principles of behavioral analysis*. New York: MacMillan.

- Moriyama, J. S.; Fernandes, K. E., & Tomazella, N. C. (2014). As amarras da terapia: esquivas emocionais e estratégias alternativas de bloqueio. In Verônica Bender Haydu, Silvia Aparecida Fornazari, Célio Roberto Estanislau (Orgs.). *Psicologia e análise do comportamento: conceituações e aplicações à educação, organizações, saúde e clínica* (pp. 517-542). Londrina: UEL.
- Mowrer, O. H. (1939). A stimulus-response analysis of anxiety and its role as a reinforcing agent. *Psychological Review*, 46, 553-565.
- Oshiro, C. K. B. & Meyer, S. B. (2014). Desafios metodológicos na pesquisa clínica: terapia com pacientes difíceis. In D. R. Zamignani & S. B. Meyer (Orgs.). *Estudos a partir do Instrumento SiMCCIT – Sistema Multidimensional para a Categorização de Comportamentos na Interação Terapêutica*. São Paulo: Paradigma.
- Pérez-Álvarez, M. (2006). La terapia de conducta de tercera generación. *EduPsykhé*, 5 (2), 159-172.
- Perone, M. (2003). Negative effects of positive reinforcement. *The Behavior Analyst*, 26, 1-14.
- Rodrigues, B. D.; Lima, C. F.; Zamignani, D. R.; Malavazzi, D. M.; Simões Filho, E.; Del Prette, G.; Mazer, M.; Zuccolo, P. F.; Banaco, R. A.; Almeida, T. A. C.; Santos, V. M. C. (2014). Efeitos de intervenções reflexivas sobre o repertório do cliente no processo terapêutico analítico-comportamental. In: D. R. Zamignani, & S. B. Meyer (Orgs.). *A pesquisa de processo em psicoterapia: Estudos a partir dos instrumentos SiMCCIT-Sistema Multidimensional para a Categorização de Comportamentos na Interação Terapêutica*(pp. 125-168). São Paulo - SP: Núcleo Paradigma.
- Savoia, M. G. (2004). Descatastrofização. In C. N. Abreu; H. J. G.(Orgs.). *Terapia comportamental e cognitivo-comportamental: Práticas clínicas* (pp. 336-343). Santo André: ESETEC.
- Sidman, M. (1989). *Coercion and its fallout*. Boston: Authors Cooperative.

- Sidman, M., & Boren, J. J. (1957a). A comparison of two types of warning stimulus in an avoidance situation. *Journal of Comparative and Physiological Psychology*, 50, 282-287.
- Sidman, M., & Boren, J. J. (1957b). The relative aversiveness of warning signal and shock in an avoidance situation. *Journal of Abnormal and Social Psychology*, 55, 339-344.
- Skinner, B. F. (2014/1953). *Science and Human Behavior. Originally published as Science and human behavior*. New York: Macmillan.
- Skinner, B. F. (1987). What is wrong with daily life in the western world? Em B. F. Skinner (Ed.), *Upon further reflection* (pp. 15-31). Englewood Cliffs: Prentice Hall. Publicado originalmente em 1986.
- Todorov, J. C. (2001). Quem tem medo de punição? *Revista Brasileira de Terapia Comportamental e Cognitiva*, 3 (1), 37-40.
- Tsai, M., Kohlenberg, R. J., Kanter, J. W., Kohlenberg, B., Follette, W. C. e Callaghan, G. M. (2009). *A Guide to Functional Analytic Psychotherapy: Awareness, Courage, Love and Behaviorism*. New York: Springer.
- Vermes, J. S., Kovac, R. & Zamignani, D. R. (2007). A relação terapêutica no atendimento clínico em ambiente extraconsultório. In D. R. Zamignani, R. Kovac e J. S. Vermes (Orgs.). *A clínica de portas abertas: Experiências e fundamentação do acompanhamento terapêutico e da prática clínica em ambiente extraconsultório* (pp. 201-227). São Paulo: Paradigma/ESETec.
- Wielenska, R. C. (2004). Técnica implosiva. In C. N. Abreu, & H. J. G.(Orgs.). *Terapia comportamental e cognitivo-comportamental: Práticas clínicas* (pp. 234-237). Santo André: ESETec.
- Wolpe, J. (1958). *Psychotherapy by Reciprocal Inhibition*. Stanford, CA: Stanford University Press.
- Young, M. (2009). *Learning the art of helping: Building blocks and techniques*. Upper Saddle River, NJ: Pearson Education.

- Zamignani, D. R. (2001). *Uma Tentativa de Caracterização da Prática Clínica do Analista do Comportamento no Atendimento de Clientes com e sem o Diagnóstico de Transtorno Obsessivo-Compulsivo*. Dissertação, Mestrado em Psicologia Experimental: Análise do Comportamento, Pontifícia Universidade Católica de São Paulo.
- Zamignani, D. R. (2004). Dessensibilização ao vivo. In C. N. Abreu; H. J. G. (Orgs.). *Terapia comportamental e cognitivo-comportamental: Práticas clínicas* (pp. 169-176). Santo André: ESETEC.
- Zamignani, D. R. (2007). *O desenvolvimento de um sistema multidimensional para a categorização de comportamentos na interação terapêutica*. Tese de Doutorado, Instituto de Psicologia, Universidade de São Paulo, São Paulo.
- Zamignani, D. R. & Meyer, S. B. (2011). Comportamentos verbais do terapeuta no sistema multidimensional para a categorização de comportamentos na interação terapêutica (SiMCCIT). *Perspectivas em Análise do Comportamento*, 2, 25-45.
- Zamignani, D. R. & Meyer, S. B. (2014). *A pesquisa de processo em psicoterapia: O desenvolvimento do SiMCCIT – Sistema Multidimensional para a Categorização de Comportamentos na Interação Terapêutica*. São Paulo: Paradigma.
- Zamignani, D. R., & Nico, Y. C. (2007). Respostas verbais de mando na terapia e comportamentos sociais análogos: uma tentativa de interpretação de respostas agressivas e autolesivas. In Zamignani, D. R.; Kovac, R.; Vermes, J. S.. (Org.). *A Clínica de Portas Abertas: Experiências e Fundamentação do Acompanhamento Terapêutico e da Prática Clínica em Ambiente Extraconsultório*. Santo André: ESETEC. (p. 101-133).



Fostering the sustainable use of common-pool resources through behavioral interventions: an experimental approach

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ABSTRACT: This study proposes the use of an experimental analogue of natural resource exploitation to evaluate the effects of the real-time displaying of the amount of available resources and the provision of written feedback messages on the resource extraction behavior of participants sharing a common-pool whereby participants are physically and verbally isolated from each other. The experiment involved the application of a three-member common-pool resources (CPR) game. The members of the groups sharing the CPR were changed periodically and were allowed to talk briefly to each other so that an experienced participant could give instructions to a newcomer. In this way, it was also possible to evaluate how the accuracy of instructions regarding resource preservation and sustainability affects group member resource extraction patterns and CPR maintenance in the long run. Twenty-two college students took part and were distributed into three groups: Control, Display, and Feedback. The amount of resources extracted individually and by the groups in every round of the game was analyzed, as were the verbal responses of the experienced participants when

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giving instructions to newcomers. Results showed that the manipulated variables were effective for the short-term decrease in the amount of resources extracted by the members of the Display and Feedback groups. The accuracy of the instructions was also important for the sustained maintenance of the pattern of consumption established by the manipulated variables, leading to the recovery and the preservation of the resources in a greater number of the game's rounds.

Keywords: behavior analysis, experimental analogue, laboratory microsocieties, sustainability

Common-pool resources (CPR) include several types of renewable natural resources used by multiple individuals, such as forests, groundwater basins, grazing lands, and fisheries (Dietz, Ostrom, & Stern, 2003; Ostrom, 2002, 2009; Ostrom, Gardner, & Walker, 1994). Two major attributes differentiate CPR from other types of assets (Ostrom et al., 1994): difficulty in excluding potential beneficiaries of the assets (e.g., laws that guarantee the access of any individual to public water sources), and the fact that the resource units extracted by one individual are no longer available to others (e.g., if one person extracts 10 gallons of freshwater from a water source, those gallons cannot be extracted by another person). The rationale regarding CPR use underlies the efforts of researchers from different fields (e.g., economics, biology, environmental science) to understand the behavioral patterns of extraction and use of renewable natural resources observed in individuals and groups all over the world, this being a core aspect in the notion of Sustainable Development, which emphasizes a kind of use of natural resources that meets the needs of individuals in the present without compromising the possibility of individuals of future generations meeting their own needs (WCED, 1987).

Garrett Hardin's seminal paper *The Tragedy of the Commons* (Hardin, 1968) predicts the overuse and the total depletion of CPR, since there is no control over the limit of individuals that are allowed to use the resource, or

any kind of restriction regarding the amount of resource units that each individual can exploit. In an open access pasture, for example, each herdsman who puts their cattle to graze in it faces two components: a positive one (relating to the individual gains arising from the sale of each animal), and a negative one (relating to the overgrazing created by each animal added to the herd). As the effects of overgrazing are shared by all the herdsmen using the pasture, the negative component becomes only a small fraction of the positive component. In view of this, each herdsman is more likely to try to increase their own gains, adding more and more animals to their herd, without considering the long-term effects of massive exploitation of the pasture. The result is the overexploitation of the resource until total depletion occurs, so that grazing can no longer take place. *The Tragedy of the Commons* points out a clear conflict regarding short-term benefits for individuals versus long-term harmful effects that impact everyone who depends on a CPR to survive (see Borba et al., 2014 for more details about this kind of conflict).

As the main solutions to avoiding *The Tragedy of the Commons*, Hardin (1968) advocates for the institution of private CPR ownership and the establishment of governmental constraints over resource access and exploitation. However, empirical evidence arising from economic studies, conducted in the decades that followed, suggest that self-organization of individuals into groups sharing CPRs can be more effective for the establishment of a sustainable practice than any kind of boundaries or rules centrally imposed by governmental agencies (e.g., Dietz et al., 2003; Ostrom, 2009). Research into the preservation of 152 forests around the world conducted by Chhatre and Agrawal (2008), indicates that this kind of local enforcement reduces the probability of resource degradation and increases the likelihood of the regeneration of overexploited areas. Self-organized communities succeed, more frequently, when the size of the resource is not large and when it is shared by individuals who can communicate with each other, establishing community-based rules for the exploitation of the

resources, including monitoring and sanctioning practices (Dietz et al., 2003; Ostrom, 2002, 2009; Ostrom et al., 1994).

Despite the evidence regarding the importance of self-organized groups for the establishment of sustainable practices for the use of common-pool resources, there are still many situations in which Hardin's worst predictions seem to fit almost perfectly. These are situations like the shared access of especially large water reservoirs, whereby resources are used by many individuals acting alone and controlled by singular demands (e.g., quenching thirst, bathing, car washing), thus making it difficult or even impossible to establish self-organized resource exploitation practices. Brazil's largest city, São Paulo, for example, suffered a huge water supply crisis in 2014, due to a prolonged period of abnormally low rainfall which in turn required a reduction in the volume of water consumed by each household. The solution, in such cases (in which self-organization is extremely difficult), seems to lie in adjusting the behavioral pattern of consumption shown by members of society, especially those who use the resources in a reckless manner. Several Behavior Analysis studies have shown important effects of the manipulation of behavioral variables on the establishment of pro-environmental behaviors, like recycling, reducing energy use and fuel conservation (cf., Lehman & Geller, 2004; Luke & Alavosius, 2012; Osbaldiston & Schott, 2012). In general, such studies have evaluated the effects of antecedent and consequent variables on the pro-environmental behavior of interest, for example, the use of messages prompting people to turn off the lights when leaving a room (Winett, 1978), and information feedbacks to increase aluminum can recycling (Larson, Houlihan, & Goernert, 1995). Unfortunately, study results also point to poor long-term effects and the return to baseline levels when interventions are withdrawn (Lehman & Geller, 2004; Luke & Alavosius, 2012). This is an important limitation, given the sustainability goals attached to the use of common-pool resources.

One of the major hindrances to producing reliable evidence regarding long-term effects of behavioral interventions focused on maintaining large and heavily shared CPRs is the slow manner in which a cultural practice is established and transmitted across generations. It can take months, years or even decades to verify, for example, how far an intervention has been effective in maintaining a given natural resource (e.g., freshwater in a water source). One way to circumvent this limitation may be by performing studies analogous to real-life cultural practices in the laboratory, using micro-society experiments (Baum, Richerson, Efferson, & Paciotti, 2004; McElreath et al., 2005; Nogueira & Vasconcelos, 2015; Ward & Houmanfar, 2011; Whiten & Flynn, 2010). Such experiments are mainly characterized by performing fairly simple collective tasks, in which group members are periodically changed and experienced participants give instructions to newcomers. According to Baum et al. (2004), the use of laboratory micro-societies can be considered “a flexible tool for examining many aspects of cultural transmission under controlled conditions” (p. 306). The framework for this kind of research is the assumption that some behavioral processes cannot be fully understood by studying their parts independently, whereby the need exists for some kind of methodological tool which enables the empirical study of these processes in their full complexity (see Ward & Houmanfar, 2011, for a review regarding the use of simulations as a tool for research into complex human behavior).

Given the possibility put forward by Baum et al. above, this study proposes the use of an experimental analogue of CPR exploitation in micro-societies to evaluate the effects of environmental variables on the resource extraction behavior of participants sharing a common-pool and who are physically and verbally isolated from each other. The experimental task involved the application of a three-member CPR game with periodical changing of participants. Analogous to Hardin’s *Tragedy of the Commons*, the game involved a situation in which up to three participants had access to a renewable natural resource, represented by fish in an ocean. Individually,

participants had to choose how much fish they wanted to extract in each round of the game. From time to time, the remaining amount of resources was readjusted, simulating the reproduction of fish in their natural environment. Choices for the extraction of a great amount of fish, when performed by multiple participants, could exceed CPR renewal capacity, leading to a decrease in the amount of available fish and, ultimately, total depletion of the resource. Thus, an increased amount of available fish and the long-term maintenance of the resources depend on a pattern of extraction below CPR renewal capacity. In light of these characteristics of the game, the environmental variables manipulated were the real-time displaying of the amount of fish available in the CPR and the display of written feedback messages when the amount of available resources declined. Complementarily, the members of the groups sharing the CPR were periodically changed and allowed to talk briefly, so that an experienced participant could give instructions to a newcomer. In this way it was also possible to evaluate how the accuracy of the instructions regarding resource preservation and sustainability affects the extraction patterns of the group members and the long-term maintenance of the CPR.

The choice of the kind of variables manipulated in this study lies originally in the dichotomy between antecedent and consequence-based interventions presented in the literature regarding pro- environmental behavior (e.g., Lehman & Geller, 2004; Luke & Alavosius, 2012). The real-time displaying of the amount of available resources aimed to answer our question: “if people had some kind of parameter to guide their choices, would this lead to a consumption pattern considered sustainable?” Complementarily, the use of feedback messages was based on solid evidence of success of this type of intervention (at least in the short-term) presented in the literature (e.g., Lehman & Geller, 2004; Luke & Alavosius, 2012). In the final section of this paper, we discuss how appropriate the definitions of these variables were and how they resulted in our experiment getting closer to or further away from the conditions observed in the natural environment.

Method

Participants

Twenty-two undergraduate students (17 females and 5 males) aged between 19 and 27 years old participated in the study. They were psychology students who had never taken part before in research into social behavior and cultural practices.

Setting

Two 16.0 x 22.0 ft. rooms were used as the research setting. One was a classroom containing about 15 chairs and one desk and was used as a reception area for participants. The other was a laboratory room containing three Medium Density Fiberboard cubicles (6.0 x 6.0 ft.) where the experiment was run. The cubicles enabled participants to be visually isolated from each other. Each of the cubicles contained a desk, a chair and a computer. Near the entrance of the laboratory there was another desk, a chair and a computer where the researcher monitored data collection.

Equipment

Equipment was comprised of four notebook computers with Intel® Core i3, 1.80 GHz processors, 2 GB of RAM, Windows® 8 OS, HD webcam and wireless connection; three stereo headphones; one urn containing 10 numbered cards; Brazilian currency (BRL) bills and coins. The computers were internet connected to access the Virtual Fishery system (Camargo, Rossi & Haydu, 2014), a computerized version of a Common-Pool Resources (CPR) game.

Procedure

Participants were recruited from university classrooms and distributed into three groups: *Control* ($n = 5$), *Display* ($n = 7$), and *Feedback* ($n = 10$). The size of each group varied either according to the number of participants that attended the sessions, or according to the number of rounds undertaken to

complete the experiment. Each group attended one experimental session which lasted about 60 minutes on average.

Sessions started with the researcher welcoming the participants in the classroom, asking them to read and sign the Consent Form approved by the Ethics Committee of the authors' institution and containing a brief description of the study aims and the experimental task. Following this the researcher asked the participants to take a numbered card from the urn to define the order of participation in the experiment.

The experimental task consisted of a computerized version of a CPR game (see Figure 1), showing a simulated situation of renewable natural resource extraction: an ocean fishery. Up to three participants played the game simultaneously, each one choosing the amount of resource units (fish) to be extracted from a common-pool. The MDF cubicles and the use of headphones ensured participants were visually and acoustically isolated from each other. The Virtual Fishery system was programmed to make 200 fish available to the common-pool at the beginning of the task. Each round of the game consisted of each participant choosing to catch between 1 and 9 fish. Before the round started the message "Wait..." appeared on the game screen, and the commands were blocked. As soon as the round began, the "Wait..." message disappeared, the commands were released and a countdown timer started to run so that participants had 20 seconds to make their choices, selecting the amount of fish in the choice panel, and then clicking the "Fish" button to conclude. The value in the choice panel was always "7" when a round began. If the countdown timer reached zero, the current amount in the choice panel was computed. After the end of each round, the system calculated the amount of resource units remaining in the common-pool and added a readjustment of 6.5% to the final value to simulate the reproduction of the fish in their natural environment. The fish (points) obtained in the game were exchanged for money after participants concluded the task. The amount paid for each fish was 0.05 BRL (approximately 0.03 USD at the time of the study).

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The Virtual Fishery system allowed the manipulation of certain variables in the CPR game, such as the displaying of written messages on the participants' screens and the real-time displaying of information regarding the resources in the common-pool. The researcher could control when rounds began, enable and disable interventions, and phase out the game for each player. For each round, the system recorded the amount of fish caught by the group of participants, the amount of fish caught by each participant, and the amount of fish available in the common-pool. Computer webcams recorded the verbal responses of the participants in each cubicle.

Initially, only one participant began the game, using the computer in one of the three cubicles. The first participant in each group received instructions about the task directly from the researcher who also pointed out the game interface elements when necessary:

You are going to play a game called Virtual Fishery. It's a model to evaluate the consumption of renewable natural resources, represented here by fish in an ocean. The total amount of fish available in the ocean is shared among all the players. You can see how many players are connected through this indicator on the screen [pointing to the number of fishermen connected]. Initially you will be fishing alone, but after some intervals other players will join the game and you will be asked to give instructions to one of them. The entry and exit of players will be displayed here [pointing to the players' entry or exit indicator]. You will play for several rounds and for each round you must choose the amount of fish that you want to catch. The amount of fish you have caught will be displayed in here [pointing to the panel indicating the amount of fish caught]. Once you have finished, this amount of fish will be exchanged for money and you will receive 0.05 BRL for each fish. The round begins when the "Wait..." message disappears from the screen and the countdown timer starts to run [pointing to the countdown timer], and you will have 20 seconds to make your choice. To make a choice you must click on the down arrow or the up arrow in the choice panel [pointing to the arrows in the choice panel], and you can catch 1 to 9 fish in each round. After making your choice, you must click the "Fish" button to

confirm it and conclude the round. If time runs out, the amount caught will be the number of fish displayed in the choice panel when the countdown timer reaches zero. You will be informed when your participation ends. Is everything clear?

If the participant was unclear about any point, a new explanation was given following the same instructions described above. If everything was clear to the participant, or after a new explanation, the researcher gave the following instructions: “Before starting the game you must put on the headphones to isolate all outside sounds. You will hear a sound similar to the ocean. Get ready for the round to start. Have a good game!”

Once the participant had put on the headphones, the cubicle door was closed and the game began. After every six rounds the game stopped for the entry of a new participant. This was the beginning of a new generation. Each participant played up to 18 rounds of the game. When all three cubicles were occupied, the generation exchange occurred when a participant who had completed 18 rounds left the game and a new participant started. Every time a newcomer joined the game, the participant who joined the game in the previous generation was asked to give instructions to the newcomer on how to play the game. The researcher gave the following instruction to the experienced player: “Please explain to [name of the newcomer] what this game is about, what each element on the screen is, and give [him or her] all information you judge necessary for proper participation in the game”.

Having instructed the newcomer, the experienced participant returned to their cubicle to continue the game. Participants were only allowed to talk when an experienced participant was asked to give instructions to a newcomer, and headphones were used to guarantee acoustic isolation during the game. When a participant completed 18 rounds, the following message was displayed on their screen: “You have finished your participation in the

game. Contact the researcher to exchange your points (fish) for money”. Then, the participant was directed to the laboratory entrance to receive payment. Finally, the researcher thanked the participant for collaborating with the research and asked him or her to keep the information about the game confidential. An experimental session ended either when the last participant of the group completed 18 rounds, or due to total depletion of the CPR.

Experimental design

An ABA’ design was employed to conduct the experimental task for each group (Control, Display, and Feedback), where “A” was the baseline phase, “B” was the intervention phase, and “A” was a reversal phase. The CPR Game started in the baseline phase for all three groups. The amount of resources extracted and participants’ instructions were recorded before any of the variables were manipulated. The criterion for ending the baseline phase was a decrease in the amount of available resources in the common-pool, for at least five out of six consecutive rounds, counted with effect from the 16th round of the game.

Following the baseline phase, two of the groups were submitted to the intervention phase in which two types of environmental variables were manipulated. The Display group participants were exposed to a real-time display of the amount of fish available in the common-pool (see Figure 1). When the intervention began, the Display group participants received the following message on the screen:

Caution! Your group is acting in an unsustainable manner. That means you are catching more fish than are being reproduced. This type of behavior could lead to the total depletion of the resources for the next generation of participants. The display in the bottom left corner of the screen indicates the amount of resources available at this time. Reproduction capacity is just 6.5% per round.

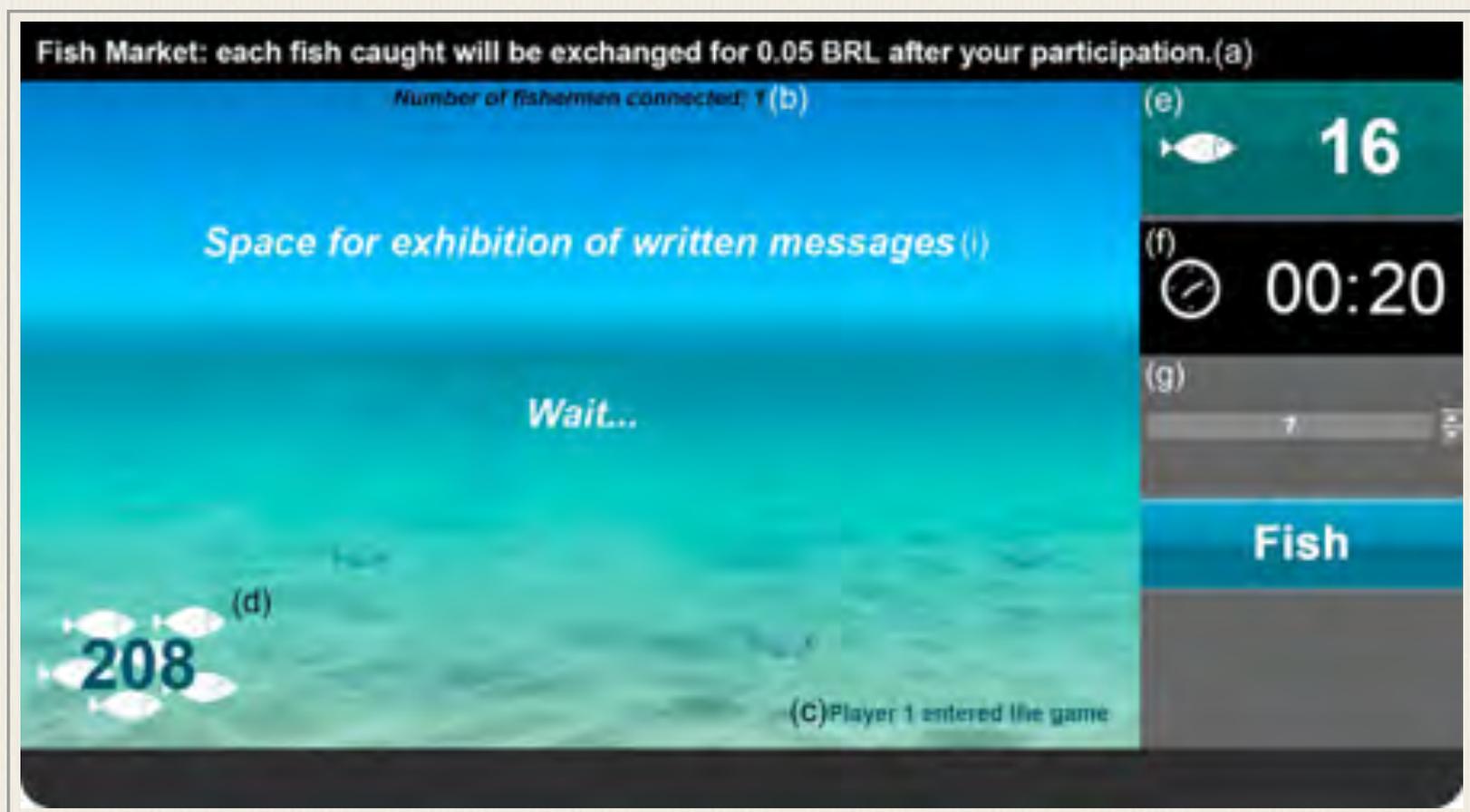


Figure 1. Visual representation of the CPR game containing (a) the “exchange value” of fish, (b) the number of participants connected, (c) a field to indicate the entry or exit of players, (d) the total amount of available fish (not always visible), (e) the amount of fish caught by the participant, (f) a timer, (g) a selection panel, (h) a “Fish” button to confirm the choices and (i) space for displaying written messages.

The Feedback group participants were exposed to the display of written feedback messages after every round in which the amount of resources in the common-pool decreased. At the beginning of the intervention phase, the Feedback group participants received the following message on the screen:

Caution! Your group is acting in an unsustainable manner. That means you are catching more fish than are being reproduced. This type of behavior could lead to the total depletion of the resources for the next generation of participants.

The feedback message displayed after resources decreased was as follows:

“Caution! The amount of fish is decreasing. Take care to preserve resources. Behave in a sustainable manner.”

The intervention phase ended after 12 rounds and was followed by a reversal phase in which variables manipulated during the intervention were withdrawn. The Control group participants remained in the baseline phase throughout the entire experiment and did not enter the intervention or reversal phases.

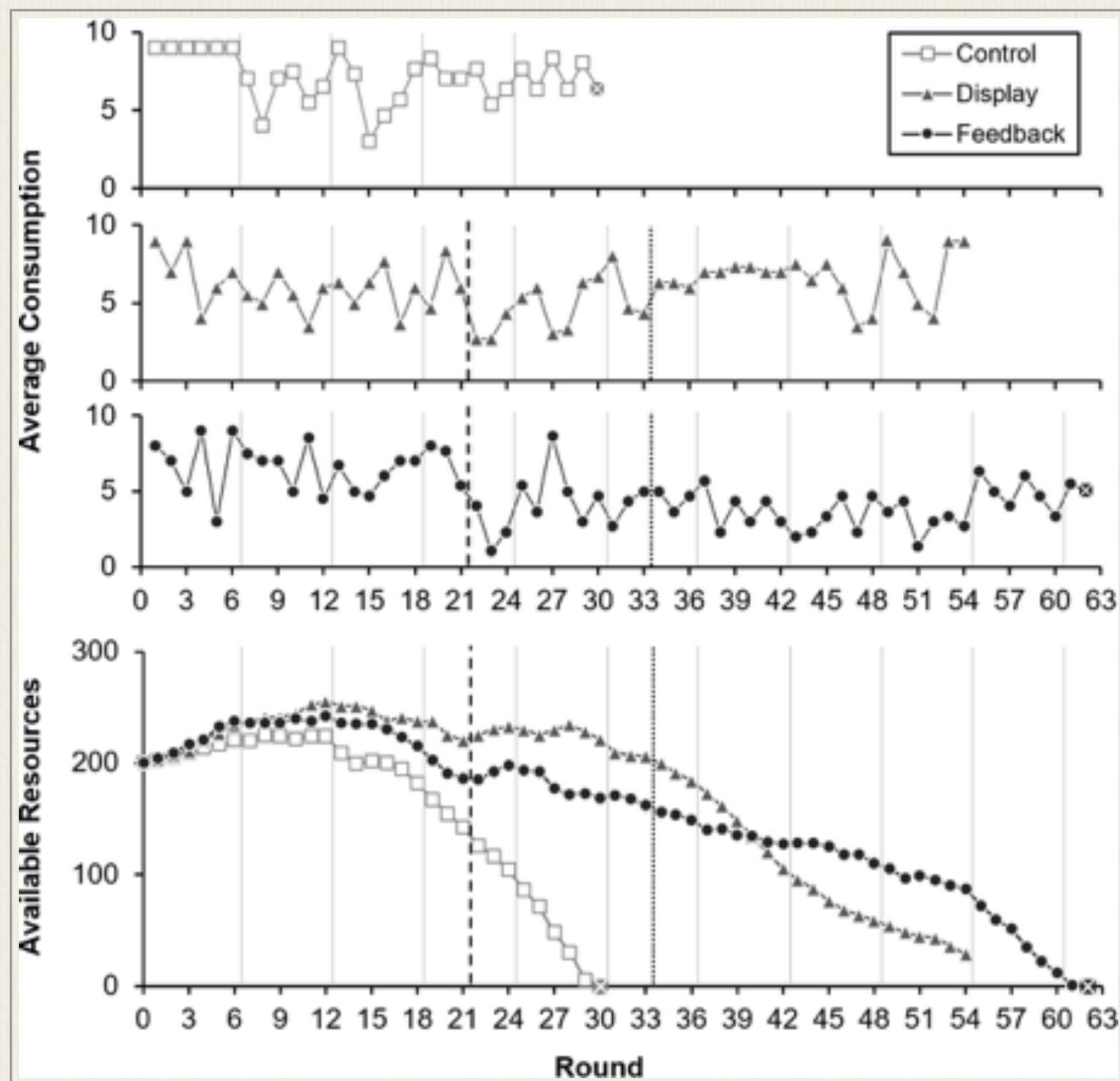
Analysis of the instructions

The verbal responses of the experienced participants were assessed using a checklist to evaluate the accuracy of the instructions given to new participants about resource preservation and sustainability. The checklist had five items based on the information found in the written messages displayed in the intervention phase: statements about resource preservation or sustainability issues; statements about resource decrease or depletion; statements about the next participants; statements about the amount of available resources; statements about CPR renewal capacity. The checklist items were also used for analysis of the control group. Two independent coders tabulated the data recorded by the webcams. Inter-coder data reliability achieved an agreement index of 90.5% and a Pearson coefficient of 0.79. With the aim of making data presentation clearer, we designed an Instruction Accuracy Index (IAI) by dividing the number of statements types appearing in a given instruction by the five possible statements ($IAI = \text{number of statements presented} / 5$). IAI ranges from 0 to 1, whereby scores closer to 1 indicate better instruction accuracy.

Results

Data analysis included the amount of resources extracted by the groups and by participants in each round of the game, the amount of common

resources available to each group throughout the rounds, and the accuracy of the instructions regarding resource preservation and sustainability given



by the experienced participants to the newcomers at the time of the generation exchange.

Figure 2. Average amount of resources extracted by the groups (upper graph) and amount of resources available (lower graph) in each round of the CPR game. Dashed and dotted lines indicate, respectively, the beginning and the end of interventions for the experimental groups. The thin vertical lines indicate the time of the generation exchange. “x” indicates the depletion of the resources available to the groups.

Figure 2 shows the average amount of resources extracted by the groups (top panel) and the amount of common resources available for extraction in each round of the game (bottom panel). During the baseline phase, all the groups showed a similar pattern of resource extraction, with the total amount of common resources decreasing from 12th round onwards (the participants of Control, Display, and Feedback groups showed average consumption of 6.72, 6.05, and 6.83 fish per round, respectively, in the last six rounds of the baseline phase). When the intervention phase began, the participants in the Control group (the group that did not receive any intervention) maintained a pattern of extraction similar to the baseline, with average consumption of 6.92 fish per round until the 30th round, when total depletion of the common resource occurred (total extracted = 495 fish). On the other hand, the participants of Display and Feedback groups showed a decrease in average consumption at the beginning of intervention phase, leading to a partial recovery of common resources: the participants of Display group had an average consumption of 4.0 fish per round in the first six rounds of the intervention phase, which represents a decrease of 33.9% from the baseline, while the participants of Feedback group had average consumption of 4.17 fish per round in the same period, representing a decrease of 39.0% from baseline. Effect size (Cohen's d) was small when comparing Display and Feedback groups' average consumption in the first six rounds of the intervention phase ($d = 0.07$), and large when comparing both Display and Feedback groups to the Control group average consumption in the same period ($d = 1.21$ and 1.14 , respectively). Feedback messages regarding resources were displayed to Feedback group participants in rounds 22, 25, 27, 28, 30, 32, and 33 of the game.

In the last six rounds of the intervention phase, the participants' average consumption increased in the Display group (5.55 fish per round) and remained quite stable in the Feedback group (4.11 fish per round), so that the amount of common resources started to run out more intensely for the first

group than for the second. Furthermore, after the end of the intervention phase, and the withdrawal of the manipulated variables (reversal phase), the participants of Display and Feedback groups continued to show different patterns of resource extraction: whereas average Feedback group consumption remained stable (approximately 4.28 fish per round in the first six post-intervention rounds), the Display group participants showed an increase in average consumption, reaching baseline levels of resource extraction (6.66 fish per round in the first six rounds of the reversal phase). As result, the amount of resources available in the common-pool decreased smoothly in the Feedback group until the 54th round, lasting for a total of 62 rounds, and for 10 different participants (total = 771 fish). In the case of the Display group, the amount of available resources decreased markedly until round 42, when one participant finished 18 rounds and left the game, the remaining two participants stayed until the 48th round, and only one of them remained until the end of the experiment in this group at round 54 (total = 738 fish).

The amount of resources extracted by each participant during the CPR game is presented in Figure 3. Individual curves were plotted in a manner that allows the visualization of the beginning and the end of participation for each group member, as well as the beginning and the end of the intervention phase for the Display and Feedback groups. The Control group (Figure 3 top left panel) was characterized mainly by the singular patterns of extraction presented by each participant. Participant C01, for example, consumed the maximum amount allowed in the first six rounds of the game and then began to switch between high and low consumption when C02 joined. Both participants C03 and C05 presented a high and stable pattern of consumption during their participation, with the former accounting for the largest amount of fish extracted within the Control group (145 fish) and the latter accounting for the greatest average consumption (8.17 fish per round). After a stable beginning (similar to C01), participant C04 alternated choices

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around the mean value, showing the least average consumption within the group (5.17 fish per round).

In the case of the Display group (Figure 3 top right panel) we highlight the consumption pattern shown by participant D03, who switched between high and low extractions throughout his participation, with an average consumption of 4.89 fish per round in both the baseline and intervention phase. Participant D02 showed the greatest variation in average consumption in the Display group from the baseline to the intervention phase: 6.5 and 2.3 fish per round, respectively, which represents a decrease of 64.3% from one phase to another. Conversely, participant D06's average consumption went from 5 to 6.5 fish per round by the end of the intervention phase, representing an increase of 29.3% in consumption in the reversal phase. Participant D05 also showed increased consumption in the reversal phase, by choosing the default value of 7 fish in the later rounds of his participation. The Display group's greatest average consumption and greatest amount of resources extracted was achieved by participant D07 (7.1 fish per round, and a total of 127 fish), who chose low values for extraction in very few rounds of his participation. The Feedback group results stand out because of the short-term decrease in the participants' consumption from the baseline to the intervention phase (see Figure 3 bottom panel). The average consumption of participants F02 and F03 went down from 6.1 to 2 and 2.1 fish per round, respectively, which represents a decrease of at least 65.6% in consumption from one phase to another. Participant F01 showed greatest average consumption and greatest cumulative amount of resources extracted in the Feedback group (6.9 fish per round, and a total of 125 fish), while participant F06 showed the lowest average consumption and cumulative amount compared to all other study participants: 1.2 fish per round (only 21 fish extracted in 18 rounds). We believe that participant F06 did not fully understand the instruction given by F05, since, in addition to have chosen low values, F06 also typed "0" (zero) in the choice panel in some rounds (a kind of response not planned in the experiment).

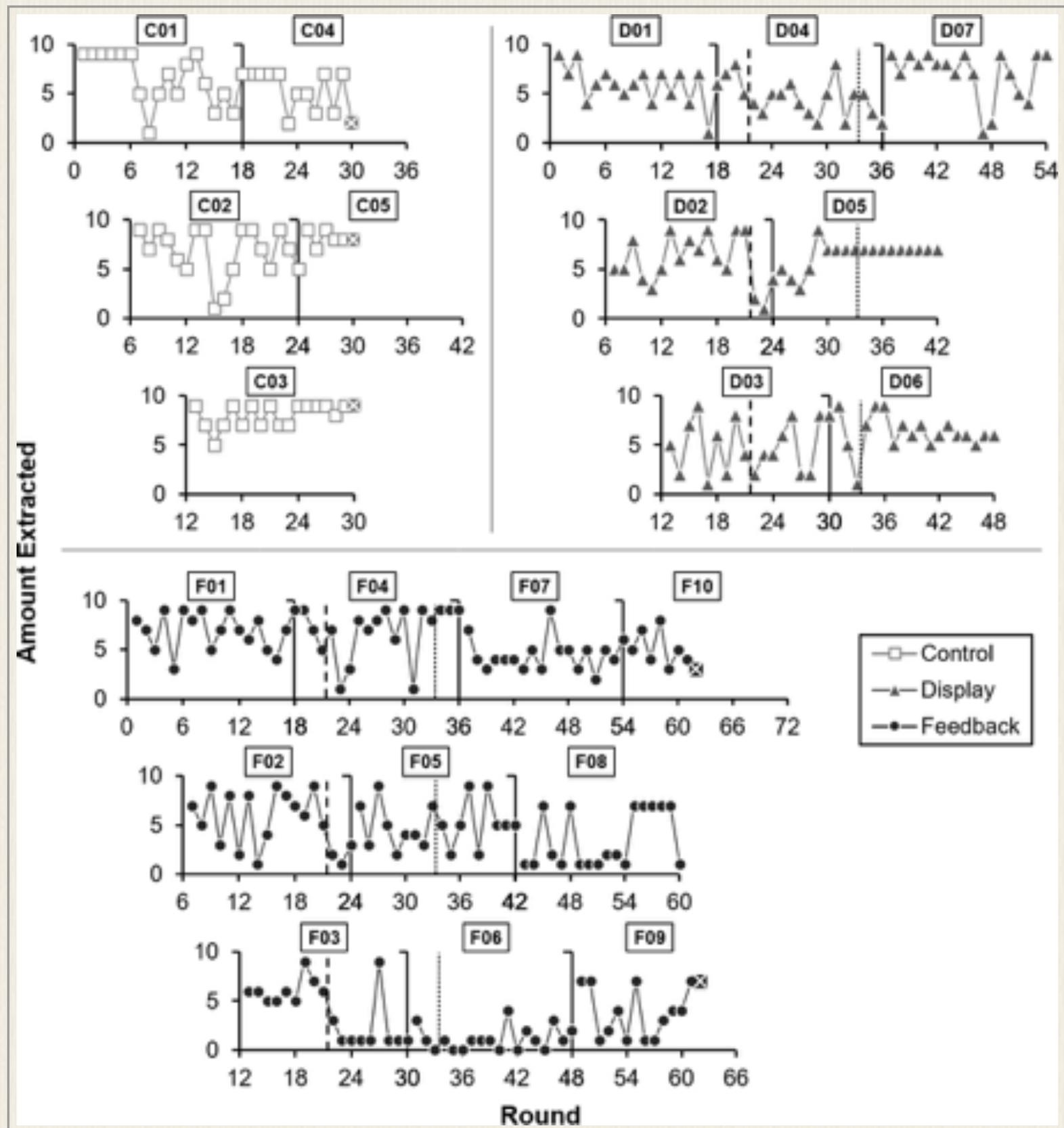


Figure 3. Amount of resources individually extracted by the participants of the Control group (top left panel), Display group (top right panel), and Feedback group (bottom panel) in each round of the CPR game. Dashed and dotted lines indicate the beginning and the end of intervention phase, respectively. “x” indicates the depletion of the resources available to the groups

Figure 4 shows the Instruction Accuracy Index (IAI) for the instructions regarding resource preservation and sustainability that were given by experienced participants to newcomers at the time of generation exchange.

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All groups followed the same sequence of instructions: Participant_01 (i.e., C01, D01, or F01) gave instructions to Participant _02, Participant _02 gave instructions to Participant _03, and so forth. The IAI for sustainability was zero for all three groups in the baseline phase of the experiment. During the intervention phase, the IAI for sustainability increased in the Display and Feedback groups, but remained at baseline levels in the Control group. The highest IAI found at the beginning of the intervention phase in the Feedback group (IAI = 0.6): participant F04 gave participant F05 an instruction quite similar to the written message displayed before the first round of the intervention phase. It is noteworthy in the case of the Feedback group, that the accuracy of the instructions provided to the newcomers remained above the baseline levels until the end of the experiment, even after the intervention's feedback messages had been discontinued. The Display group's sustainability IAI went from 0.4 to 0.2 during the intervention phase, returning to baseline levels in the reversal phase: the instruction given by participant D04 to participant D05 mentioned the possibility of resource depletion and the effect on future generations, while participant D05's instruction to participant D06 only indicated the common resources display on the game screen and did not provide details regarding resource preservation and sustainability.

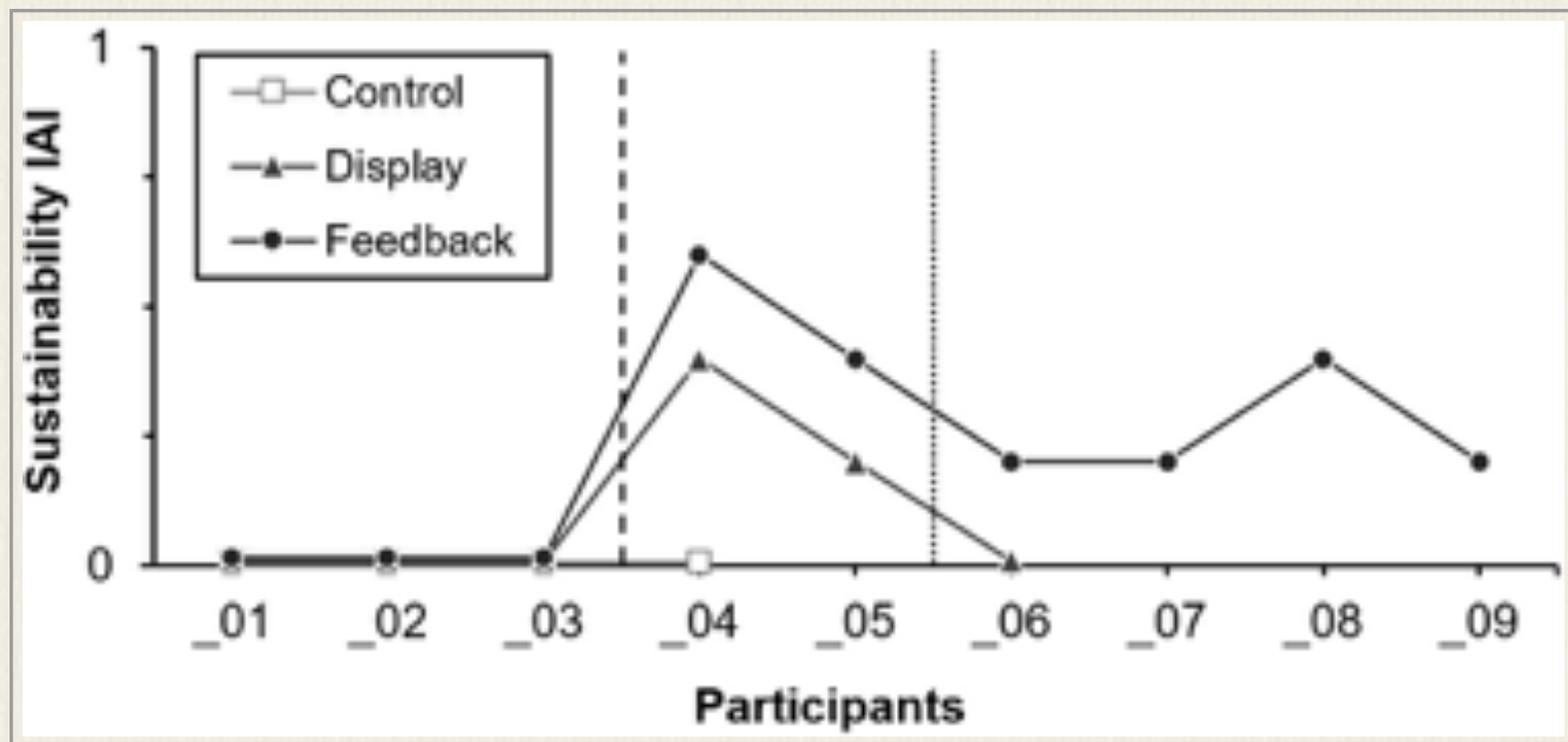


Figure 4. Accuracy of the instructions (IAI) given by the experienced participants (numbered) to newcomers regarding resource preservation and sustainability during the CPR game. Dashed and dotted lines indicate, respectively, the beginning and the end of interventions for the Display and Feedback groups.

Discussion

This research is probably one of the first attempt to investigate, inside a laboratory setting, the full complexity of the behavioral processes involved in the sustainable use of renewable natural resources, composed mainly by three key elements: (1) individual choices for the extraction of resources (2) in a common-pool shared by several individuals isolated from each other (whereby unrestricted communication to establish collective rules, monitoring or sanctioning actions were not possible), and (3) the transmission of verbal and non-verbal responses across several generations. We focus our investigation on the effects of behavioral variables on the establishment of a moderate pattern of consumption in individuals, and, consequently, the preservation of the resources for the group as a whole. The method proposed here aimed to fill a gap noticed in literature in the field of Economics that already indicates relevant variables related to the self-organization of communities who share a renewable natural resource (cf. Ostrom, 2002, 2009; Ostrom, et al., 1994), which is not possible when the individuals

cannot freely communicate with each other. It also contributes to the community of behavior analysts by proposing an important methodological tool for studying the long-term effects of behavioral interventions focused on natural resource preservation and the establishment of pro-environmental behavior by society (for a review see Lehman & Geller, 2004 and Luke & Alavosius, 2012).

Analysis of the amount of resources extracted by the members of each group in the CPR game allows us to infer an important effect of the manipulated variables on the short-term decrease in consumption shown by the participants of the Display and Feedback groups after the baseline phase, while similar results were not found in the Control group. The variables manipulated in the Display and Feedback groups were also important for the recovery and preservation of available resources for further rounds of the game. Moreover, the accuracy of the instructions given by the experienced participants to newcomers was probably relevant to the long-term maintenance of the pattern of consumption established during the intervention phase, even when the manipulated variables ceased. This was mainly found in the Feedback group results.

With regard to the analysis of the “group as a whole,” the difference in the results shown by the three groups, even before the end of the baseline phase, must be highlighted. For example, the groups did not show a completely similar pattern of resource extraction in the last six rounds of the baseline phase, varying between average consumption of 6.05 fish per round (Display Group) and 6.85 fish per round (Feedback group). According to Baum et al. (2004), these random differences among groups are expected, mainly in societies formed by few individuals, with cultural diversity being established with information transmission among participant generations. Comparison between participants also shows idiosyncratic data, with some participants showing high consumption (e.g., C03) whilst others showed mild consumption (e.g., F06). In addition, some participants were more (F02) or less (D03) responsive to the manipulated variables. These individual differences can be due to motivational factors (e.g., the reinforcement value

of the money earned in the game) and pre-experiment variables, like the history of common resource consumption, or each participant's experience regarding following rules (Skinner, 1969, 1974).

We also highlight the fact that the results discussed here were obtained in a context in which the participants worked isolated from each other and were thus individually exposed to the contingencies of the CPR game. Changes in the groups' overall consumption could be observed mainly in groups submitted to a behavioral variable during the intervention phase, which points to relevant effects of individual contingency management on the environmental impact produced by groups as a whole. In this sense, the interventions presented here can be characterized as macrocontingency manipulations, since the locus to change in the resource extraction practice was the operant behavior of individuals acting in isolation (Malott & Glenn, 2006). Given the results obtained, it is possible to state that changes in individual behavior will not always be sufficient for resource recovery and maintenance, but they can be an important basis for intervening in environmental issues, whereby the greater the proportion of individuals who adopt a sustainable pattern of consumption, the greater the chances of this practice being effective and maintained between generations.

Results related to the long-term effects of the manipulated variables also draw special attention. In the case of the Display and Feedback groups, which had the greatest number of rounds in the game, an overall evaluation of interventions becomes possible by integrating quantitative data and the instructions registered through the experiment. By the beginning of intervention phase, both the Display group and the Feedback group showed a decrease in average consumption and recovery in the amount of available resources. However, with the generation exchange, the behavioral pattern shown by the two groups differed considerably. This can be attributed to the difference in the accuracy of the instructions given to newcomers by experienced participants regarding resource preservation and sustainability. The instruction given by Display group participant D04 to participant D05

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had an accuracy index (IAI) below the mean point (IAI = 0.4), while participant D05, in his instruction to participant D06, only mentioned the function of the panel displaying the amount of available resources and said nothing about resource preservation and sustainability. Hence, average consumption by the Display group increased by the end of the intervention phase, returning to baseline levels when the total amount of available resources was no longer displayed. On other hand, in the Feedback group, the instruction given by participant F04 to the newcomer had the highest sustainability IAI (0.6), which, along with the written feedback messages displayed, may have been essential to this kind of instruction continuing to appear up until and including the group's last participant. Accordingly, the Feedback group maintained relatively mild and constant average consumption during the last rounds of the CPR game. These results are in accordance with prior research on the effects of rule accuracy in organizational settings, which show that explicit and accurate rules could lead to greater and longer lasting levels of productivity (Houmanfar, Rodrigues, & Smith, 2009; Smith, Houmanfar, & Denny, 2012). This kind of assumption points to the importance of effective educational practices for the transmission of accurate and relevant information regarding the preservation of renewable natural resources, and for the long-term maintenance of well-established consumption practices.

Like every initial approach, this study also has some limitations that can be taken into consideration in future research. Without a basis for evaluating the adequacy of the procedure in simulating the processes involved in the sustainable use of common-pool resources, we attempted to root our independent variables in the literature that has already shown important effects of antecedent and consequence-based interventions (e.g. Lehman & Geller, 2004 and Luke & Alavosius, 2012). The variable manipulated in the Display group, for example, departs from the conditions observed in naturalistic conditions, since in most situations there is no consensus regarding the amount of a given natural resource present in the environment

(Grant, 2007), precluding the use of such information as an independent variable. For similar reasons, the degree of precision of the primary feedback given to both experimental groups at the beginning of the intervention phase is also rarely found in naturalistic conditions. Furthermore, the statement “Behave in a sustainable manner!” given to the Feedback group brings a qualitatively different type of feedback than that of the Display group, so that the participants may have changed their behavior due to pliance from the research setting and social control of experimenter, and not controlled by what the message presented said about their own behavior. Future studies could focus on less verbal responses and interventions, by replacing the use of discrete rounds with verbal inputs (numbers from 1 to 9) through a free operant procedure, and the intervention messages by the differential reinforcement of some pattern of responses. Recent research has shown some progress with free operant data collection for social interaction tasks (Toledo et al., 2015), both for obtaining clearer learning curves and to avoid the instructional control and verbal mediation that arise from the experimental setting, which can overlap the effects of nonverbal contingencies on behavior (Young, Webb, & Jacobs, 2011).

Another limitation observed in this study was the low number of participants and groups for the evaluation of each behavioral variable manipulated. Despite the differences observed between the groups, it was not possible to conduct a more robust statistical analysis of the data (e.g., Analysis of Variance - ANOVA) which could have made the inferential power of the results stronger. Future research could pay special attention to this kind of methodological issue, seeking to achieve a large number of participants and groups to obtain clearer analysis of the effects of the variables. In general, none of the variables manipulated in the Display and Feedback groups can be considered as being totally effective with regard to the long-term maintenance of resources, since both groups maintained average consumption above the renewal capacity of the CPR, leading to the total or nearly total depletion of the resource. In this sense, new studies could

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evaluate the effects of other behavioral variables in pursuit of better results, such as providing special rewards (e.g., extra points) following a sustainable pattern of consumption, the loss of points earned when resources are extracted excessively, and more direct teaching concerning the instructional practices adopted by the group members regarding resource preservation and sustainability. Another aspect to be considered in future studies is the type of reinforcers used in the experiment (points exchanged for money), which implies motivational issues that constrain the homogeneity between participants. It is possible that naturalistic conditions are more accurately simulated if the points obtained by participants entail more or less likelihood of success during the game than simply resulting in greater financial gain after participation (see Young, Webb, & Jacobs, 2011 for an example of a videogame-based task with does not imply financial gains).

In conclusion, data obtained in this study can serve as an important landmark to a more elaborate analysis of consumption practices regarding common-pool resources and the effects of behavioral variables on the establishment and maintenance of sustainable behavior among the members of society. Aspects discussed here could lead to the refinement of experimental procedures aiming to reproduce the behavioral processes involved in the use of renewable natural resources inside the laboratory, as well as guiding the conception of applied research on this subject. Scientists from other fields, interested in the issue of use and preservation of natural resources (e.g., biologists, economists, etc.), can also benefit from the knowledge obtained here, mainly by the assertion that is possible to achieve broader changes starting by manipulating variables that impact the behavior of several individuals who are spatially and verbally isolated from each other. Short and long-term public policies also can be guided by those findings, including programs to promote the rational use of natural resources in the present and educational practices that perpetuate these achievements for future generations.

References

- Baum, W. M., Richerson, P. J., Efferson, C. M., & Paciotti, B. M. (2004). Cultural evolution in laboratory microsocieties including traditions of rule giving and rule following. *Evolution and Human Behavior*, 25(5), 305-326. <http://dx.doi.org/10.1016/j.evolhumbehav.2004.05.003>
- Borba, A., Silva, B. R., Cabral, P. A. A., Souza, L. B., Leite, F. L., & Tourinho, E. Z. (2014). Effects of exposure to macrocontingencies in isolation and social situations in the production of ethical self-control. *Behavior and Social Issues*, 19, 5-19. <http://doi.org/10.5210/bsi.v23i0.4237>
- Camargo, J. C., Rossi, M., & Haydu, V. B. (2014, May). Pescaria virtual: um sistema informatizado para o estudo de variáveis comportamentais no jogo “Dilema dos Comuns” [Virtual Fishery: a computerized system to study behavioral variables in the “Common Dilemma” game]. *Anais do III Congresso de Psicologia e Análise do Comportamento*, Londrina, Brazil.
- Chhatre, A., & Agrawal, A. (2008). Forest commons and local enforcement. *Proceedings of the National Academy of Sciences of the United States of America*, 105(36), 13286-13291. <http://www.pnas.org/cgi/doi/10.1073/pnas.0803399105>
- Dietz, T., Ostrom, E., & Stern, P. C. (2003). The struggle to govern the commons. *Science*, 302(5652), 1907-1912. <http://doi.org/10.1126/science.1091015>
- Grant, L. K. (2007). Peak oil as a behavioral problem. *Behavior and Social Issues*, 16(1), 65-88. <http://dx.doi.org/10.5210/bsi.v16i1.405>
- Hardin, G. (1968). The tragedy of the commons. *Science*, 162(3859), 1243-1248. <http://doi.org/10.1126/science.162.3859.1243>
- Houmanfar, R., Rodrigues, N. J., & Smith, G. S. (2009). Role of communication network in behavioral systems analysis. *Journal of*

Organizational Behavior Management, 29, 257-275.
<http://dx.doi.org/10.1080/01608060903092102>

Larson, M. E., Houlihan, D., & Goernert, P. N. (1995). Effects of informational feedback on aluminum can recycling. *Behavioral Interventions*, 10(2), 111-117. <http://doi.org/10.1002/bin.2360100207>

Lehman, P. K., & Geller, E. S. (2004). Behavior analysis and environmental protection: Accomplishments and potential for more. *Behavior and Social Issues*, 13, 13-32. <http://dx.doi.org/10.5210/bsi.v13i1.33>

Luke, M. M., & Alavosius, M. (2012). Impacting community sustainability through behavior change: A research framework. *Behavior and Social Issues*, 21, 54-79. <http://dx.doi.org/10.5210/bsi.v21i0.3938>

Malott, M. E., & Glenn, S. S. (2006). Targets of intervention in cultural and behavioral change. *Behavior and Social Issues*, 15(1), 31-56. <http://doi.org/10.5210/bsi.v15i1.344>

McElreath, R., Lubell, M., Richerson, P. J., Waring, T. M., Baum, W. M., Edsten, E., . . . Paciotti, B. M. (2005). Applying evolutionary models to the laboratory study of social learning. *Evolution and Human Behavior*, 26(6), 483-508. <http://doi.org/10.1016/j.evolhumbehav.2005.04.003>

Nogueira, E. E., & Vasconcelos, L. A. (2015). De macrocontingências a metacontingências no jogo dilema dos comuns [From macrocontingencies to metacontingencies in the dilemma of commons]. *Brazilian Journal of Behavior Analysis*, 11(2), 104-116. <http://dx.doi.org/10.18542/rebac.v11i2.1941>

Osbaldiston, R., & Schott, J. P. (2012). Environmental sustainability and behavioral science: Meta-analysis of proenvironmental behavior experiments. *Environment and Behavior*, 44(2), 257-299. <http://doi.org/10.1177/0013916511402673>

- Ostrom, E. (2002). Reformulating the commons. *Ambiente & Sociedade*, 5(10), 1-22. <http://doi.org/10.1590/S1414-753X2002000100002>
- Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939), 419-422. <http://doi.org/10.1126/science.1172133>
- Ostrom, E., Gardner, R., & Walker, J. (1994). Rules, games, and common-pool resources. Michigan: The University of Michigan Press.
- Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1974). *About behaviorism*. New York: Alfred A. Knopf.
- Smith, G. S., Houmanfar, R., & Denny, M. (2012). Impact of rule accuracy on productivity and rumor in an organizational analog. *Journal of Organizational Behavior Management*, 32, 3-25. <http://dx.doi.org/10.1080/01608061.2012.646839>
- Toledo, T. F. N. d., Benvenuti, M. F. L., Sampaio, A. A. S., Marques, N. S., Cabral, P. A. d. A., Araújo, L. A. d. S., Moreira, L. R. (2015). Free culturant: A software for the experimental study of behavioral and cultural selection. *Psychology & Neuroscience*, 8(3), 366-384. <http://dx.doi.org/10.1037/pne0000016>
- Ward, T. A., & Houmanfar, R. (2011). Human simulations in Behavior Analysis (1987-2010): Facilitating research in complex human behavior. *Behavior and Social Issues*, 20, 72-101. <http://dx.doi.org/10.5210/bsi.v20i0.3707>
- Winett, R. A. (1978). Prompting turning-out lights in unoccupied rooms. *Journal of Environmental Systems*, 6, 237-241.
- Whiten, A., & Flynn, E. (2010). The transmission and evolution of experimental microcultures in groups of young children. *Developmental Psychology*, 46, 1694-1709. <http://doi.org/10.1037/a0020786>

**Fostering the sustainable use of common pool resources through behavioral interventions:
an experimental approach**

World Commission on Environment and Development (1987). *Our common future*. Oxford: Oxford University Press.

Young, M. E., Webb, T. L., & Jacobs, E. A. (2011). Deciding when to “cash in” when outcomes are continuously improving: An escalating interest task. *Behavioural Processes*, 88(2), 101–110.

<http://doi.org/10.1016/j.beproc.2011.08.003>



Toward consistent terminology in a behaviorist approach to cultural analysis

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ABSTRACT: This article represents an attempt to reach consensus on terms frequently used by its authors, who share an interest in extending a behaviorist worldview to cultural phenomena. Definitions of *metacontingency*, *macrobehavior*, *macrocontingency*, *culturo-behavioral lineage*, and *cultural cusp* were agreed on and are reported in this paper. In addition, the paper presents additional points its authors discussed in arriving at the definitions provided. It is expected that this terminology

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will continue to be refined with further study and applications.

Keywords: metacontingency; macrobehavior; macrocontingency; cultural cusp; cultural-behavioral lineage; cultural transmission

In April, 2015, a group of 12 behaviorists was convened in São Paulo, Brazil, by João Claudio Todorov to resolve differences in terminology used in behavioral publications on cultural-level phenomena. The meeting was held in conjunction with a conference sponsored by the University of São Paulo (Todorov, Benvenuti, Glenn, Malott, Houmanfar, Andery, et al., 2015). Although meeting participants had a broad range of interests—including experimental research, applications to business and other organizations, and applications to large scale social phenomena—they had in common a conviction that the behaviorist world view promulgated by B. F. Skinner could be used and extended to understand and change the cultural phenomena in which the behavior of individuals is embedded.

Todorov's goal in convening the meeting was that participants arrive at a consensus regarding definitions of concepts viewed as important to the work of participants. Of particular interest at the outset were definitions for the concepts of *metacontingency*, *macrocontingency* and *macrobehavior*. A preliminary point on which there was general agreement was that the concepts planned for discussion were *not* assumed by participants as being the *only* concepts needed in the analysis of cultural phenomena. Rather, they were prioritized because they had been found useful conceptual tools both in guiding experimental analysis (e.g., Costa, Nogueira, & Vasconcelos, 2012; Marques & Tourinho, 2015; Saconatto & Andery, 2013; Smith, Houmanfar, & Louis, 2011; Velasco, Benvenuti, & Tomanari, 2012; Vichi, Andery, & Glenn, 2009) and in understanding and changing everyday cultural-level phenomena (e.g., Houmanfar, Alavosius, Morford, Reimer, & Herbst, 2015; Machado & Todorov, 2008; Malott, 2003; Naves & Vasconcelos, 2008; Sandaker, 2009, 2010; Todorov, 2009, 2013).

Throughout the meeting the group found it necessary to clarify what they meant by terms that appeared in their proposed definitions or to address related issues that arose in the context of their discussions. This wandering of the task,

from the initially targeted quasi-technical terms to words used to explicate their meanings, was to be expected because scientific terms not expressed mathematically are expressed in ordinary language, and thus introduce their own confusions. In short, participants found themselves immersed in the kind of thorny philosophy- of-science problems often dealt with at great length by scholars grappling with evolutionary biology's key concepts. As Keller and Lloyd (1992, p. 3) succinctly stated in their introduction to *Keywords in Evolutionary Biology*:

Although it may not be possible, or even wholly desirable, to achieve a fixed meaning for scientific terms, the effort to 'control and curtail the power of language' remains a significant feature of scientific activity. The very extent to which scientists ... aim at a language of fixed and unambiguous meanings constitutes, in itself, one of the most distinctive features of their enterprise. And even though never quite realizable, this effort to control the vicissitudes of language, like the commitment to objectivity, reaps distinctive ... benefits.

Despite the vicissitudes of ordinary language and the varying scientific and practical interests of the participants, the group managed to end the two-day session with a product comprising two pages of working "definitions." In the following paragraphs, we report the content of that product and discuss some of the issues the group dealt with in attempting to come to a consensus.

Metacontingency

During its nearly 30-year history, the concept of *metacontingency* had been undergoing more or less continuous development. Given the variations in definition, the group agreed to seek consensus on a definition having the minimum number of terms possible. Without denying that metacontingencies could be expanded to three or more terms (e.g., Houmanfar, Rodrigues, & Ward, 2010), the group agreed that the minimum number of metacontingency terms was two—comparable to response/consequence contingencies first investigated by Skinner

(1938). The first term in a metacontingency relation is interlocking behavioral contingencies (IBC) measured by their aggregate product (AP). This term was viewed as analogous to movements of a laboratory animal measured by the switch closure they produced. The second term in a metacontingency relation is the consequences contingent on IBC/AP (analogous to the delivery of food contingent on movements producing switch closure in an operant experiment). The following definition specifies the contingent relation between these two elements.

Metacontingency: A contingent relation between 1) recurring interlocking behavioral contingencies having an aggregate product and 2) selecting environmental events or conditions.

The contingent relation, then, in a metacontingency is between a culturant (IBC+AP) and its selecting consequences. The IBCs themselves are made up of interlocking contingencies of reinforcement in which the local behavior of participants is directly reinforced. That IBCs can be maintained eventually by culturant consequences (in the absence of direct reinforcement for participant behavior) was demonstrated by Saconatto and Andery (2013), Tadaiesky and Tourinho (2012) and Vichi, Andery and Glenn (2009).

Figure 1 is a schematic of a metacontingency that depicts recurring IBCs in which five people produce an aggregate product. Each person's activity and/or its effects functions as environment in the operant contingencies maintaining the behavior of others. For example, packing depends on the presence of materials to pack, which depends on the conveying behavior of another person, and so on. The orderly arrangement of these interlocking contingencies results in the aggregate product of a shipment of packed items. The IBC/AP unit is identified as a culturant (named by Hunter, 2012) and it is shown as being selected by an external

environment in the form of consumers who pay for the shipped items. The contingent relations between the IBC/AP and the selecting environment constitute the metacontingency. (For other examples of this type of metacontingency, see Malott, 2003; Malott & Glenn, 2006).

The example is designed to distinguish as clearly as possible between the *operant* contingencies participating in the IBCs and the *metacontingencies* in which the IBC/AP recurrences function as cohesive wholes (culturants) susceptible to a selecting environment. Important to note is that the selecting environment cannot reasonably be expected to function as reinforcer for the behavior internal to the IBCs in this example. That behavior is maintained by operant contingencies that remain in existence only because they function together as a unit to generate the product in the metacontingency. Perhaps too obvious to require mention is that most IBCs participating in metacontingencies involve verbal behavior of participants. The verbal behavior of interest in those IBCs is that which supports or undermines a viable aggregate product.

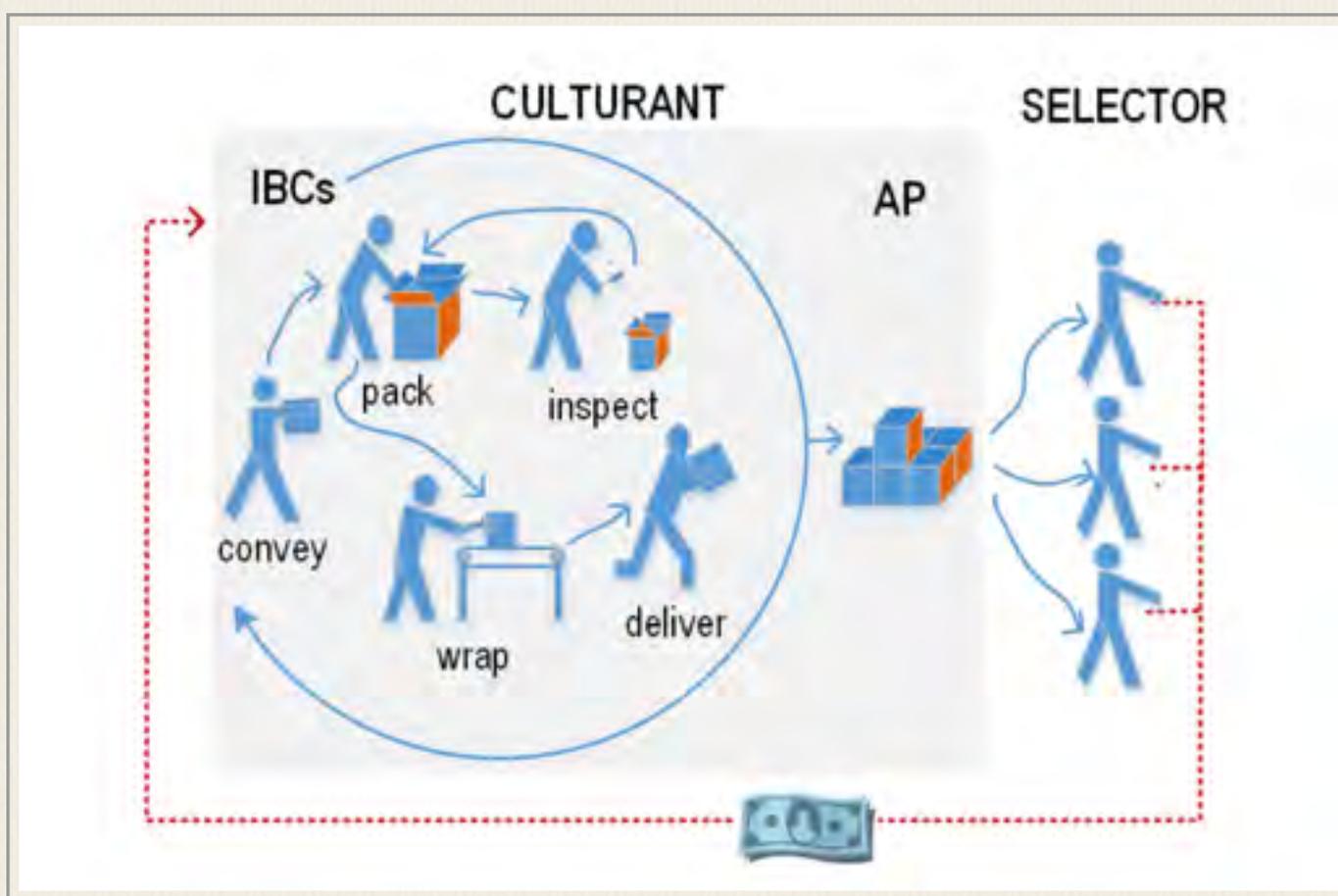


Figure 1. Metacontingency depicting selection of a shipping company culturant by an external selector

It needs also be noted that the particulars in the example are incidental to the purpose of the example, which is to depict the *kinds* of relations that constitute metacontingencies. That is, the product of IBCs does not have to be objects, and their selection does not require financial transactions. For example, negative political ads produced by IBCs of a campaign staff may be selected by voter choices, and musical products of an amateur band's IBCs may be selected by offers to play at the local pub.

Participants addressed several topics related to the terms in the definition. It was pointed out that the interlocking behavioral contingencies that play a role in metacontingencies are a subset of the more general “interlocking contingencies” that were named by Skinner (1957, p. 432) and that are ubiquitous in human affairs as pointed out by Andery, Micheletto and Sérgio (2005). Metacontingencies, however, involve only those interlocking contingencies that *recur* in a lineage *because* they have been selected as functional wholes by their environment. The addition of *behavioral* to Skinner's interlocking contingencies serves merely to identify them as operant- level contingencies *in* the IBCs, to be distinguished from metacontingencies that involve relations *between* the IBCs/AP and their selecting environment (Andery & Sérgio, 2003).

Another point of general interest was that variation among recurrences of IBCs is assumed. IBC variation could be the result of variation in operant recurrences in the behavior of individuals participating in the IBCs, or of replacement of one or more of those individuals, or of alterations in the organization of the interlocking contingencies. Any of these variants might be planned or unplanned. If variations in recurrences result in drifting of IBCs sufficient to alter the aggregate product, selection may be affected—either positively or negatively. Further, culturants may change over time as external environmental consequences (or antecedent conditions) change and variants not selected in a given socio-cultural environment may remain available for selection at a later time.

The arrangement depicted in Figure 1 was discussed in light of other possible arrangements that might be considered as metacontingencies. For example, Hunter (2012) discussed an experiment conducted by Azrin and Lindsley (1956) as a metacontingency arrangement. In that experiment, candy to be shared by two children was delivered contingent on interlocking contingencies that produced a particular arrangement of pegs (AP) on a board with holes for the pegs. The candy may be considered as reinforcement for each child's actions and also as selector of the IBCs that produced the required arrangement of pegs. This type of redundancy may characterize many metacontingencies in complex societies. An example is shown in Figure 2.

Figure 2 depicts a high school basketball team's interlocking behavioral contingencies that produce a winning score (AP). Winning scores in a sufficient number of games results in the external delivery of the championship trophy. Implicit in this example, is the likelihood of alternative variations in IBCs resulting in losses of some of the previous games, with resulting alterations in the team's playbook. The championship trophy selects those IBCs (including playbook adjustments) that produced winning games. The awarding of the trophy following the championship game may have the dual function of reinforcer for the plays made by individuals as well as selector of the playbook IBCs that resulted in winning scores.

In a third kind of metacontingency arrangement, the aggregate product itself may have the dual function of reinforcing the behavior of participating people and of selecting the interlocking contingencies that result in the product. In Figure 3, the completed puzzle (AP) requires that each participant's behavior occur in relation to the behavior of the others. Recurrences of their assembling suggest that the aggregate product functions as selector of IBCs, and it also likely functions as reinforcer for the cooperating behavior of the puzzlers.

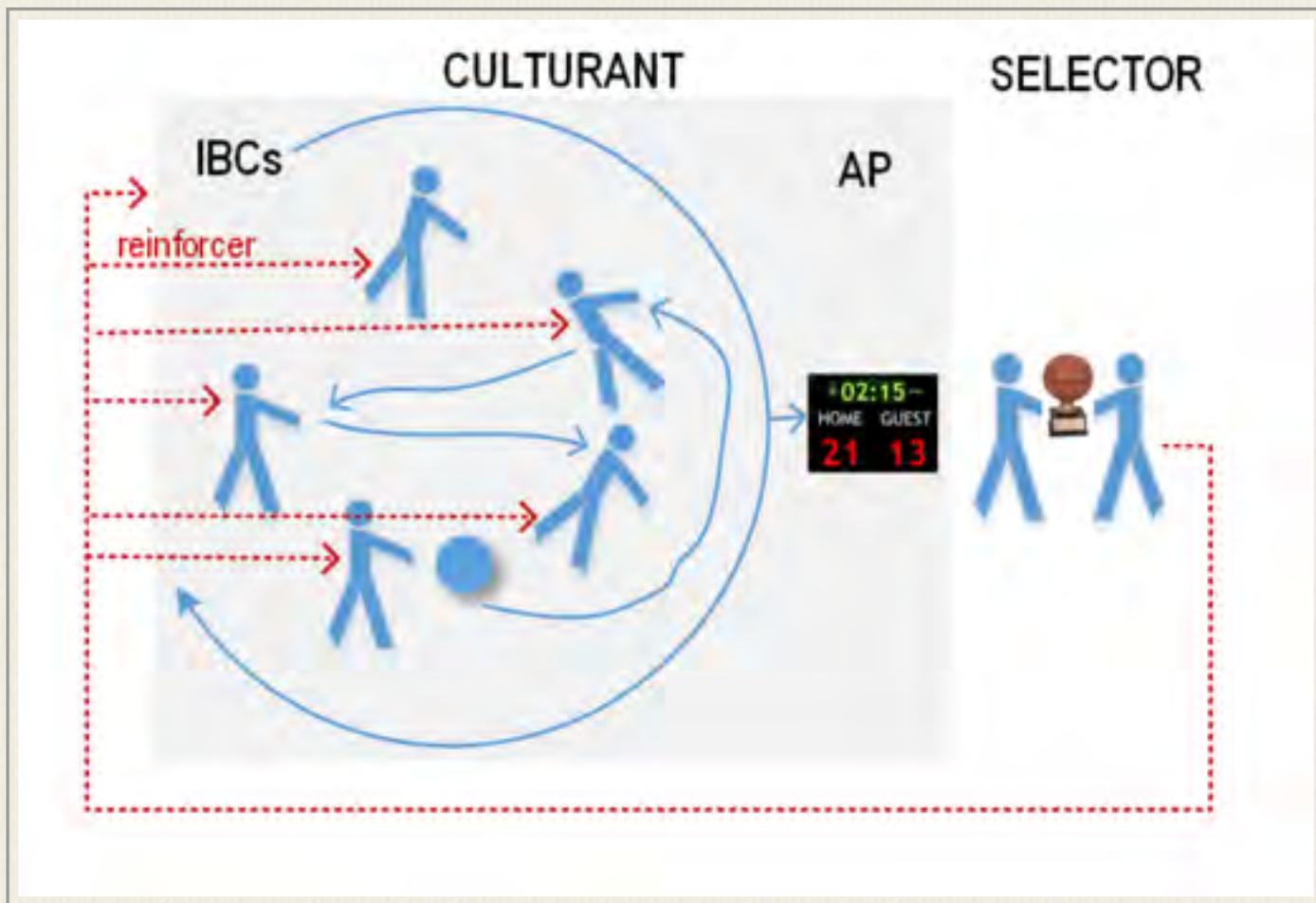


Figure 2. Selection of basketball game culturant by an external selector with dual functions—operant and culturant

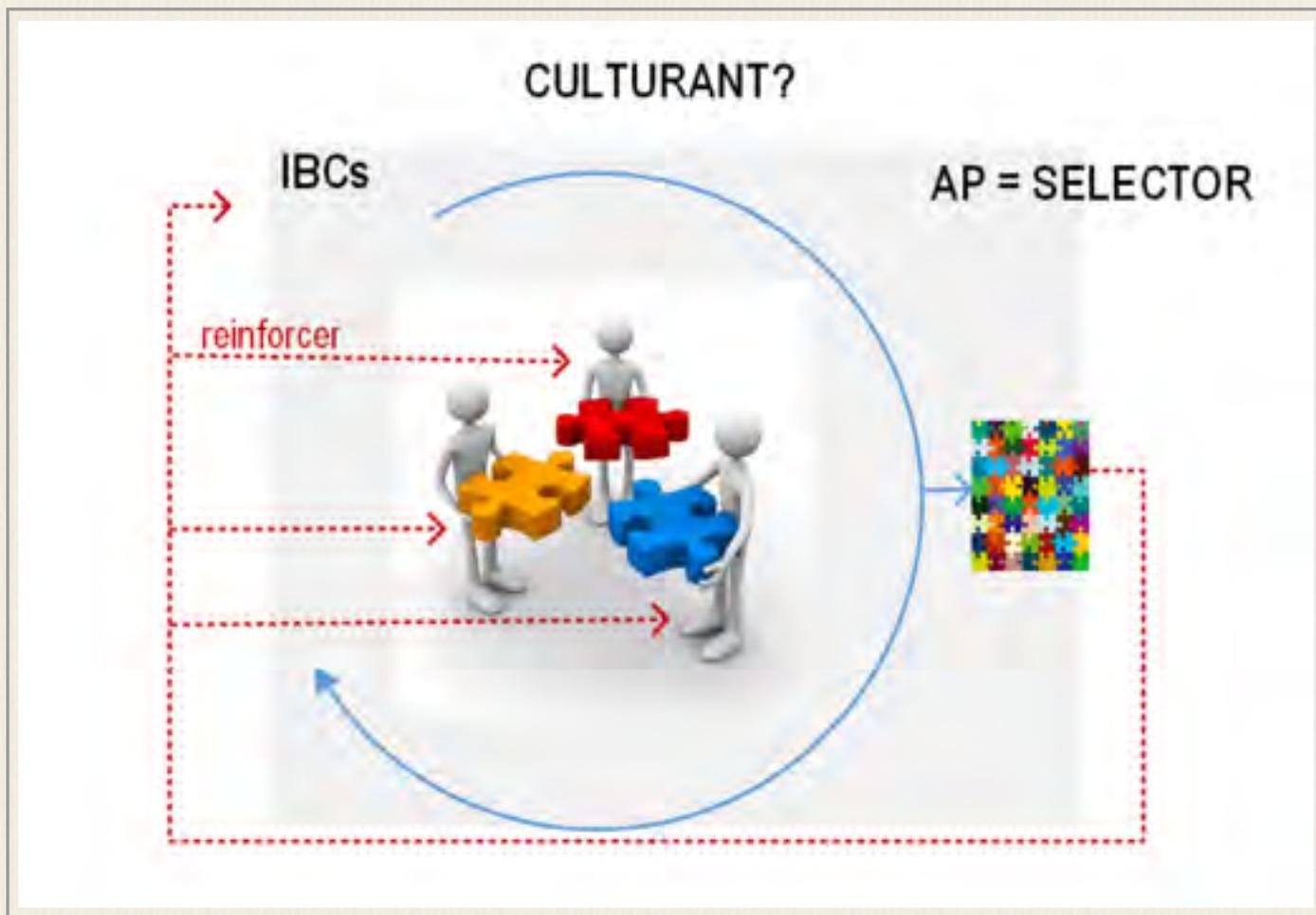


Figure 3. Selections of puzzle assembly by an aggregate product with dual functions—operant and culturant

This type of simple arrangement in which the aggregate product itself has dual functions of operant and cultural selector may typify the historical emergence of recurring IBCs in social environments. Because complex organizations surely did not materialize fully formed, their evolution in historical social environments must have involved some “mixed” arrangements of operant and cultural selection processes. Skinner suggested similar “mixed” arrangements between operant reinforcement and natural selection: “When the selecting consequences [in operant and natural selection] are the same, operant conditioning and natural selection work together redundantly” (Skinner, 1981, p. 501).

Because the operant/culturant distinction can be seen most clearly when the environment that selects IBCs producing a particular product cannot function to reinforce the operant behavior participating in the IBCs, several laboratories have developed preparations that clearly delineate between operant and culturant contingencies, and even pit the two kinds of consequences against one another (Baia, Azevedo, Segantini, Macedo, & Vasconcelos, 2014; Cavalcanti, Leite, & Tourinho, 2014; Ortu, Becker, Woelz, & Glenn, 2012; Pavanelli, Leite, & Tourinho, 2014; Saconatto & Andery, 2013; Toledo, Benvenuti, Sampaio, Marques, Cabral, Araujo, et al., 2015). A review of much of the experimental research on metacontingencies was recently published (Tourinho, 2013).

Culturo-Behavioral lineage and cultural transmission

Most human behavior is acquired as a result of learning from other humans—by observation or via explicit instruction. The behavior of both parties in these learning episodes, usually designated as “social behavior,” is the foundational phenomenon of human cultures. The specific behavior acquired by learners depends, of course, on the repertoires of the particular humans whose behaviors (or products) function in the learner’s operant contingencies. Norwegian speakers teach Norwegian speech and Portuguese

speakers teach Portuguese speech to new members of their communities. (See Andery, 2011, for review of behavior analytic publications on social behavior/interactions.)

The prototypical relations of cultural transmission are those between behavior of parents and teachers, on the one hand, and children on the other. But children (and adults) also learn from peers, neighbors, religious and lay leaders, books, art, music, and the internet. When a socially acquired behavior is replicated in the repertoire(s) of other individuals, a new type of lineage emerges. It was named a *culturo-behavioral lineage* and suggested as a type of phenomenon that emerged historically in the transition between operant and cultural selection processes (Glenn, 2003).

Culturo-behavioral lineages are “behavioral” because they comprise recurring *behavior*. Although the behavior is operant, the lineage is not. That is because an operant lineage is grounded in the existence of an individual organism. Culturo-behavioral lineages are “cultural” because the lineages extend beyond any specific operant lineage and even beyond the lives of organisms whose behavior contributes to the lineage. The meeting participants defined them as follows:

Culturo-behavioral lineage: The transmission of operant behavior across individual repertoires.

Behavior transmitted in a culturo-behavioral lineage is of most cultural interest when it is reinforced and becomes established as an operant in new repertoires. Its recurrences are then in a position to serve as antecedents for further transmission to yet other repertoires (providing the supporting physical and social environments are present). In this way each repertoire altered by social learning can function as a node in an evolutionary “bush” of ongoing transmissions.

Although transmission of operant behavior often occurs across individuals in one-to-one interactions, culturo-behavioral lineages are also embedded in the recurring IBCs of organizations. For example, when a retiring volunteer teaches a new volunteer how to carry out a task embedded in an organization's IBCs, it is critical that the socially learned behavior fit well enough into the recurring IBCs to contribute to the aggregate product. In IBCs that continue recurring as their participants change over time, culturo-behavioral lineages are like individual threads extending continuously through the larger pattern of a fabric. The culturo-behavioral threads embedded in recurring IBCs are seen in experiments where participants who replace others in recurring IBCs learn to behave like those they replaced (Borba, Silva, Cabral, Souza, Leite, & Tourinho, 2014; Marques & Tourinho, 2015; Pavanelli, Leite, & Tourinho, 2014; Soares, Cabral, Leite, & Tourinho, 2012).

Macrobehavior

Human societies are characterized by many similarities in the behavior of their constituent populations. These similarities result from similarities in the physical and/or social content of the contingencies supporting the behavior of individuals. The combination of social learning and consistency in particulars of operant contingencies allows observers to distinguish among various “cultures” and “sub-cultures”, including those of corporations, churches, extended families, ethnic communities, and entire nations. That which is being depicted has been called macrobehavior (Glenn, 2004). Think Tank participants agreed on the following definition of *macrobehavior*.

Macrobehavior: Socially-learned operant behavior observed in the repertoires of several/many members of a cultural system.

Although the concept of *macrobehavior* may seem somewhat redundant with the concept of a *cultural practice*, the latter term has been defined in many ways, and often includes “beliefs” and “attitudes”. The concept of *macrobehavior* is limited to observable operant behavior. It is the subject of much descriptive social science research, where population characteristics are the object of investigation. For present purposes, we will discuss the role of macrobehavior in macrocontingencies.

Macrocontingency

As people go about their daily activities, their behavior is constantly undergoing selection by consequences. For example, cigarette smoking may be reinforced by nicotine consumption, excuse to take a work break, or opportunity to socialize. Another possible outcome is lung cancer or heart disease, but these consequences are both delayed and probabilistic, therefore no match for the immediacy and certainty of the abatement of nicotine withdrawal or the no-work period. Even more poorly correlated with smoking by an individual is the cost of smoking to society. This is because the contribution of any one smoker to that cost is negligible, but the cumulative effect of the macrobehavior of smoking can be huge. The relation between the macrobehavior of smoking and its cumulative effect on disease in the United States is depicted in Figure 4. These diseases, in turn, contribute to health care costs and air pollution, which may be considered additional effects of the macrobehavior of smoking.

People behaving individually are not, of course, the only contributors to health care costs and air pollution. Organizations of many different kinds also contribute to those effects. As in the case of individual behavior, the IBCs/AP that contribute to air pollution, for example, are selected for other attributes. The contribution to air pollution is a side effect of the metacontingencies maintaining the IBCs. Figure 5 shows cumulative effects

resulting from the combined effects of individual behavior and IBCs of organizations.

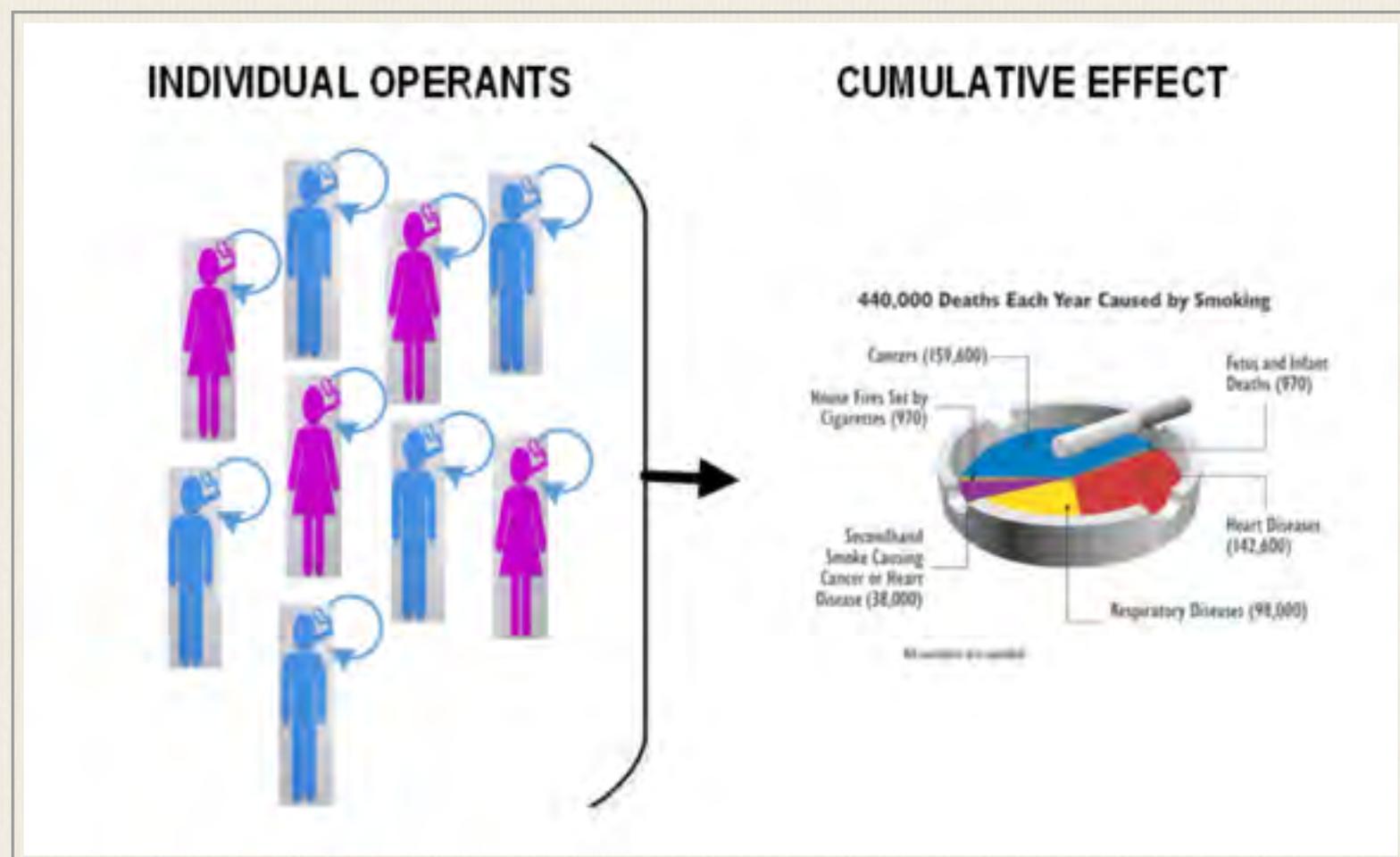


Figure 4. Deaths as a cumulative effect of smoking of many people under individual operant contingencies

Societal “problems”, then, may often be the negative cumulative side effects of behavior selected for other properties at individual and organizational levels. Thus, participants agreed on the following working definition for *macrocontingency* ².

². Jerome Ulman (2006) has used the term macrocontingency in a way that includes some of the features of metacontingencies, some of the features of what we call here macrocontingencies, and some of the features of what we will discuss later as a cultural cusp. Examples of macrocontingencies he offered included the four-term contingencies involved in a verbal episode involving two people (“a minimal macrocontingency,” p. 99), the (evolving) English language, a two-week march of landless workers in Brazil, the Movement of Landless Workers in Brazil as well as the Police Department of Brasilia. What the present analysis has in common with Ulman’s is that observable events at the cultural level are the focus of analysis.

Macrocontingency – Relation between 1) operant behavior governed by individual contingencies and/or IBCs governed by metacontingencies and 2) a cumulative effect of social significance.

Societal attempts to alter behavior of many individuals having undesired cumulative effects often involve imposition of costs on the operant behavior contributing to those effects. For example, increasing taxes on cigarettes is reported to decrease the macrobehavior of smoking (Chaloupka, Stralf, & Leon, 2010; Hu & Mao, 2002). Further, decreases in macrobehavior of smoking have been associated with reduced per capita health care expenditures (Lightwood, Dinno, & Glantz, 2008). In this case, contingent response cost for behavior of many individuals results in positive cumulative effects at the societal level (and presumably prevention of health problems for many people at the individual level.)

As in the case of altering individual behavior, it is also possible to alter macrobehavior to produce positive cumulative effect (or reduce negative cumulative effect) in less aversive ways. For example, guests at hotel buffets who use smaller plates choose foods more carefully. Their aggregate choices result in less waste, with obvious benefits to the environment (Kallbekken & Saelen, 2013). Similarly, placing healthy food items within easy reach and requiring a stretch to reach less healthy alternatives can improve food choices in school cafeterias (Hanks, Just, Smith, & Wansink, 2012) with the cumulative effect of better public health.

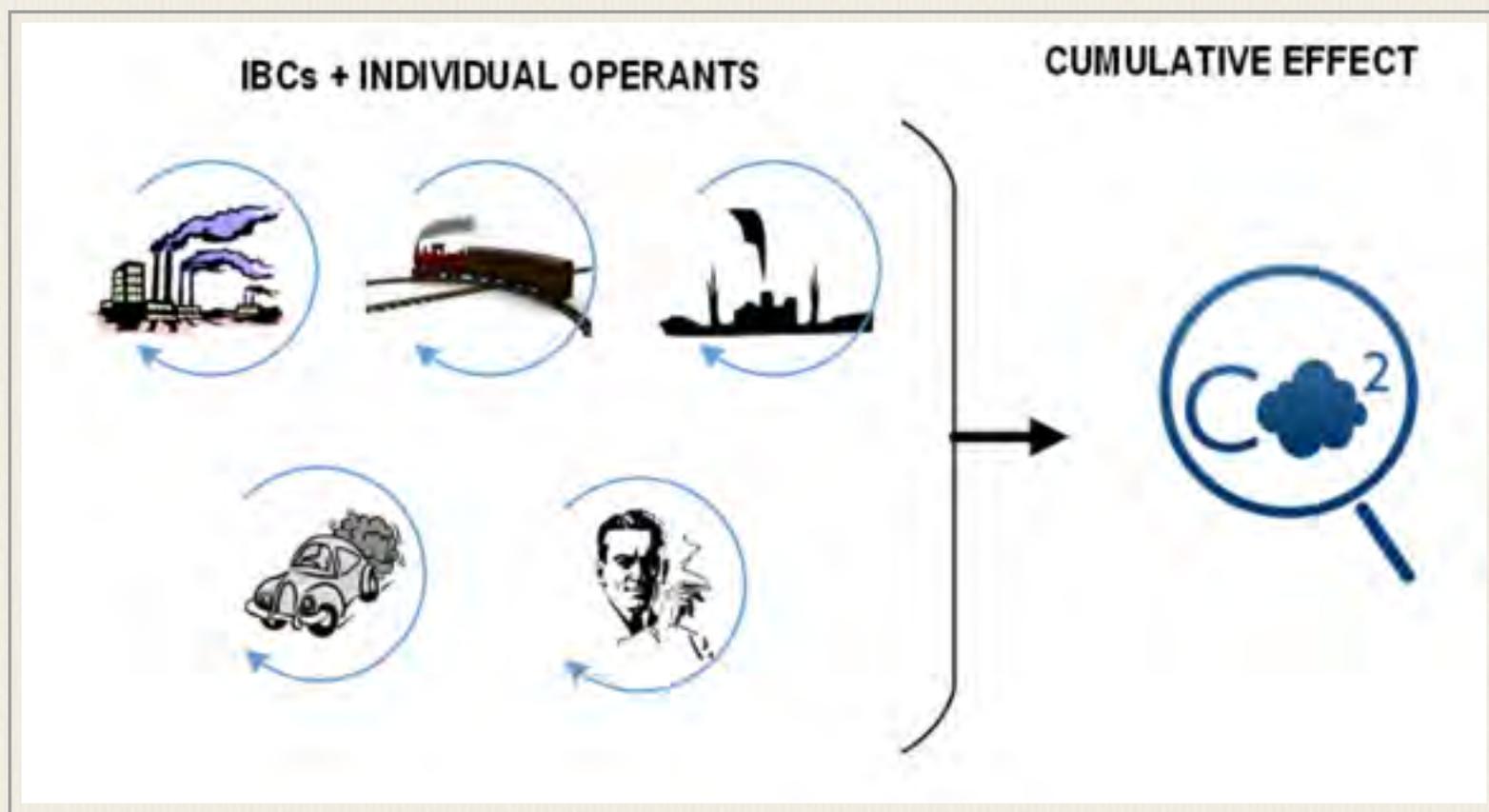


Figure 5. CO₂ as a cumulative effect of independent cultural units and operants

Participants agreed that the term macrocontingency, as defined here, is problematic for several reasons. First, the cumulative effect in a macrocontingency is not actually in a *contingent* relation with the practices (individual or organizational). That is, the cumulative effect automatically results from the practices and is not independently manipulable. This problem is analogous to scratching an itch at the operant level, and thus could be rationalized as not posing a conceptual problem.

A problem less easily dispensed with is that the effect of the scratching behavior (reducing the itch) appears to have an automatic selective function; but the cumulative effect of the individual and organizational practices of a macrocontingency has no such automatic selective function. This is for two reasons. First, even if altering the cumulative effect could function as a reinforcer for personal behavior, or a cultural selector for organizational IBCs, no individual human or organization alone can significantly alter a cumulative effect. Second, and more important, is that the sources of the cumulative effect are unrelated individual behaviors and IBCs of unrelated organizations. So they cannot function as a unit that can undergo selection.

Rather, the many recurring behaviors contributing to the cumulative effect are individually selected and/or the IBCs of many different organizations contributing to the cumulative effect are selected each by their own consequences. In a macrocontingency, then, the selection contingencies are all *within* the first term in the macrocontingency relation, and not in the relation *between* the terms in the definition. Experimental analysis of culturo-behavioral lineages in macrocontingencies was reported by Borba, Tourinho and Glenn (2014).

To alter behavior participating in macrocontingencies it is necessary to establish a connection between the individual behavior and its effect, or else it is necessary to interlock both terms (Sampaio & Andery, 2010). This is frequently done in our societies through verbal contingencies. Campaigns to “educate” or “raise awareness” of individuals in a population can work if they succeed in establishing a “link” between behavior and its cumulative effect and result in new, positive or negative, social consequences for individual behavior. Verbal descriptions of such “links” can also participate as a controlling variable over the desirable behavior. The recently observed decrease in smoking of entire populations is partially explained by such changes: the frequently announced links between smoking and disease, smoking and pollution, smoking and social cost has allowed the emergence of social frowning upon the actual smoking behavior and also for the many forms of self-control developed by smokers who quit.

Cultural Cusp

As mentioned earlier, not all interlocking behavioral contingencies function as cohesive wholes with recurring aggregate products that meet (or fail to meet) selection criteria of their environment. Interlocking contingencies are, in fact, ubiquitous in human societies, evident in the thousands of daily interactions among people who will never see each other again. Other interlocking contingencies may recur but still not constitute

cohesive wholes selected by an environment external to any reinforcers embedded in the interlocking contingencies. Examples of the latter are seen in regularly occurring interlocking contingencies shared by shoppers and a cashier at a grocery store, or by a desk employee and members of a gym, or by repetitions of a bedtime story told to a child by her father.

Most of these unique or recurring interlocking contingencies simply represent the warp and woof of societies. Sometimes, however, they coalesce uniquely in such a way as to produce an aggregate product that results in massive alterations of the behavior and maintaining contingencies constituting the fabric of a sociocultural system. Participants in the meeting suggested identifying such coalescence of interlocking contingencies as a *cultural cusp* and agreed on the following definition

Cultural cusp: The coalescence of unique and nonrecurring interlocking and/or individual behavioral contingencies that results in a product that leads to significant sociocultural change.

An example of a cultural cusp is depicted in Figure 6. The Declaration of Independence was the aggregate product of a Continental Congress, whose members were appointed by the governments of 13 British colonies on the east coast of what is now the United States. The appointments are shown in the figure as the products of recurring IBCs within each colony. These representatives debated extensively, offering a variety of reasons for remaining loyal to or declaring independence from Britain. Eventually, a draft of the Declaration was written by Thomas Jefferson and edited by the drafting committee. Its adoption was far from certain and extensive debate resulted in further changes to satisfy representatives of the slave states. The coalescence of all of these novel operants and IBCs resulted in a document signed, not without anguish and trepidation, by a majority of each colony's

representatives. The distribution of copies of the Declaration throughout the American colonies led to a host of immediate and long term changes in operant contingencies and metacontingencies of American society.

Some of the lasting cultural changes emanating from the Declaration are shown in the figure, and include the long war for independence; acquisition of western lands via the Treaty that ended the war, and increased pace in westward migration; the U.S. Constitution (which itself contained language that led in time to the U.S. Civil War); industrial growth and expanded commerce; resettlement of Indian tribes (usually without their consent) in the west, and the emergence of political parties. All of these outcomes represented massive changes in the operant and cultural contingencies for people in the new confederation. (See Wood, 1992 for description of social and economic changes attendant to American independence.) Not represented in the figure are changes in other parts of the world that the Declaration likely contributed to (e.g., French Revolution, constitutional governments in European and South American countries, etc.).

The Declaration of Independence is viewed here as a product of uniquely occurring interlocking contingencies and as a catalyst for resulting socially significant changes. A cultural cusp, then, is defined by its origin in unique and non-recurring interlocking contingencies, an ensuing result or product, and socially significant cultural changes that emanate from that product. Other uniquely occurring contingencies and metacontingencies that appear to have resulted in massive cultural changes have been described by Malott (2015); and her interest in this type of cultural phenomenon was what generated discussion that led to a name for it

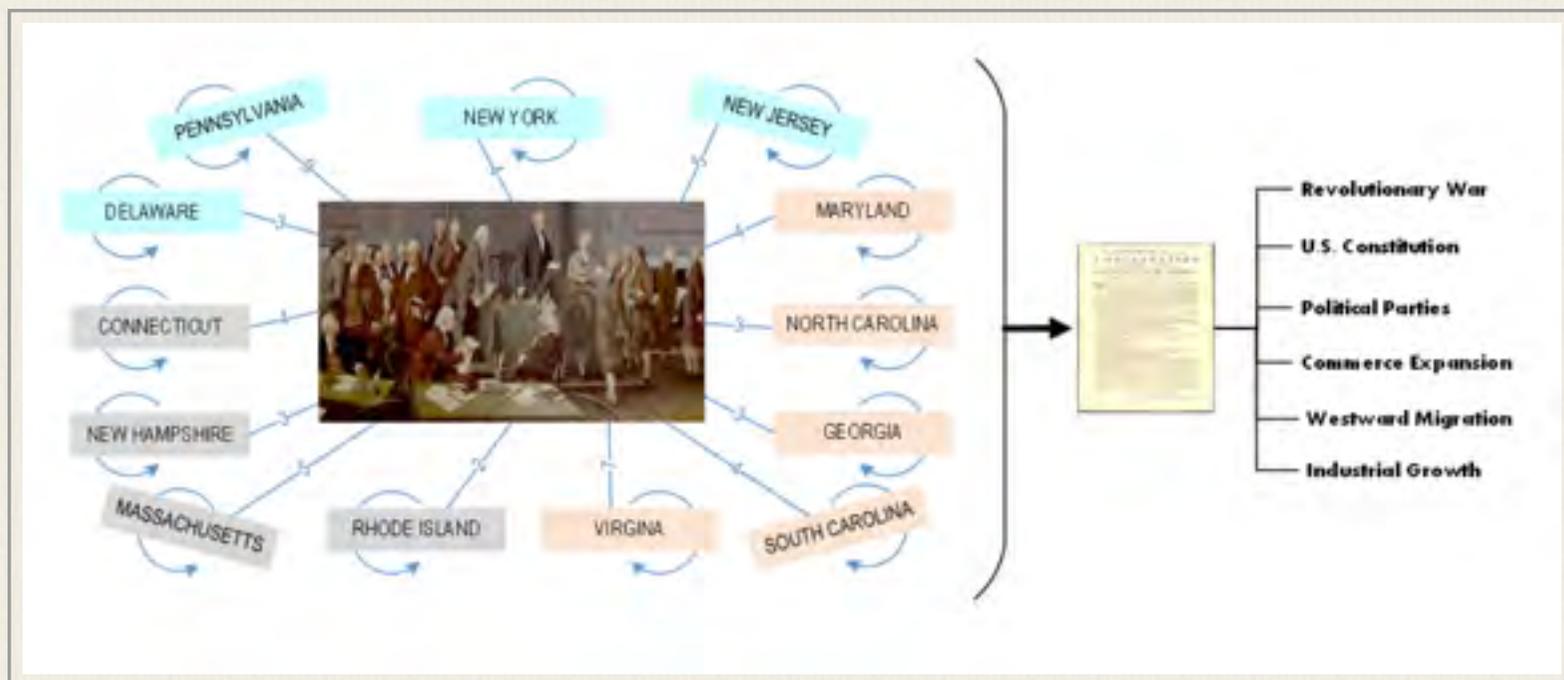


Figure 6. The Declaration of Independence as a cultural cusp resulting from the coalescence of a novel IBCs.

Distinctions of Process, Content and Procedure

One of the most vexing problems in process sciences is the conceptual interplay between the content-free terms of scientific principles or laws and the empirical content constituting the phenomena to be investigated, explained or changed. David Hull (1975) has addressed this problem in the philosophy of biology and it has also been discussed in behavior analysis (Glenn & Malagodi, 1991; Lee, 1988). In this section, our goal is to distinguish between *process* and *content* in behavioral and cultural selection and to consider the role of *procedures* as actions of scientists and practitioners that link content to process.

We begin by pointing out that none of the italicized definitions in the above sections specifies empirical particulars. The terms in the definitions refer to spatiotemporally unrestricted classes that play a role in lawful processes that apply to a great range of particulars. On the other hand, the figures, as well as other examples offered in the text, specify particulars that exemplify the kinds of phenomena involved in the processes. Participants discussed these distinctions as they apply to both operant contingencies and metacontingencies.

Process, Content and Procedure in Operant Contingencies

In a prototypical operant experiment, a rat presses a lever and food is delivered contingent on some feature of the pressing (e.g., one or more switch closures, or time between switch closures). The experiment is not, of course, “about” rats, lever presses, switch closures or food deliveries; these are simply the particulars the experimenter arranges. They are the *empirical content* the experimenter has chosen in order to learn about something else. The ‘something else’ is the *process* of operant conditioning. Although a resulting change in our rat’s behavior may provide evidence that operant conditioning has occurred, the conditioning *process* itself must be described in generic (content-free) terms, not by the particulars of empirical content.

Thus the process of operant conditioning can be described as *change over time in operants as a function of response/consequence contingencies*. Note that the terms that describe the process are content-free and spatiotemporally unrestricted, as they must be for the process to be considered “lawful” (Hull 1977/1989). The more particulars a process accounts for, the greater the generality of the principle describing the process. For this reason, basic research in any field is almost always conducted with an eye to discovering processes that account for the broadest range of empirical content. Having available some principles that describe fundamental processes, such as operant conditioning or natural selection, researchers can explore the limits of those principles as well as extend their domain.

For real-world interventionists the specifics of behavioral *content* are vitally important. After all, their goals are to alter the observable particulars causing problems: Johnny can’t read; Samantha’s head banging is injurious; children with autism do not display joint attention. Knowing something about the specific behavior/environment relations that constitute reading or joint attention is critical. Knowing the particulars of the environment that maintain Samantha’s head banging or the particulars of Johnny’s current repertoire is also important. But the world is very large, comprising

innumerable particulars, so how does the interventionist know where to start? This is where knowledge of process becomes critical. The better the interventionist understands operant conditioning and other behavioral processes, the more likely the interventionist is to identify the critical content and alter specific events to reach a desirable outcome.

But knowledge of how operant conditioning works and of the particular content important to the problem at hand is still not enough for solving the problems faced by interventionists. The interventionist must *do* something, which brings us to *procedure*.

Procedure constitutes the operations conducted by both basic researchers and interventionists in accomplishing their goals. In behavior analysis, procedures involve manipulation of the environment in relation to behavior. The basic researcher manipulates the particulars of contingencies to understand behavioral processes. Thus, content is always present in experimental research but it remains in the background — a means to an end. Conversely, the interventionist manipulates the particulars of contingencies to bring about a particular change in behavioral content. The content is front and center for interventionists while process is a means to the end. Thus process and content are the yin and yang in the circle of science³.

Process, Content and Procedure in Metacontingencies

Having discussed these terms with respect to operant contingencies, participants next turned to analogous usage in the analysis of metacontingencies. Several laboratories conducting metacontingency experiments had developed procedures designed to systematically manipulate relations between IBCs having specified AP and an independent

3. Applied research often combines the interests of basic researchers and interventionists. Although it typically begins by identifying a particular problem, experimental analyses are sometimes conducted to better understand processes contributing to the problem.

variable contingent on IBCs having that AP. In some cases, the experiments manipulated *operant* contingencies *within* the IBCs as well as the *metacontingencies between* the IBCs/AP and their external environment. The behaviors involved in the various preparations differed as did the nature of the consequences in the metacontingencies. To the extent that these experiments demonstrated selection of IBCs/AP by external consequences, they exemplified a cultural process analogous to the process of operant conditioning. To the extent that the experiments empirically distinguished between operant selection (for behavior *within* IBCs) and cultural selection (for IBCs/AP), those experiments demonstrated concurrent and sometimes conflicting selection processes at behavioral and cultural levels.

That the content of IBCs and consequences in the above mentioned experiments differed from laboratory to laboratory and from experiment to experiment is not relevant to the nature of the processes under investigation any more than it is in operant experiments. However, and also as in the case of operant contingencies, the content becomes the focus of investigation in applied work. A case in point pertains to the 7-Step Disaster Reduction Plan formulated at the 3rd World Conference on Disaster Risk Reduction (Vasconcelos, 2015). The project is overseen by a committee of delegates from 188 countries, the UN's Office of Disaster Reduction and the UN's Scientific and Advisory Group.

A complete analysis of metacontingencies, macrocontingencies and operant contingencies involved in this vast undertaking is well beyond the scope of this paper, so we will focus on one item in one of the project's targets.

The first-stated global target is to *reduce disaster mortality* between 2020 and 2030 compared to the period between 2005 and 2015. For our purposes, we will consider the kind of metacontingencies likely involved in obtaining the annual data needed to assess global progress in achieving this target. Those data are the aggregate products of recurring IBCs of various

organizations around the world and the value of each organization's data is directly related to the adequacy of the IBCs in generating those products. Perhaps it is obvious that the body making use of the collected data will benefit from specifying what is (and is not) to be included in the data contributing to the aggregate product. That is, what counts as "mortality resulting from a disaster"? For example, should a heart attack occurring during an earthquake be counted? Should starvation of people who were starving before a tsunami occurred be counted? The reliability and validity of the global data will depend on the aggregate products of the data-collecting agencies representing the same types of empirical events.

Although it would be possible to drill down even further in analysis of metacontingencies involved in global disaster risk reduction, we will instead consider what could happen to the aggregate products of the independently operating organizations involved in data collection. In brief, they become the inputs to another organization (perhaps a committee tasked to collect global data for the project). The IBCs of that organization produce the annual reports used to determine whether the targeted reduction in disaster mortality has been met. Thus, the project itself is a pyramid of IBCs ... a system in which lower level elements (lower meaning closer to empirical events being measured) generate products (data) that contribute to the performance of higher level elements (committees who make use of the data in recurring IBCs of their own). Similar pyramids of IBC lineages would be involved in other elements of the program, for example those dedicated to prevention, mitigation, preparedness, response, recovery and rehabilitation.

Returning to the distinction between cultural process and content, the foregoing is a conceptual analysis of cultural level phenomena roughly akin to the analysis of "self-control" offered by Rachlin (2000). Although the experimental basis for Rachlin's analysis is far greater than in the present case, the global importance of reducing disaster mortality would seem to make it worthwhile to point to the specific content that must be considered in meeting the goals of a huge organization. Such contingency analyses as

offered by Vasconcelos (2015) offer interventionists a road map of sorts in identifying real world events likely to be playing a role in behavioral and cultural processes.

Conclusion

Given the varying histories of the meeting participants, as well as their different interests with respect to relations between behavioral and cultural level phenomena, the culmination of the meeting in a document spelling out definitions of terms was a happy result. As the goal of the convener of the meeting was to establish a common understanding among participants as to definitions of key terms, it is hoped that those spelled out herein will be useful in that regard.

Because scientific concepts are subject to revision over time as they garner more attention and scrutiny, the authors expect to see continuing refinement and utility of the concepts discussed herein. We hope that behavior analysts interested in integrating principles of operant and cultural selection will take up the challenge of improving upon this and previous work directed toward a functional approach to the analysis of cultural level phenomena.

References

- Andery, M. A. P. A. (2011). Comportamento e cultura na perspectiva da análise do comportamento. *Perspectivas em Análise do Comportamento*, 2, 166-178.
- Andery, M. A. P. A., Micheletto, N., Sérgio, T. M. (2005). A análise de fenômenos sociais: esboçando uma proposta para a identificação de contingências entrelaçadas e metacontingências. *Revista Brasileira de Análise do Comportamento*, 1(2), 49-165.
- Andery, M. A. P. A., Sérgio, T. M. (2003). Metacontingencias y dialéctica: son incompatibles? *Revista Latinoamericana de Psicología*, 35(3), 273-280.
- Azrin, N. H., & Lindsley, O. R. (1956). The reinforcement of cooperation between children. *Journal of Abnormal and Social Psychology*, 52, 100-102. doi: 10.1037/h0042490
- Baia, F. H., Azevedo, F. F., Segantini, S. M., Macedo, R. P., & Vasconcelos, L. A. (2014). Effects of different magnitudes of individual consequences and cultural consequences on culturant's selection. *Acta Comportamentalia*, 23(3), 257-272.
- Borba, A., Silva, B. R., Cabral, P. A. A., Souza, L. B., Leite, F. L., & Tourinho, E. Z. (2014). Effects of exposure to macrocontingencies in isolation and social situations in the production of ethical self-control. *Behavior and Social Issues*, 23, 5-19. doi: 10.5210/bsi.v23i0.4237
- Borba, A., Tourinho, E. Z., & Glenn, S. S. (2014). Establishing the macrobehavior of ethical self-control in an arrangement of macrocontingencies in two microcultures. *Behavior and Social Issues*, 23, 68-86. doi: 10.5210/bsi.v.23i0.5354
- Cavalcanti, D. E., Leite, F. L., & Tourinho, E. Z. (2014). Seleção de Práticas culturais complexas: Avaliação experimental de um análogo do procedimento de aproximação sucessiva. *Psicologia e Saber Social*, 3, 2-21.

- Chaloupka, F. J., Stralf, S., Leon, M. E. (2010). Effectiveness of tax and price policies in contingent cultural events. *Tobacco Control, 20*(3), 235-238. doi: 10.1136/tc.2010.039982
- Costa, D. C., Nogueira, C. P. V., & Vasconcelos, L. A. (2012). Effects of communication and cultural consequences on choices combinations in INPDG with four participants. *Revista Latinoamericana de Psicologia, 44*, 121-131. ISSN 0120-05534
- de Toledo, T. F. N., Benvenuti, M. F. L., Sampaio, A. A. S., Marques, N. S., Cabral, P. A. A., Araujo, L. A., Machado, L. R., & Moreira, L. R. (2015). Free culturant: a software for the experimental study of behavior and cultural selection. *Psychology and Neuroscience, 8*, 366-384. doi: 10.1037/pne0000016
- Glenn, S. S. (2003). Operant contingencies and the origin of cultures (pp. 223-242). In Lattal, K. A. and Chase, P. N. (Eds.), *Behavior theory and philosophy*. New York: Kluwer Academic/Plenum.
- Glenn, S. S. (2004). Individual behavior, culture, and social change. *The Behavior Analyst, 27*, 133-151. PMID: PMC2755396
- Glenn, S. S., & Malagodi, E. F. (1991). Process and content in behavioral and cultural phenomena. *Behavior and Social Issues, 1*(2), 1-14. doi: 10.5210/bsi.v1i2.163
- Hanks, A. S., Just, D. R., Smith, L. E., & Wansink, B. (2012). Healthy convenience: nudging students toward healthier choices in the lunchroom. *Journal of Public Health, 34*(3), 370-376. doi:10.1093/pubmed/fds003
- Houmanfar, R. A., Rodrigues, N. J., & Ward, T. A., (2010). Emergence & metacontingency: Points of contact and departure. *Behavior and Social Issues, 19*, 78-103. doi:10.5210/bsi.v19i0.3065

- Houmanfar, R., Alavosius, M. P., Morford, Z. H., Reimer, D., & Herbst, S. A. (2015). Functions of organizational leaders in cultural change: Financial and social well-being. *Journal of Organizational Behavior Management, 35*, 4-27. doi: 10.1080/01608061.2015.1035827
- Hull, D. L. (1975). Central subjects and historical narratives. *History and Theory, 14*, 253-274. Reprinted in Hull, D. L. (1989). *The metaphysics of evolution* (pp. 181-204). New York: State University of New York.
- Hull, D. (1977). The ontological status of species as evolutionary units. In R. Butts and J. Hintikka (Eds). *Foundational Problems in Special Sciences* (pp. 91-102). Dordrecht-Holland.: D. Reidel. Reprinted in Hull, D. L. (1989). *The metaphysics of evolution* (pp. 79-88). New York: State University of New York.
- Hunter, C. S. (2012). Analyzing behavioral and cultural selection contingencies. *Revista Lationomerica de Psicologia, 44*, 43-54. ISSN 0 1 2 0 - 0 5 3 4
http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0120-05342012000100005&lng=en&nrm=iso
- Hu, T. W., & Mao, Z. (2002). Effects of cigarette tax on cigarette consumption and the Chinese economy. *Tobacco Control, 11*, 205-108. doi:10.1136/tc.11.2.105.
- Kallbekken, S., & Saelen, H. (2013). 'Nudging' hotel guests to reduce food waste as a win-win environmental measure. *Economics Letters, 119*, 325-327. doi: 10.1016/j.econlet.2013.03.019
- Keller, E. F., & Lloyd, E. A. (1992). *Keywords in evolutionary biology*. Cambridge, MA and London, England: Harvard University Press.
- Lee, V. L. (1988). *Beyond behaviorism*. Hillsdale, NJ: Lawrence Erlbaum.

- Lightwood, J. M., Dinno, A., & Glantz, S. A. (2008). Effect of the California Tobacco Control Program on Personal Health Care Expenditures. *PLOS|Medicine*. doi: 10.1371/journal.pmed.0050178.
- Machado, V. L. S., & Todorov, J. C. (2008). A travessia na faixa de pedestre em Brasília (DF/Brasil): exemplo de uma intervenção cultural. [Walking the crosswalk in Brasília (DF/Brasil): an example of cultural intervention]. *Revista Brasileira de Análise do Comportamento / Brazilian Journal of Behavior Analysis*, 4(2), 191-204.
- Malott, M. E. (2003). *Paradox of organizational change: Engineering organizations with behavioral systems analysis*. Reno, NV: Context Press.
- Malott, M. E., & Glenn, S. S. (2006). Targets of intervention in cultural and behavioral change. *Behavior and Social Issues*, 15(1), 31–56. doi: 10.5210/bsi.v15i1.344
- Malott, M. E. (2015). What studying leadership can teach us about the science of behavior. *The Behavior Analyst*, 39(1), 1-28. doi:10.1007/s40614-015-0049-y
- Marques, N. S., & Tourinho, E. Z. (2015). The selection of cultural units by non-contingent cultural events. *Behavior and Social Issues*, 24, 126-140. doi:10.5210/bsi.v.22i0.4283
- Naves, A. R. C., & Vasconcelos, L. A. (2008). The study of family: Contingencies and metacontingencies. *Brazilian Journal of Behavior Analysis*, 4(1), 13-25. ISSN 18078338
- Ortu, D., Becker, A., Woelz, T.A.R., & Glenn, S. S. (2012). An iterated four-player prisoner's dilemma game with an external selecting agent: A metacontingency experiment. *Revista Latinoamericana de Psicologia*, 44(1), 111-120. ISSN 0120-0534.

- Pavanelli, S., Leite, F. L., & Tourinho, E. Z. (2014). A “modelagem” de contingências comportamentais entrelaçadas complexas. *Acta Comportamentalia*, 22(4), 425-440.
- Rachlin, H. (2000). *The science of self control*. Cambridge, MA: Harvard University Press.
- Saconatto, A. T., & Andery, M.A.P.A. (2013). Seleção por metacontingências: Um análogo experimental de reforçamento negativo. *Interação em Psicologia*, 17(1), 1-10. 10.5380/psi.v17i1.26779
- Sampaio, A. A. S., & Andery, M. A. P. A. (2010). Comportamento social, produção agregada e prática cultural: Uma análise comportamental de fenômenos sociais. *Psicologia: Teoria e Pesquisa*, 26(1), 183-192. doi: 10.1590/s0102-37722010000100020
- Sandaker, I. (2009). A selectionist perspective on systemic and behavioral change in organizations. *Journal of Organizational Behavior Management*, 29(3), 276-293. doi:10.1080/01608060903092128
- Sandaker, I. (2010). Some comments on "emergence and metacontingency." *Behavior and Social Issues*, 19, 90-93. doi: 10.5210/bsi.v19i0.3222
- Skinner, B. F. (1938). *The behavior of organisms*. New York: Appleton-Century Crofts.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century Crofts. Republished by B. F. Skinner Foundation.
- Skinner, B. F. (1981). Selection by consequences. *Science*, 213, 501-04. doi: 10.1126/science.7244649
- Smith, G. S., Housmanfar, R., & Louis, S. J. (2011). The participatory role of verbal behavior in an elaborated account of metacontingency: From theory to investigation. *Behavior and Social Issues*, 20, 122 – 146. doi: 10.5210/bsi.v20i0.3662

- Soares, P. F. R., Cabral, P. A. A., Leite, F. L., & Tourinho, E. Z. (2012). Efeitos de consequências culturais sobre a seleção e manutenção de duas práticas culturais alternadas. *Revista Brasileira de Análise do Comportamento*, *8*, 37-46.
- Tadaiesky, L. T., & Tourinho, E. Z. (2012). Effects of support consequences and cultural consequences on the selection of interlocking behavioral contingencies. *Revista Latinoamericana de Psicología*, *44*, 133-147. <http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0120-05342012000100013&lng=en&nrm=iso>
- Todorov, J. C. (2009). Behavioral analysis of non-experimental data associated with cultural practices. *Behavior and Social Issues*, *18*, 10-14. doi:10.5210/bsi.v18i1.2756
- Todorov, J. C. (2013). Conservation and transformation of cultural practices through contingencies and metacontingencies. *Behavior and Social Issues*, *22*, 64-73. doi: 10.5210/bsi.v.22i0.481264
- Todorov, J. C., Benvenuti, M. F., Glenn, S. S., Malott, M. E., Houmanfar, R., Andery, M. A., deRose, J. C., Luke, M., Sandaker, I., Tourinho, E. Z., & Vasconcelos, L. A. (2015, August). Cultural analysis from a behavioral perspective. *Inside Behavior Analysis*, *7*(2), 2-4.
- Todorov, J. C., & Vasconcelos, I. (2015). Experimental analysis of the behavior of persons in groups: Selection of an aggregate product in a metacontingency. *Behavior and Social Issues*, *24*, 111-125. doi: 10.5210/bsi.v24i0.5424
- Tourinho, E. Z. (2013). Cultural consequences and interlocking behavioral contingencies: Selection at the cultural level. *Behavior and Philosophy*, *41*, 60-69. <http://www.behavior.org/resource.php?id=912>
- Ulman, J. D. (2006). Macrocontingencies and institutions: A behaviorological analysis. *Behavior and Social Issues*, *15*, 95-100. doi: 10.5210/bsi.v15i1.348

- Vasconcelos, L. A. (March 2015). *The culture in disaster risk reduction ecosystems: Evolvement of operants of individuals and the IBCs of organizational entities*. Paper presented at Think Tank on Social Contingencies: Individual, Culture and Society–Regional Meeting of the Brazilian Society of Psychology. University of São Paulo, São Paulo.
- Velasco, S. M., Benvenuti, M. F. L., & Tomanari, G. Y. (2012). Metacontingencies, experimentation and nonhumans: searching for conceptual and methodological advances. *Revista Latinoamericana de Psicologia*, 44, 25-34.
<<http://publicaciones.konradlorenz.edu.co/index.php/rlpsi/article/view/926/640>>
- Vichi, C., Andery, M.A.P., & Glenn, S. S. (2009). A metacontingency experiment: The effect of contingent consequences on patterns of interlocking contingencies of reinforcement. *Behavior and Social Issues*, 18, 41- 57. 10.5210/bsi.v18i1.2292
- Vieira, C. M., Andery, M.A.P.A., Pessôa, C.V. B. B. (under review). *Condições antecedentes participam de metacontingências?*
- Wood, G. S. (1992). *The radicalism of the American Revolution*. New York: A. A. Knopf.



Analyzing domestic violence behaviors in their contexts: violence as a continuation of social strategies by other means

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ABSTRACT: Behaviors occurring in situations of domestic violence were collated from varied sources and analyzed in several ways, using a sort of backwards engineering of contexts. The many behaviors found in domestic violence (Table 1) suggested five common functional patterns which allow a better understanding of the context (Table 2): direct physical actions and threats against the woman; manipulating the context to control the woman's behavior; strategies to keep secrets within the relationships; strategies to monitor or find out about the woman and her activities and social contacts; and verbal constructions to threaten or to persuade the woman of the man's view for the world. In Table 3 we explored how the functional groupings from Table 2 might be used strategically by the men against the women, while Table 4 explored how these patterns of behaviors might start out innocuously but over time become more violent. Training women to recognize these functions rather than topographical

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behaviors could be useful for interventions. Finally, it was argued that the functional strategies of the men which appear in our analyses can only succeed if broader social and political contexts are in place. This means that to analyze the behaviors of domestic violence it is necessary to use broader contexts, such as those found in the political and feminist analyses—the analysis of domestic violence must involve more than just the two individuals behaving. Even what are considered “private” or “intimate” contingent relations within social relationships are only made possible by the patriarchal and capitalist bases of modernity. It is demonstrated how these can be included in behavioral analyses.

Keywords: domestic violence; contextual analysis; social relationship strategies; feminism and domestic violence; development of domestic violence; societal effects on behavior

Domestic violence is prevalent in most societies around the world, and ranges from bullying and intimidation to severe physical violence and murder, leading to many negative life and health consequences for women and for families (Bloodworth, 2015; Fischbach & Herbert, 1997; Hanmer, 2000; Krantz & Vung, 2009; MacLeod, 1980; Myers, 1995; Valor-Segura, Espósito & Moya, 2011; Wendt & Zannettino, 2015; Yllo, 2005). While there are other forms of violence in close relationships (e. g., Bagshaw, Wendt, Zannettino & Adams, 2013), we focus here only on men against women in relationships because it is by far the most ubiquitous, and because other forms will need more specific analyses. We will also focus only on western societies for the latter reason.

As an indication of the magnitude and seriousness of the problem, we can contrast two countries with very different populations. With a large population (200 million), Brazil has the fifth highest position worldwide (out of 83 countries) for femicide. It is estimated that there are on average 5,664 deaths of women by violent causes each year: 472 each month, 15.52 each

day, or one every hour and a half (Garcia, Santana de Freitas, da Silva & Höfelmann, 2016). Even more telling for context, however, are the more detailed statistics: 29% of feminicides occurred in home, 31% in public and 25% in hospital or other health facility; more than half of deaths (54%) were women of 20 to 39 years; and 61% of deaths were black women (Garcia, Santana de Freitas, da Silva & Höfelmann, 2016).

Further, between 2003 and 2013 the incidence for white women in Brazil dropped 11.9% while the rate for black women rose 19.5% (Waiselfisz, 2015). The drop of white women deaths could be explained in part by the new law for domestic violence which was implemented in 2005. However, this law had a better impact on the white women's rate because they have more access to information and live in places where the public services are available and more effective. This does show clearly, though, that in Brazil there is a relationship between gendered violence and the broader economic and race contexts.

Comparing this to the much smaller population in Australia (24 million), the police there report that they deal with 657 domestic violence callouts on average every day of the year—about one every two minutes. In 2014, 84 women were killed in domestic violence, and 80 in 2015 (Counting Dead Women, Australia Researchers, from *Destroy the Joint* Facebook site, accessed October 2015). What we can learn from comparing these two countries is that the problem is more than just the size of population, since per head of population the statistics in Brazil are much worse. Other factors clearly are involved.

Despite being such an enormous issue, not enough is known about the contexts in which domestic violence behaviors actually occur and how these might emerge from everyday social relationships and strategies. An issue is that it is not only the violence *per se* that is abhorrent in such relationships, it is also the generally abusive and controlling nature of the relationships. Even when physical violence is not occurring, the woman's behavior, talk and

thinking are controlled by the man. So learning about the social strategies utilized by the man is of wider importance for understanding and changing such relationships, beyond only those involving direct physical violence. How the broader strategies might function is therefore of great importance for analysis and intervention.

Moreover, it seems clear from the country comparison earlier that the problem goes beyond just psychology and other individualistic approaches, because there are clearly aspects of social, economic and political contexts that likely lead to the occurrence of such violence. But it is unclear how these wider contexts get involved in the concrete behaviors of individuals. How can we include these broader social contexts in the individualist analyses of behavior analysis?

The two main questions for this paper, therefore, are (1) how to analyze the contexts in which domestic violence (DV) arises within relationships, and (2) how do the social, political and cultural structures influence individual behavior and how we might include these in a behavior analysis.

The main focus in this paper is to make some tentative contextual analyses of the social relationship strategies used by men who use domestic violence behaviors. The analyses will utilize already published materials to identify some general strategies, and their contexts or contingencies, which might prove useful for interventions. Rather than explaining these in terms of person-centered or individualistic theories, we will look at the domestic and wider community contexts, which will include social relationships, economic relationships, opportunity contexts, and cultural contexts (Guerin, 2004, 2016), and the possible pre-cursor behaviors for these strategies. Finally, we wish to demonstrate some ways that a broader contextual analysis might show how patriarchy and the structures of society actually enter into the 'private' world of two individuals in a relationship.

It is important to note that this is not an empirical study in the sense that no new data are presented. Rather we are using other people's observations

about the behavior of domestic violence perpetrators and what occurs in typically reported social interactions. This is also not a theory, and there is no attempt to provide a grand vision of how all domestic violence occurs and what causes it. In fact, this would be contrary to the goal here. The goal is to assemble examples of what we know from observations of all types and see if there are useful patterns in their contexts which might guide future research and future treatments or interventions for social change. It is more like “backwards engineering” in which we observe the final product and then work backwards to locate possible contexts from which those products arose, to try to find functional patterns or ideas that will be useful guides for future thought and action.

The Behavioral and Contextual Analyses of Social Issues

This paper makes use of one version of a contextual analysis which is based in behavior analysis or behavior therapy but which tries to make a more thorough analysis of the social and cultural contexts in which behaviors arise (Guerin, 2004, 2016). What is said is not exclusively reliant on this framework, however, and we welcome other framings (e. g., Glenn, Malott, Andery, Benvenuti, Houmanfar, Sandaker, Todorov, Tourinho & Vasconcelos, 2016; Houmanfar & Rodrigues, 2006).

For the framework being used here, the main analysis is to look for the resources people spend in an effort to gain (consequences), to identify the people and relationships through which those resources are obtained (or prevented), and the social strategies for how these work in reality (Guerin, 2016). Other useful contexts to explore initially are often the difference between what is being kept secret and what is being made public, and the extent to which people monitor others to find out about their behaviors. There are also many contexts of specific interest such as social relationships, economics, cultural patterns, historical contexts, and the opportunities that have been and are available to the people.

All these goals are more like guidelines rather than actual rules, and real observations should always direct any analysis. These guidelines are there to guide the observations and understanding of what people do, suggest new observations to make, and suggest how we might find out more through future research and intervention. In that sense, the specific analyses in this paper are not crucial to what might be found and suggested, since the analysis here only generates possibilities (Guerin, 2016) which need checking in any specific instances, and which could be accounted for in other ways.

Analyzing the Strategic Behaviors for Domestic Violence Initial list of behaviors and strategies

To analyze domestic violence behaviors and strategies in this way, we first started with the broad model developed as the Duluth Model, with additional materials from other papers and books (Factora-Borchers, 2014; McMillan, 2008; Paymar, 2000; Pence & Paymar, 1993; Sasson & Paul, 2014). The aim was to list some concrete behaviors commonly observed in domestic violence as starting points for analyzing the contextual strategies or contingencies which might be involved. The aim was not to generate an exhaustive list or to prove a model or theory. These behaviors were meant as a beginning to which more could be added and perhaps lead to the observation and documentation of some less common strategies by future researchers and practitioners.

The Duluth Model originated from a grass-roots community initiative to reduce domestic violence (Paymar, 2000; Pence & Paymar, 1993). There has been some criticism of this model (Dutton & Corvo, 2006), but the originators have responded to this. In any case, we are using this model only to generate realistic examples of behaviors, not to decide whether it is the ‘correct’ model of domestic violence.

In the Duluth model, there are several broad categories of behaviors commonly used by abusive men: economic abuse, coercion and threats, intimidation, emotional abuse, isolation, minimizing, denying and blaming, children, and male privilege. It therefore covered a broad base of contexts that seemed to be relevant to domestic violence. To these we have added some other categories from other literatures, such as the selection of suitable partners for abuse (McMillan, 2008) and the use of positive or reciprocal behaviors to control a person. Together, these cover the main analysis guides given earlier.

More useful than the broad categories, however, is that each of these Duluth categories has more specific behaviors, which are listed in the first column of Table 1. For example, the category of “economic abuse” has more specific example behaviors such as: preventing her from getting or keeping a job; making her ask for money; giving her an allowance; taking her money; and not letting her know about or have access to family income. Again, these are not meant to be exhaustive or to cover all aspects.

Possible strategic social contexts for domestic violence behaviors

The second part of the analysis was to suggest some possible (Guerin, 2016) contexts or contingencies in which these behaviors might occur. These are not meant as *evidence* for those relationships since that can only come later through research and more systematic documentation of real cases. We are merely trying to identify some possibilities for the complex relations within which these strategies or behaviors might emerge. This can then guide thinking and observations which can lead to interventions.

To do this analysis we have listed in Table 1, alongside the more specific behaviors, some suggestions as to the broad contextual or contingent functional relations. Many are similar possible functions but involve different behaviors, strategies or outcomes in our examples. These are important since

there will be many other very specific or idiosyncratic strategies involving the same functioning that might be identified in practice but not listed as the ‘common’ forms in the materials we have collected and utilized. The idea behind this is that there will never be an exhaustive list of abusive behaviors and strategies, and men will keep trying new ways, so it might be more useful in practice to teach women to recognize the *strategic functioning* of what is happening rather than specific, common, current forms of behavior. This is something for which behavioral and contextual analyses might help and we will come back to initial suggestions in a later Table.

To spell out an example of the strategic properties, the first specific social strategy listed under “economic abuse” is that the man prevents the woman from getting or keeping a job. There could be many possible strategies and outcomes in doing this, so only three broad strategies are listed as possibles in the right-hand column but we can also expand on the strategic outcomes that might eventuate from using such strategies. First, keeping her from employment has a contingent outcome such that she cannot get money or other resources, including social support, independently of the man. This is likely to lead to greater chances for the man to control the woman’s behaviors. Second, preventing employment means she is more frequently present in the home so he has a better chance of monitoring all of her behaviors in that way. A third suggested possibility is that this strategy prevents social contact from any of the woman’s work colleagues, a frequent source of independent social support, and so also leads to potential greater control for the man.

Table 1. Examples of domestic violence behaviors from the literature and some social properties of their context

Examples of abusive behaviors from numerous literatures	Social properties for contextual analysis
<i>Using economic abuse</i>	
Preventing her from getting or keeping a job	Prevents her access to economic resources Makes a context in which she is more easily monitored Prevents social contact
Making her ask for money	Increases monitoring of her resources, and thereby control Gains control of her resources for use in other contingent relations
Giving her an allowance	Increases monitoring of her resources, and thereby control Gains control of her resources for use in other contingent relations
Taking her money	Gains control of her resources for use in other contingent relations Prevents her access to economic resources
Not letting her know about or have access to family income	Keeps economic consequences secret Gains control of her resources for use in other contingent relations
<i>Using coercion and threats</i>	
Making and/or carrying out threats to do something to hurt her, or expose secrets, spread rumors	Verbally threatens punishing events from which escape or avoidance is likely to be preferred option Sometimes contingent on specific behaviors
Threatening to leave her, to commit suicide, to report her to welfare	Verbally threatens punishing events from which escape or avoidance is likely to be preferred option
Making her drop charges	Prevents actions she might take to end or change the relationship
Making her do illegal things	Controls her to do actions that are required to be secret Revealing the secret is then strategized as a new verbally threatening punishing event
<i>Using intimidation</i>	
Making her afraid by using looks, actions, gestures, yelling or swearing	Acts out events from which escape or avoidance is likely to be preferred option
Smashing things	Acts out events from which escape or avoidance is likely to be preferred option
Destroying her property	Acts out events from which escape or avoidance is likely to be preferred option Prevents her access to resources Allows further strategies to control how she replaces the items
Abusing pets	Acts out events from which escape or avoidance is likely to be preferred option
Displaying weapons	Acts out events from which escape or avoidance is likely to be preferred option

Table 1.

<i>Using emotional abuse</i>	
Putting her down	Changes the way she thinks and how she talks to others Escaping or avoiding these verbal constructions is contingent on other behaviors
Making her feel bad about herself	Changes the way she thinks and how she talks to others Escaping or avoiding these verbal constructions is contingent on other behaviors
Calling her names	Changes the way she thinks and how she talks to others Escaping or avoiding these verbal constructions is contingent on other behaviors
Making her think she's crazy ("gaslighting")	Changes the way she thinks and how she talks to others Changes the way she thinks and talks about herself to others
Playing mind games	Changes the way she thinks and how she talks to others Escaping or avoiding these verbal constructions is contingent on other behaviors
Humiliating her, using online communities to humiliate, embarrass in public	Changes the way she thinks and how she talks to others Escaping or avoiding these verbal constructions is contingent on other behaviors
Making her feel guilty	Changes the way she thinks and how she talks to others Escaping or avoiding these verbal constructions is contingent on other behaviors
<i>Using isolation</i>	
Controlling what she does, who she sees and talks to, what she reads, where she goes	All her the major contexts (resources and social relationships) of life contingent on his behaviors Can arrange contexts in which monitoring is made easier Can control her learning of verbal constructions from other people and books
Limiting her outside involvement	All her the major contexts (resources and social relationships) of life contingent on his behaviors Can arrange contexts in which monitoring is made easier
Using jealousy to justify actions	Changes the way she thinks and how she talks to others Escaping or avoiding these verbal constructions is contingent on other behaviors Controls the major contexts (resources and social relationships) of life Can arrange contexts in which monitoring is made easier
<i>Minimizing, denying and blaming</i>	
Making light of the abuse and not taking her concerns about it seriously	Using verbal constructions controls how outcomes follow from her verbal constructions
Saying the abuse didn't happen	Changes the way she thinks and how she talks to others Using verbal constructions to change the way she thinks and talks about herself to others
Shifting responsibility for abusive behavior	Using verbal constructions controls how outcomes follow from her verbal constructions
Saying she caused it, blaming her for abuse	Using verbal constructions controls how outcomes follow from her verbal constructions

Analysing domestic violence behaviors in their contexts: violence as a continuation of social strategies by other means

Table 1. (end)

<i>Using children</i>	
Making her feel guilty about the children	Verbally manipulating false contexts (guilt) makes escape or avoidance likely to be preferred option Escaping or avoiding these verbal constructions is contingent on other behaviors
Using the children to relay messages	Escapes secrecy and isolation by relaying verbal constructions Uses a local context to continue strategies even when restrictions are in place
Using visitation to harass her	Uses a local context to continue strategies even when restrictions are in place
Taking away the children, or threatening to take them away	Gains control of her resources for use in other contingent relations Verbally threatens punishing events from which escape or avoidance is likely to be preferred option Sometimes contingent on specific behaviors
<i>Using societal male privilege</i>	
Treating her like a servant	Verbally uses cultural and other historical contexts to impose strategies to control contexts
Making all the big decisions	Verbally uses cultural and other historical contexts to impose strategies to control contexts Manipulates contexts by decision making to control her actions and outcomes
Acting like the “master of the castle”	Verbally uses cultural and other historical contexts to impose strategies to control contexts Manipulates contexts by decision making to control her actions and outcomes
Being the one to define men’s and women’s roles	Verbally uses cultural and other historical contexts to impose strategies to control contexts Manipulates contexts by decision making to control her actions and outcomes
<i>Using positive behaviors to gain control</i>	Uses regular positives to stop the woman exiting after negatives Uses positive verbal behaviors for the same reason—to justify or continue the bad abuse
<i>Selection of partners as being suitable for abuse</i>	
	Prepares context by careful selection of persons judged to be susceptible to all the other strategies

To expand on another example, under “using intimidation” is listed “abusing pets.” In terms of abusive behavior towards the spouse, the possible

strategic functioning here could be that the female will do things that the man commands in order to stop either the present abuse of the pets or else him demonstrating the violent behavior (on the pet) which he will use on her if she does not do what he orders. These are strategic examples in which the woman behaves as he wishes to escape or avoid his brutality on pets or on her, having witnessed him engaging or threatening these activities.

As a final example of a different sort, under “using emotional abuse” there is “putting her down.” Several strategic outcomes could arise from this for the man. He uses verbal constructions to change the way she thinks about herself and how she talks to other people, and verbal behavior has an important property that he does not need to be present for it to affect her future behavior. Many of the other strategies which can be established verbally can also then work over a longer period and in his absence.

There is a second possible strategic function of “putting her down.” While he might not be effective in establishing that she believes what he says about her, there might still be two other important outcomes based on escape or avoidance (as seen above). First, she will learn that certain of her actions will engage his abuse so while not persuaded by his verbal constructions she will still act “correctly” (as if she believes them), to avoid what he says will be the consequences. Second, the actions of “putting her down” are likely to be highly aversive so she will likely avoid any behavior on her part that might trigger another session of “putting her down.”

From Table 1, therefore, we can see that the many more detailed abusive actions can appear in a variety of possible functional social strategies on the man’s part, which need to be identified in practice through observation of cases rather than any exhaustive list. There is repetition and patterning in these, however, which we will pick up on in the next section.

Functional analysis of domestic violence behaviors and strategies

The third part of the analysis we can now make is to tentatively group the various *functions* in Table 1 rather than group the behaviors. This is done to help work with the multitude of specific strategies and functions, and is not aimed at making a model or theory to prove. So instead of just considering the observed actions alone, or attributing them to individual or internal causes as is often done in psychology, we can begin to explore the wider strategic contexts in which they might be being used. Some of these turn out to be possible variations on a single strategic maneuver and, functionally, they might be dealt with together as part of interventions to prevent the violence. These are only tentative possibilities, it must be remembered, and so further research or therapy trials are needed to sort through them further, and it should be expected that any real cases will have other complexities involved.

One version of this is shown in Table 2, but other ways are possible and are worth pursuing. The way we have done this here is to group the behaviors and outcomes under five broad functional categories: direct actions; manipulating contexts or setting events for actions; strategies of secrecy; strategies of monitoring; and verbal construction strategies. Some functions appear in more than one grouping since they can have multiple outcomes from similar actions.

“Direct actions” involve the man intervening directly on the woman or her immediate resources to change or control her behavior. These can be intimidating actions from which the woman can only escape by doing the required responses, or they can be positive actions which keep some control over the woman even when there is abuse. For example, one survivor of abuse from her father wrote: “My feelings about my father were complicated—at some point I had loved him. After all, he was my father, and he wasn’t violent 100 percent of the time—more like 80 percent. But that 20 percent mattered” (Swadhin, 2014, p. 97).

The second grouping is important because these behaviors are often difficult to recognize in practice. Rather than directly acting on the woman or her resources, the behaviors in this category do that indirectly by changing or re-organizing the *access* to resources or *the contexts which bring about access* to resources (Guerin, 2016). These are also key behaviors which can start out innocently and even be welcomed by the woman, but end up as part of the abusive context. For example, early in a relationship one of the couple might do something with another person and the partner displays some jealous behaviors. This can appear cute, and even re-assuring for the relationship—suggesting that they care—but it can establish or reinforce this strategy. Later the jealousy from the beginning of the relationship can grow stronger and more entrenched and be more problematic, restrictive and abusive. As we will see later, this is not the fault of the woman for allowing a little jealousy, since society as a whole, and patriarchy in particular, constructs and facilitates such patterns.

Strategies of secrecy and monitoring often work together—to restrict her access to outside resources and then keep monitoring whatever she does. Meanwhile, the abusive behaviors must also be kept secret. Once this is all entrenched, keeping secrets can itself become a resource for use in other contingent relations (Guerin 2016). For example, getting her to perform illegal acts, however this is done, will then be kept secret. This will increase the likelihood of her further compliance if he makes compliance contingent upon his not revealing such information.

Finally, a lot of the strategies involve verbal relations rather than direct action, allowing the many special properties of language to be utilized (Guerin, 1992, 2004, 2016, 2017). The control for this comes socially through the other means of control, but what is then specified can be completely imaginary but still have real effects since they are social consequences and not consequences from what was being talked about. Interventions therefore need to target the *social* sources of the verbal control. It is not enough just to change the words used without tackling the social

power relations which allow the words to have their effects, and this is likely to be structured through already existing patriarchal and other societal structures.

Table 2. Putting the social properties from Table 1 analysis into functional groupings of context

Direct Actions

Acting out events from which escape or avoidance is likely to be preferred option

Destroying her property allows further strategies to control how she replaces the items Destroying her property prevents her access to resources

Gain control of her resources for use in other contingent relations

Preventing her access to economic resources

Using regular positives to stop the person exiting after negatives

Manipulating Contexts or Setting Events for Actions

Arranging contexts in which monitoring is made easier

Controlling her learning of verbal constructions from other people and books

Controlling the major contexts (resources and social relationships) of life

Gain control of her resources for use in other contingent relations

Making a context in which she is more easily monitored

Manipulating contexts by decision making to control her actions and outcomes

Preparing context by careful selection of persons judged susceptible to other strategies

Preventing actions she might take to end or change the relationship

Preventing her access to economic resources

Preventing social contact

Using a local context to continue strategies even when restrictions are in place

Arranging contexts in which monitoring is made easier

Using verbal constructions to control the major contexts (resources and social relationships) of life

Strategies of Secrecy

Controlling her to do actions that are required to be secret

Escaping secrecy and isolation by relaying verbal constructions

Keeping economic consequences secret

Preventing actions she might take to end or change the relationship

Preventing social contact

Revealing the secret can be then strategized as a new verbally threatening punishing event

Strategies of Monitoring

Destroying her property also allows further strategies to control how she replaces the items

Increase monitoring of her resources, and thereby control

Making a context in which she is more easily monitored

Arranging contexts in which monitoring is made easier

Verbal Construction Strategies

Controlling her learning of verbal constructions from other people and books

Escaping or avoiding these verbal constructions can be made contingent on other behaviors

Using positive verbal behaviors for the same reason—to justify or continue the bad abuse

Using verbal constructions to change the way she thinks and how she talks to others

Using verbal constructions to change the way she thinks and talks about herself to others

Using verbal constructions to control how outcomes follow from her verbal constructions

Using verbal constructions to control the major contexts (resources and social relationships) of life

Verbally manipulating false contexts (guilt) from which escape or avoidance is likely to be preferred option

Verbally using cultural and other historical contexts to impose strategies to control contexts preferred option

Verbally threatening punishing events from which escape or avoidance is likely to be preferred option

Exploring the domestic violence strategies

The next analysis can help us understand some overall patterns of these strategies, by looking separately at the diversity of outcomes, and the strategies used both pre-context and post-context which manage either to get the outcomes and to avoid or escape unwanted outcomes.

Behaviors and outcomes shaped. If we look through the examples and the Tables we can locate several generic forms of behavioral outcomes (consequences) which are commonly required of the woman by the man.

Gaining resources. First, there are fairly direct behaviors required involving gaining resources and events for the man. These would include money, sex, getting work done by the woman, and access to further resources through the woman.

Attention. Second, giving the male attention also seems important although we must be wary of how this is analyzed. Attending to someone is indicative of a pre-condition for a number of *other* outcomes rather than the attention *per se*. It might not be important that she looks at the man, but

important because when she attends all the other strategies can be enacted by the man. The same applies to requiring that the woman “shows the man respect” (Adams, Towns & Gavey, 1995); the respect itself might not be important but “showing respect” means compliance.

Verbal compliance. Third, there is an outcome of verbal compliance in most examples. The shaping of verbal compliance builds, perhaps innocuously it might seem at the time, until the woman becomes compliant with a large number of demands and commands.

Agreement with “facts.” Fourth, an outcome is that the woman not only complies with directives but also agrees or perhaps at least shows acquiescence to the view of the world put forward by the man. This is sometimes called “establishing facts” or “warranting accounts” in discourse analysis and sociolinguistics. It might be an elaborate account of the way the world works, a simple fact of “establishing” that the man does far more work than the woman, or an abstract generalization that she must agree that men work harder than women. Some examples can be found in Adams, Towns and Gavey (1995).

Avoid control from others. Finally, one other common behavioral outcome seen in Table 1 is that the woman should avoid control by other people. Not only are the behaviors listed above required as outcomes, but also the behaviors of avoiding anyone else’s control.

As always in these analyses, this list is not meant to be exhaustive nor apply in all cases. These are possibilities built from some concrete examples which can be added to or adapted in any real instances. There will be many other outcomes men shape in women not covered here, and that is part of using these analyses to spur further thought and research, rather than treating them as final theories or models meant to encompass every possibility.

Pre- and post-context management strategies. We have already seen that there are two main strategies for making these behaviors or outcomes work in practice. The first is to organize or enforce conditions *prior to* the woman's required behavior to make it more likely to happen. One important feature is that they can occur prior to any violence if used to set up more innocuous contexts. For example, under the pretext of helping the woman, the man might assert control over some smaller negative features of their life, such as doing all the driving in their car, or taking control of money matters to help the woman. However, these can then form the basis later for more negative contexts as seen above.

The second strategy for making the behaviors or outcomes work in practice are those done *after* some outcome to manage unwanted outcomes or consequences. For example, if the man threatens her pets to get the woman to comply with some directive so as to avoid violence to either the pet or herself, there is a chance that the woman could go to an animal welfare service to report this. So strategies are needed to prevent her doing this or else be prepared to explain or make excuses if that occurs.

The before and after management of unwanted (by the man) consequences will be discussed together since there is much overlap, because the contexts set up beforehand can also be utilized to manage unwanted consequences afterwards. Table 3 presents 14 of these strategies found in our original corpus of behaviors and some descriptions.

Once again it can be seen that most of these are not unusual in everyday life and occur to some extent in all social relationships. It can also be seen that each can be instigated through the use of violence or the threat of violence. For example, gaining control over the woman's resources in life can be done initially through bullying, violence and forceful coercion, and thereafter need only occasional reminders of the violence, perhaps through verbal narratives ("Remember what happened last time you disobeyed?").

Table 3. Pre- and post- context strategies for managing the woman's behaviors with a description of strategies possibly involved

Strategies for Pre- and Post-Context Management	Description
<i>Gain control over resources</i>	Woman's resources can be made contingent on her compliant behaviors
<i>Act in ways to produce avoidance and escape behaviors</i>	Produce compliant behaviors as escapes from violence and other aversive acts
<i>Verbal threats to remove positive resources and events</i>	Same as above but using verbal threats which must first be established
<i>Remove alternative sources of resources</i>	Make woman more dependent upon resources under man's control
<i>Remove alternative sources of control (competition)</i>	Prevent or stop other people or sources of contingent control which might compete with that of the man
<i>Prevent escape or avoidance from the situation</i>	Prevent the woman from exiting the situation entirely
<i>Set up contexts to maintain secrecy</i>	Many of the man's strategies can be compromised if other people were to find out, so arrange and maintain ways of keeping events secret, both through preventing her revealing these things or preventing others from finding out in other ways
<i>Set up contexts to monitor what she does</i>	All the man's strategies need information about what is happening
<i>Build strong verbal compliance</i>	Use many methods of both persuasion and rhetoric coupled with bullying, violence and threats to the relationship to maintain the compliance of the woman with the man's verbal directives
<i>Provide 'positives' to induce compliance</i>	In cases there are instances of pleasant and positive behaviors towards the woman but these can also be directed at maintaining compliance and other manipulative strategies
<i>Build ways of being 'persuasive'</i>	Developing discourses and persuasive tacts
<i>Build acceptance of stories, especially to justify action, avoid responsibility, and blame others</i>	Build stories and narratives to convince the woman of the man's portrayal of the world, their relationship and herself,
<i>Isolate her</i>	Generic strategy which allows many of the above to work easier
<i>Lie and dissemble</i>	Generic strategy which allows many of the above to work easier but requires attention to monitoring to make sure she cannot find out the lies

Another example is the use of persuasion and story-telling by the man to get his view accepted or acquiesced to by the woman. People in most relationships exchange views and agree or else agree-to-disagree with each other. In the extreme, however, the man can abusively or violently get her acceptance of his own views of the world so she avoids or escapes punishment. The extreme of this is the well-known “gaslighting,” in which completely fabricated versions of the world are accepted by a woman under force of being called crazy and making her doubt her own sanity (Zemon Gass & Nichols, 1988). If she persists in her version of events, the man tells their friends that she is crazy.

Looking through the strategies for managing the pre- and post-contexts for getting the woman’s compliance, it can also be guessed that some of his strategies are more amenable to violence as a strategic method. For example, gaining control of many resources can be done by physically taking them away, without much social interaction or violence. Acting in ways so that the woman will comply with directives in order to escape, however, is inherently open to the use of violence, since violence is always aversive and needing escape—with functional contingencies, pain and violence are always available and potent (Guerin, 2004). As another contrast, the setting up of strategies both to keep events secret and also to monitor what the woman does and says, does not always require the use of violence. In contrast, verbal threats usually require some initial demonstration of physical violence to be effective.

The final point to be made about Table 3 is that this list of 14 generic strategies or outcomes (consequences) for the man should be useful in preventative and intervention strategies for people dealing with domestic violence. While we could identify many behaviors perpetrated by men and train women to recognize and avoid these individual behaviors, it is most likely that the men will devise another way of achieving the same outcome with a new behavior (including *strategic usurpation*, Guerin, 2016).

If, instead, we train women and families to recognize the 14 (or more) *functional* outcomes of the men's behaviors, that is, the consequences which are shaping any of his variant behaviors, we can possibly achieve better intervention and earlier recognition of problems. That is, *training women to recognize the functions of a man's behavior, rather than teaching her to recognize many separate topographical behaviors, should be more useful for both prevention and intervention.*

The development of domestic violence: Innocuous origins and warning signs

The final analysis is more speculative but might be useful for future research and practice. It has been mentioned a few times that most of these strategies are commonly used in everyday social relationships and often erroneously seem innocuous and without violence or intimidation. There are also forms of these that are acceptable and even welcome to people in relationships, at least at the start of relationships, although they can contain the seeds of abusive control. Many of these strategies can quickly escalate or gradually evolve into violence, as in this real example from Wendt and Zannettino (2015, pp. 2-3) which also illustrates a number of the strategies which have been suggested so far in this paper:

I started with my partner when I was about 17 years old. I was about 18 when I was studying a course. I was having lots of fun and actually making friends for the first time. He got jealous and kept on threatening and getting aggressive and threatening to kill himself if I didn't stay with him and disconnected me from my friends. This happened throughout our relationship years later... making sure I never had connections with friends. If he got mad or angry he would throw plates and stuff around the house. With him it was all more verbally aggressive... he didn't really hit me... but then a few times he put knives to my throat. I would

have to make sure the kids were always quiet otherwise he would get upset and starting shouting abuse at us all... This all just sort of progressed along the way I think.

Table 4 lists the main strategies for controlling pre- and post-contexts, taken from Table 3. Alongside are some suggested (only) ways in which these controlling relationships might have started in seemingly innocuous ways. These are plausible examples only and need to be researched and explored far more.

To consider just a few examples, using the strategies listed for gaining control of resources, the behaviors of looking after parts of someone's life for them can initially be helpful and useful. Offering to manage the finances in the household, or offering to be the one to organize what the couple does on weekends, can be welcomed and pleasant. But this can lead to more and more control over resources, and then failure to relinquish or share any of that control, and lead to more threatening or violent behaviors if she tries to re-establish her control over these parts of her life.

As another example, keeping what occurs in a social relationship secret from others can start out simply as a way of not revealing to others how close you are, or not letting your parents know that you have commenced a serious relationship. Keeping secrets from the rest of the world can function to enhance bonding (Richardson, 1988). If continued, however, these strategies can become the basis for keeping quiet about the other worsening conditions within the relationship.

Table 4. Pre- and post-contexts for strategies and suggested ways that these could develop within social relationships

Strategies for Pre- and Post-Context Management	Starting points of strategies/ Good intentions/ Warning signs
<i>Gain control over resources</i>	Wanting to look after her and make sure he can supply all the things she need Regulating the things she wants and needs Regulating or taking over the getting of things she needs through other people, even strangers in extreme cases
<i>Act in ways to produce avoidance and escape behaviors</i>	Acting out behaviors from which she escapes by doing something he nominates Doing mildly punishing or aversive acts (pinching gently?) with stopping of this contingent on a mild compliant response
<i>Verbal threats to remove positive resources and events</i>	Verbally talking about (or joking about) removing items or activities, contingent on a response
<i>Remove alternative sources of resources</i>	Cutting off sources of getting things and events, including networks through other people
<i>Remove alternative sources of control (competition)</i>	Might replace with own sources as a way of appearing to be helpful (see above) Might be isolating (see below) or allowing interaction but presenting plausible stories as to why she should not comply with others but with him
<i>Prevent escape or avoidance from the situation</i>	Finding out ways she might respond other than through his control and surreptitiously sets up contexts to make those non-viable
<i>Set up contexts to maintain secrecy</i>	Most of the secrecy patterns can be welcome or cute at first (“our little secrets”) but if they continue then ways of keeping them secret from others will be needed
<i>Set up contexts to monitor what she does</i>	To do all these patterns he will need to monitor her and her friends and daily routines to find out her resources, relationships, behaviors, and any potential alternatives; this can be part of appearing devoted and interested in her
<i>Build strong verbal compliance</i>	Numerous ways for inducing verbal compliance which initially might not involve anything aversive
<i>Provide “positives” to induce compliance</i>	Doing nice things for her but introduce costs or contingent actions
<i>Build ways of being “persuasive”</i>	Arguing and insisting on being right, not letting go of arguments even when clearly wrong; initially getting agreement on innocuous topics
<i>Build acceptance of stories, especially to justify action, avoid responsibility, and blame others</i>	Building stories, social constructions, world- views, etc. to impose his own versions of reality and life; can be pleasant story-telling to begin
<i>Isolate her</i>	Wanting to be together or just with him; then with his friends but not hers; reasons given for not spending time with her friends
<i>Lie and dissemble</i>	In doing the above he will need to lie and pretend things are not as they seem, especially when moving to more extreme forms Upon finding out lies, further verbal constructions are easily given to show that the lies were not real

Conclusions and Possible Interventions for Domestic Violence

The analyses here are tentative although based on concrete examples of domestic violence which we have tried to contextualize in ways that might be useful. The analyses are meant as guides to explore real cases and discover further conditions and strategies which engender and perpetuate violence against women. Using our analyses, we can demonstrate some fairly complex relations between innocuous strategies in everyday social relationships that, through the use of violence, can be changed into far more devastating patterns that are not acceptable. The main conclusions are:

1. Behaviors and strategies by men in abusive relationships are extensions of ordinary behaviors and strategies.
2. The strategies can begin in many acceptable ways but escalate, especially with the use of violence.
3. Because they can start out mildly, this means they can be difficult to detect early in relationships.
4. This approach does give hope that when people are learning the ‘normal’ strategies of relationships they can be warned about possible extensions into abuse, and also hope that current maladaptive strategies might be re-learned.
5. Strategies that men use to control women may begin mildly but clearly show in different ways a blatant disregard for the consequences to the partner and what they mean for her.
6. Because the strategies which men use to control women can begin innocuously, when they get out of hand those early versions can be used as excuses, “I was only ever doing this for your sake!”

How societal contingency structures appear in individual behavior: The necessity of feminist analyses in behavioral analyses

Another implication that has not been explicitly discussed so far is that all these strategies only arise from, and are made possible by, many external contexts—economic, social, cultural, and historical—not just from the perpetrator’s individual behavioral history or individual “psychology.” Most of the strategies would not work at all without the societal acceptance of such contexts and differential privileges: such as keeping events secret within relationships, allowing men to govern parts of women’s lives as a right, allowing jealousy to be an accepted behavior, permitting men to have a “duty” to run the finances of western couples (Fleming, 1997), and allowing men to talk over the top of women. *The violent men do not invent these conditions*, they engage with contingent strategies they have learned but which only work if these broader social and political contexts allow them to proceed. Thus, we need to include these in our behavioral or contextual analysis of the behaviors of individuals, as pre-existing contexts (societal structures) utilized by the men—or pre-existing contingency structures if you will.

This is reflected in a recent review by Htun and Weldon (2012) of global policy changes to reduce violence against women. They wrote:

“...we show that feminist mobilization in civil society—not intra-legislative political phenomena such as leftist parties or women in government or economic factors like national wealth—accounts for variation in policy development” (p. 548)

The Feminist movement must therefore be part of the solution to domestic violence because it actually tries to change those larger contexts or environments which support DV. Rather than just target the behaviors of individuals directly, it actively works to change the societal structures or

contexts which are necessary in the historical background for the very existence of individual contingencies of behavior, something often overlooked in behavior analysis (Guerin, 2005). It does this by pressuring governments through protest and campaigns, by actively engaging people to be aware of misogynistic behaviors in everyday life, and by finding ways to make punishment contingent on these misogynistic behaviors. Perhaps most importantly, the Feminist movement works to change the current inequalities that allow men the power to shape women's behaviors. That is, currently men can shape women's behavior in many ways only because of the societal power imbalance (the patriarchy), and can even lead women to compete against each other. The Feminist movement promotes ways to change this by empowering women to work together in shaping their behaviors independently of men, and thus weaken the dominance of the shaping by men.

That is, changing domestic violence requires the inclusion of the broader changes proposed in feminist writings and activism. This includes challenging the role of general patriarchy in shaping individual behavior. This can be placed into analyses through the inclusion of such wider social and political contexts as the very conditions or setting events that allow for men's behavior and consequence patterns to be functional in the first place. It is not that men verbally "think" patriarchy and then follow its instructions when they behave. Rather, patriarchy is already built in to the social contexts that shapes us all, and men's behaviors then "work better" unless we can actively work against these conditions. That is, the role of patriarchy in individual behavior is a western cultural structure which allows some people (men) to engage privileged functional contingencies not otherwise possible, and which are not available to others.

These wider societal contexts therefore need to be researched and changed, and included within the very individualistic analyses of behavior analysis, since many individual behaviors will not function (engage contingent relations) without established social and political contexts in place.

This is also why the general societal acceptance of some abusive patterns, even in the early forms of relationships, need to be changed as well. Many of the early forms of control derive from currently acceptable patterns in society, such as men interrupting conversations more than women, men looking after finances in western countries (Fleming, 1997), or men being able to be more assertive in persuasion without apologizing (James & Clarke, 1993; James & Drakich, 1993).

What this means, in essence, is that the wider issues of patriarchy and male dominance in society are at the root of domestic violence and enter into the perpetrator's violent behavior through the *functional contexts* for many strategic behaviors engendered by the broader societal contexts in which they live. Even secrecy, for example, is part of the accepted set-up (social contingency) of modernity which tells us we can have relationships with strangers and non-kin that will—and sometimes must—be kept compartmentalized from family and friends (Bauman & Rudd, 2015; Beck, 2001; Giddens, 1990; Guerin, 2016). *Acceptance of these societal patterns in modernity facilitates the abuse by violence within modern social relationships.* Acceptance of gender inequalities can also therefore be seen through our analyses to directly support the violence that appears too often in domestic situations, and makes it appear solely as a domestic issue when it is not. Men would have great difficulty getting away with the behaviors in Table 1 without the ever-present gender inequalities which can perversely justify what they do.

In a real sense, therefore, feminism and other social and political movements seeking widespread changes in how modernity and capitalism abet the shaping and maintenance of patriarchal, unequal and other behavior patterns, are an absolutely necessary part of the action against domestic violence, perhaps even more so than one-on-one psychological therapies (Guerin, 2017; Wendt & Zannettino, 2015; Yllo, 2005). Men do not directly learn their abusive behaviors as abusive behaviors, but the wider patriarchal and gender unequal patterns get included within the strategic

contexts which are necessary not just to accomplish them but also to turn them around.

Finally, while we have not focused on the woman's behavior in this paper, the social conditions put in place by patriarchy also shape women's behavior. This includes directly teaching particular ways of behaving for women, shaping women's behavior to inadvertently reinforce those patriarchal conditions we have described which support men's behavior, or to extinguish or suppress alternative behavior from women. These ideas, however, require further research and analyses not done here.

Conclusions

For behavior analysis, the important point we can learn is that social analyses cannot be satisfied with analyzing only how individuals engage with contingencies, but rather, must also observe and describe the structures of social contingency relations and how they are kept in place to be utilized. The structuring of contingency relations in experimental settings is controlled by the researcher, so behavior analysts have not explored this context since they just impose it. But in the real world of human social behavior, the very structuring of contingency relations, which explicitly determines what people do, is usually there before we are even born, and needs to be described before we can properly understand human behavior. While it might seem paradoxical, in order to analyze the behavior of individuals we must go beyond the behavior of those individuals. But in fact, this is no different from saying that to understand the behavior of rats and pigeons, we also need to know how the contingent relations were structured by the researchers (and not by the rats and pigeons).

Putting these two forms of contextual analyses together is where the structures of social, cultural and political contexts meet the individual behaviors (Htun & Weldon, 2012). Even for so-called "intimate" and private

behaviors within relationships between partners, such as common knowledge that secrets can and should be kept within relationships, the behaviors cannot maintain functionally without a wider societal acceptance and modeling. Any social analyses, therefore, even those focusing on two “individuals” in a relationship, must include political, cultural and feminist analyses (Guerin, 2017).

References

- Adams, P. J., Towns, A., & Gavey, N. (1995). Dominance and entitlement: The rhetoric men use to discuss their violence towards women. *Discourse & Society*, 6, 387-406. <https://doi.org/10.1177/0957926595006003006>
- Bagshaw, D., Wendt, S., Zannettino, L., & Adams, V. (2013). Financial abuse of older people by family members: the views and experiences of older Australians and their family members. *Australian Social Work*, 66, 86–103. <http://dx.doi.org/10.1080/0312407X.2012.708762>
- Bauman, Z., & Ruad, R. (2015). *Practices of selfhood*. Oxford: Polity Press.
- Beck, U. (2000). Living your own life in a runaway world: Individualism, globalisation and politics. In W. Hutton & A. Giddens (Eds.), *On the edge: Living with global capitalism* (pp. 164-174). London: Vintage. <http://dx.doi.org/10.4135/9781446218693.n2>
- Bloodworth, S. (2015). The roots of sexual violence. *Marxist Left Review*, Winter, No. 10. doi: 10.1057/9781137447449_2
- Dutton, D. G. & Corvo, K. (2006). Transforming a flawed policy: A call to revive psychology and science in domestic violence research and practice. *Aggression and Violent Behavior*, 11, 457–483. <http://dx.doi.org/10.1016/j.avb.2006.01.007>
- Factora-Borchers, L. (Ed.). (2014). *Dear sister: Letters from survivors of sexual abuse*. Edinburgh, Scotland: AK Press.

- Fischbach, R. L., & Herbert, B. (1997). Domestic violence and mental health: Correlates and conundrums within and across cultures. *Social Science & Medicine*, 45, 1161-1176. [http://dx.doi.org/10.1016/S0277-9536\(97\)00022-1](http://dx.doi.org/10.1016/S0277-9536(97)00022-1)
- Fleming, R. (1997). *The common purse: Income sharing in New Zealand families*. Auckland, New Zealand: Auckland University Press.
- Garcia, L. P., Santana de Freitas, L. R., da Silva, G. D. M., & Höfelmann, D. A. (2016). *Violence against women: Femicide in Brazil*. Available at: <http://www.ipea.gov.br/portal/images/stories/PDFs/130925_sum_estudo_femicidio_leilagarcia.pdf Retrieved: 04 June 2016.
- Giddens, A. (1990). *The consequence of modernism*. Oxford: Polity Press.
- Glenn, S. S., Malott, M. E., Andery, M. A. P. A., Benvenuti, M., Houmanfar, R. A., Sandaker, I., Todorov, J. C., Tourinho, E. Z., & Vasconcelos, L. A. (2016). Toward consistent terminology in a behaviorist approach to cultural analysis. *Behavior and Social Issues*, 25, 11-27. <http://dx.doi.org/10.5210/bsi.v25i0.6634>
- Guerin, B. (1992). Behavior analysis and the social construction of knowledge. *American Psychologist*, 47, 1423- 1432. doi: 10.1037/0003-066X.47.11.1423
- Guerin, B. (2004). *Handbook for analyzing the social strategies of everyday life*. Reno, Nevada: Context Press.
- Guerin, B. (2005). *Handbook of interventions for changing people and communities*. Reno, Nevada: Context Press.
- Guerin, B. (2016). *How to rethink human behavior: A practical guide to social contextual analysis*. London:Routledge.
- Guerin, B. (2017). *How to rethink mental illness: The human contexts behind the labels*. London: Routledge.

- Hanmer, J. (2000). Domestic violence and gender relations: Contexts and connections. In J. Hanmer & C. Itzin (Eds.), *Home truths about domestic violence: Feminist influences on policy and practice* (pp. 9–23). London: Routledge. doi: 10.4324/9781315011585
- Houmanfar, R., & Rodrigues, N. J (2006). The metacontingency and the behavioral contingency: Points of contact and departure. *Behavior and Social Issues*, 15, 13-30. <http://dx.doi.org/10.5210/bsi.v15i1.342>
- Htun, M., & Weldon, S. L. (2012). The civic origins of progressive policy change: Combating violence against women in global perspective, 1975–2005. *American Political Science Review*, 106, 548-569. <https://doi.org/10.1017/S0003055412000226>
- James, D., & Clarke, S. (1993). Women, men and interruption: A critical review. In D. Tannen (Ed.), *Gender and conversational interaction* (pp. 231-280). London: Oxford University Press.
- James, D., & Drakich, J. (1993). Understanding gender differences in amount of talk: A critical review of research. In D. Tannen (Ed.), *Gender and conversational interaction* (pp. 281-312). London: Oxford University Press.
- Krantz, G., & Vung, N.D. (2009). The role of controlling behavior in intimate partner violence and its health effects: A population based study in rural Vietnam. *BMC Public Health*, 9, 143. doi: 10.1186/1471-2458-9-143
- MacLeod, L. (1980). *Wife battering in Canada: The vicious circle*. Ottawa: Minister of Supply and Services.
- McMillan, D. L. (2008). *But he says he loves me: How to avoid being trapped in a manipulative relationship*. NY: Allen & Unwin.
- Myers, D. L. (1995). Eliminating the battering of women by men: Some considerations for behavior analysis. *Journal of Applied Behavior Analysis*, 28, 493-507. doi: 10.1901/jaba.1995.28-493

- Paymar, M. (2000). *Violent no more: Helping men ends domestic abuse*. NY: Hunter House.
- Pence, E., & Paymar, M. (1993). *Education groups for men who batter: The Duluth Model*. NY: Springer Publishing Company.
- Richardson, L. (1988). Secrecy and status: The social construction of forbidden relationships. *American Sociological Review*, 53, 209-219. <http://www.jstor.org/stable/2095688>
- Sasson, S., & Paul, L. A. (2014). Labeling acts of sexual violence: What roles do assault characteristics, attitude, and life experiences play? *Behavior and Social Issues*, 23, 35-49. <http://dx.doi.org/10.5210/bsi.v23i0.5215>
- Swadhin, A. Y. (2014). Letter 14: Amita's fine. In L. Factora-Borchers (ed.), *Dear sister: Letters from survivors of sexual abuse* (pp. 95-112). Edinburgh, Scotland: AK Press.
- Valor-Segura, I., Espósito, F. & Moya, M. (2011). Victim blaming and exoneration of the perpetrator in domestic violence: The role of beliefs in a just world and ambivalent sexism. *Spanish Journal of Psychology*, 14, 195- 206. https://doi.org/10.5209/rev_SJOP.2011.v14.n1.17
- Waiselfisz, J. J. (2015). *Map of 2015 violence: The murder of women in Brazil*. http://www.mapadaviolencia.org.br/pdf2015/MapaViolencia_2015_mulheres.pdf Retrieved: 6/4/2015.
- Wendt, S., & Zannettino, L. (2015). *Domestic violence in diverse contexts*. Routledge: London.
- Yllo, K (2005). Through a feminist lens, gender, diversity and violence: Extending the feminist framework. In D. Loseke, R. Gelles, & M. Cavanaugh (Eds.), *Current controversies on family violence* (2nd Ed.). Thousand Oaks, CA: Sage. <http://dx.doi.org/10.4135/9781483328584.n2>
- Zemon Gass, G., & Nichols, W. C. (1988). Gaslighting: A marital syndrome. *Contemporary Family Therapy*, 10, 3- 16. doi:10.1007/BF00922429



Natural, behavioral and cultural selection-analysis: an integrative approach

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In *Selection by Consequences*, Skinner (1981) described a causal model that explains human behavior as a joint product of three levels of selection: (a) the contingencies of survival involved in natural selection, (b) the contingencies of reinforcement involved in the selection of individual behavior, and (c) contingencies of an evolving social environment. Since then, researchers from behavior analysis and other fields such as biology and anthropology have used an evolutionist/selectionist approach to greatly improve our understanding of those three levels of analysis. As our knowledge of each level has expanded, the borders between them and their belonging to specialized academic domains has become less clear. Even though Skinner (1981, p. 502) stated that “each level of variation and selection has its own discipline—the first, biology; the second, psychology and the third anthropology,” we argue that *Selection by Consequences* sets a milieu for behavior analysis to take part in the analysis of the integrated relation among all;

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levels of analysis. In this commentary to Skinner's (1981) paper, we aim to point out some advances in behavior analysis that may contribute to bridging the gap between the three levels of analysis described by Skinner. In doing so, we will briefly describe some relations between natural and behavioral selection and between behavioral and cultural selection. Additionally, we discuss an alternative model to analyze selection of cultures.

Keywords: cultural evolution; cultural analysis; cultural contingency; selectionist approach

Natural-Behavioral Selection

Let us start with the relationship between natural and behavioral selection. Glenn and Madden (1995) pointed to Skinner (1953) and Campbell (1956) as the first to compare the processes of natural selection and reinforcement. Glenn and Madden argued that if the same processes that explain organic selection were applicable to behavioral selection, the understanding of one would provide valuable insights about the other. In organic evolution through natural selection, genes are the units of retention and replication that are transmitted generation-to-generation, enabling species survival and adaptation to environmental changes. On the other hand, in behavioral selection, reinforcement operates on behavioral variation differentially selecting a behavioral repertoire which will likely result in future reinforcement. While in natural selection, genes are the unit of retention and replication is transmitted through generations, Glenn and Madden suggest that in an individual behavioral lineage, retention and replication take place in the nervous system. For Moore (1997), behavior analytic explanations may be valid without considering neurological variables, just as Mendel's work did without considering DNA analysis. However, knowledge from neuroscience may show pragmatic value and open new venues to behavior analysis.

In a commentary article to *Selection by Consequences*, Donahoe (1984) highlighted the importance of looking at the neural basis of respondent and operant conditioning to understand selection at the behavioral level. He

argues that Skinner prudently focused on the effects of reinforcement on operant behavior, but that it would also be valuable to study physiological mechanisms that undergo respondent and operant conditioning. In response to Donahoe, Skinner postulated that questions about the physiological mechanisms of respondent and operant behavior should be answered by neurology (Catania & Harnad 1988; Skinner 1988, p. 38). Ten years after Donahoe's commentary, he and Palmer published *Learning and Complex Human Behavior* (Donahoe & Palmer, 1994), where a biobehavioral approach is offered to analyze general principles such as extinction, generalization and discrimination. There, findings from neuroscience and neuropsychology are taken into consideration. Behavior analysis has entered in a field previously declared as territory of neurology and biology, integrating knowledge from behavior-environment relations with genetic and neural variables (Kennedy, Caruso, & Thompson, 2001) and contributing to a better understanding of behaviors such as self-aggression (Symons, Fox, & Thompson, 1998).

Thus, in addition to using natural selection processes as insight to better understanding behavioral selection, knowledge from physiological mechanisms may be of great value to explain behavioral principles that undergo the learning of new repertoires. Here, we are making a distinction between (a) using natural selection as a metaphor to explain behavioral selection (Glenn & Madden, 1995), and (b) using the knowledge of responses and mechanisms acquired by natural selection to better understand a repertoire acquired during an individual life span (Donahoe & Palmer, 1994). Skinner (1981, p. 501) prompted this interaction when writing: "Through respondent (Pavlovian) conditioning, responses prepared in advance by natural selection could come under control of new stimuli. Through operant conditioning, new responses could be strengthened (reinforced) by events that followed them." Accordingly, Donahoe and Palmer have worked to understand how contingencies of survival selected a neural system responsible for respondent and operant conditioning. Donahoe (1984) also argues in his commentary to Skinner (1981) that respondent and operant

conditioning may be distinguished simply in terms of procedures to study behavioral changes, but they share a selecting environment and physiological mechanisms. Again, Skinner (Catania & Harnad, 1988; Skinner 1988, p. 38) did not agree with Donahoe, affirming that the two types of conditioning (respondent and operant) are differentiated by the contingencies under which they occur, not by their procedures to study behavioral changes.

A behavioral-organic approach has been used by behavior analysts, in several applied settings, for example in the treatment used on self-injuring behavior in individuals with developmental disability. Self-injuring can be maintained by (a) medical conditions, (b) functional/ecological variables and (c) psychiatric illness. If the self-injuring behavior is controlled by a sinus infection, medical treatment will be recommended (a), as it will be a recommended behavioral intervention if it is maintained by environment variables (b), and psychiatrist would be recommended if the behavior is the result of a brain and/or chemical abnormality (c). However, medical, operant and 55 psychiatric variables often covariate, and a functional analysis of medical and psychiatric treatment, together with functional/ecological variables, may be the most effective alternative (Pyles, Muniz, Cade, & Silva, 1997).

As for the relationship between behavioral and genetic selection, it may go beyond their possible interdependence to determine human behavior (Donahoe & Palmer, 1994) and selection analogies (Glenn & Madden, 1995). As it turns out, behavioral and genetic selection has more in common than many would have known when *Selection by Consequences* was published in 1981. It was only in the mid-1970s that two rather speculative articles by Holliday and Pugh (1975) and Riggs (1975) suggested the epigenetic inheritance system, in which DNA function is modified and transmitted in response to environmental changes during an organism's life span. As most biologists knew at the time, every cell of a given organism shares the same DNA code, and genes are turned *on* and *off* during developmental periods when cells acquire specialized functions (e.g. liver and skin cells). Those genes and their

functions are selected from mutations and population genetic pools and then transmitted to offspring. The maturation of functions would be determined through inheritance. However, the so-called epigenetic inheritance systems call attention to the process in which genes are turned *on* and *off* in response to local environmental changes during individual life span and how these functional changes are transmitted through generations (Jablonka, Lamb, & Zeligowski, 2014). The epigenetic inheritance system is a clear example of an interaction of natural and behavioral selection, showing how fragile the frontiers between levels of selection can be. Nonetheless, the extent to which behavior analysis can both contribute to and benefit from understanding of the epigenetic processes is still a question to be answered.

Behavioral-Cultural Selection

For Skinner the third level of selection began when individuals were under control of the same sets of contingencies of reinforcement. When an individual's behavior becomes a practice that benefits the group, a selection of culture takes place. Thus, it is the effect of consequences for the group, not individual reinforcement that maintains the cultural evolution (Skinner, 1981). However, the object of selection at the cultural level was not clearly defined in *Selection by Consequences*. Whereas the objects of natural and behavioral selection were described as genes and behavior respectively, the object of selection on the third level remained unclear. In a commentary to Skinner (1981), Dawkins (1984) questioned if the *entities* selected through cultural evolution are cultural practices or whole societies with their cultural practices. In response, Skinner writes that there should be a distinction between what is selected and the selecting consequences. *Within groups* practices are selected and transmitted, whereas *between cultures* features such as social systems and technological methods (e.g. agriculture) are the object of selection (Catania & Harnad, 1988; Skinner 1988, p. 36).

Recently, the field of behavior analysis has seemed to highlight the selection of within groups, focusing on selection of cultural practices. For example, the metacontingency concept (Glenn 1986; Glenn 1988; Glenn & Malott 2004; Malott & Glenn 2006) was developed as a new conceptual tool to analyze the third level of selection (cultural). A metacontingency describes a functional relation between interlocking behavioral contingencies (IBCs), their aggregate product and selecting environment (see Figure 1). Thus, while in natural selection (i), genes are selected and in behavioral selection (ii), classes of responses are selected, in cultural selection (iii) the IBCs and their aggregate product is the object of selection.

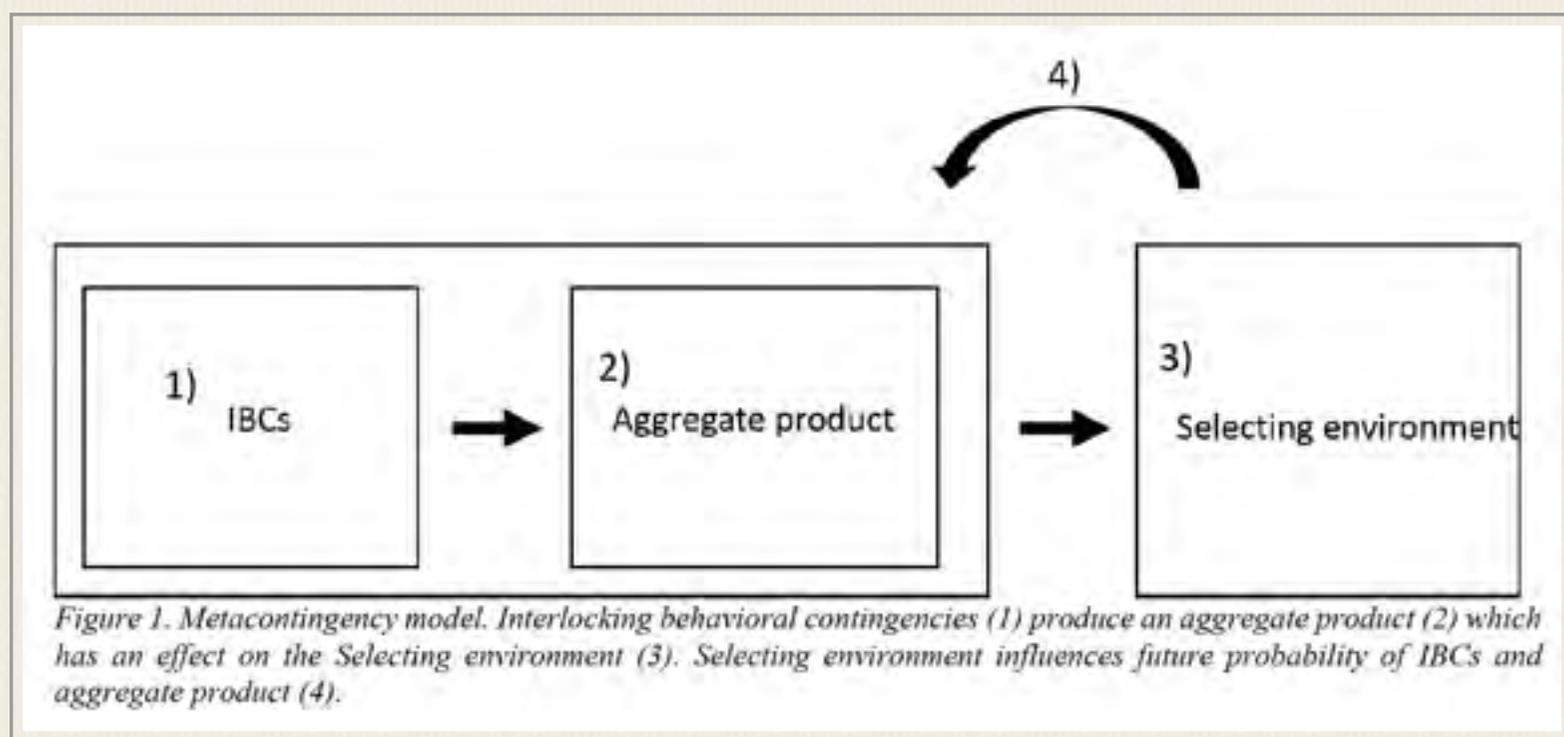


Figure 1. Metacontingency model. Interlocking behavioral contingencies (1) produce an aggregate product (2) which has an effect on the Selecting environment (3). Selecting environment influences future probability of IBCs and aggregate product (4).

The metacontingency model encompasses selection of cultural practices (within groups) but does not consider the selection of cultural-social environments (between groups) described by Skinner (1981). Here we would like to offer an alternative unit of cultural analysis that accounts for selection of cultural practices and selection of cultural-social environments. From Skinner (1981), we may highlight at least two selection processes involved in

cultural evolution: (1) *selection of cultures* and (2) *cultural-selection*. The selection of cultures refers to the selection of cultural-social environments (we will refer to it as *environmental settings*) whereas cultural selection refers to how those environmental settings select behavior of individuals and practices within this culture. Thus, individual behaviors and practices are selected by and are under the control of environmental settings (cultural-selection). An external environment selects environmental settings, which are possibly competing with other settings. Besides the cultural-selection control on individual behavior and practices, environmental settings also coevolve with gene selection. For example, it is known that sexual preference and/or dispersal adaptation influenced extremity selection (skin pigmentation, hair thickness, eye and hair color, and freckles) and development of cooking techniques and diet influenced jaw musculature and tooth-enamel thickness (Laland, Odling-Smee, & Myles, 2010). Sexual preferences and cooking techniques are environmental settings selected by external conditions and between group competition (selection of cultures). In its turn, environmental settings participate in the cultural selection of sexual and cooking behavior/practice and genetic selection.

Thus, a cultural phenomenon would involve selection of cultures (environmental settings) and cultural selection of genes, individual behavior and practices. In Figure 2 we suggest a model of analysis that encompasses both selection of cultures and cultural selection. Separately, selection of cultures and cultural-selection guide a functional analysis of each of the three levels of analysis illustrating their interaction. Taking as example behaviors or cultural practices that lead to misuse of vaccines and consequently resurgence of diseases. At a cultural level, environmental settings that control a population's practices will need to be engineered in order to provide the correct stimuli control of the appropriated practices. The evolving history of this environmental setting and population repertoire will need to be taken into consideration when programing the most effective

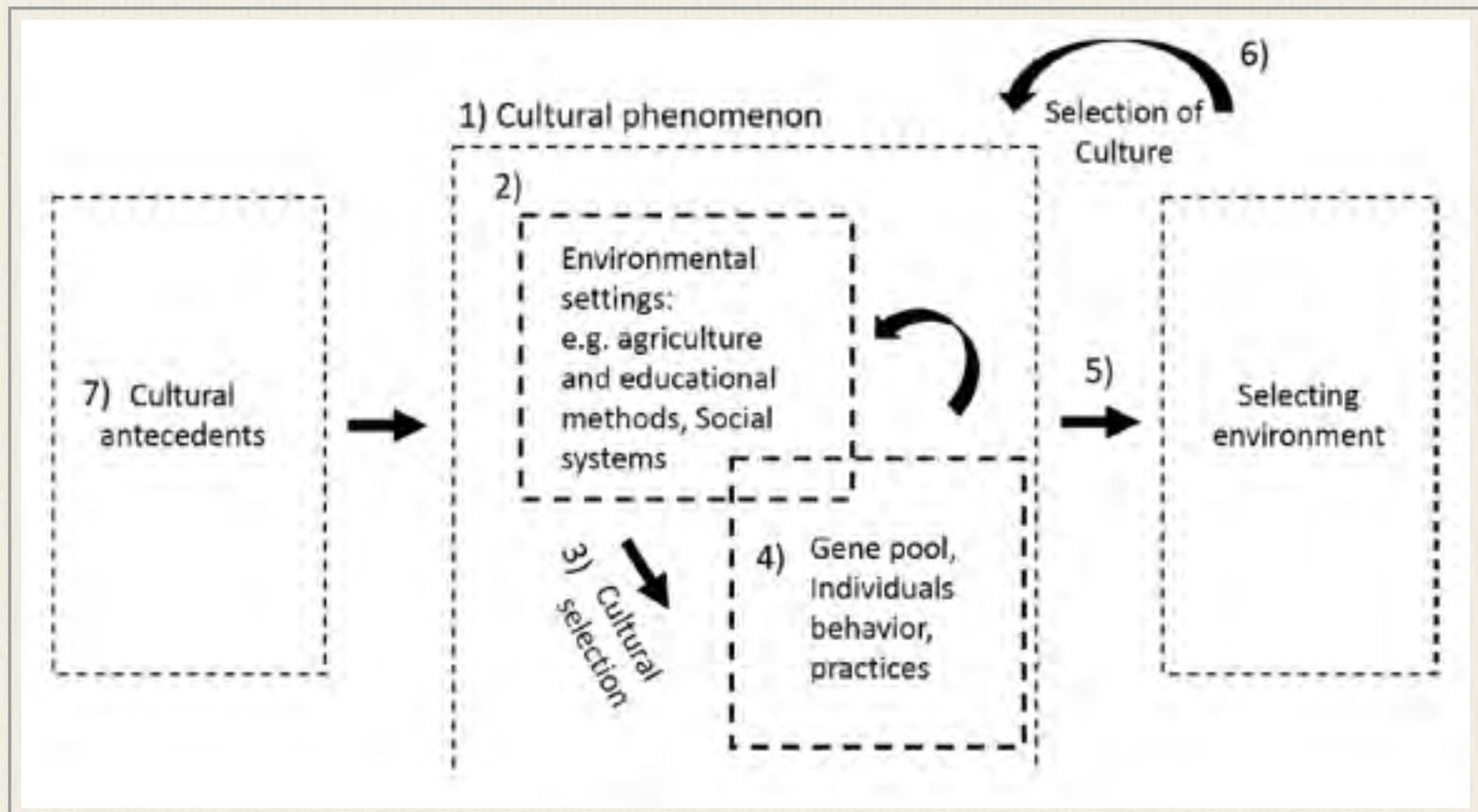


Figure 2. Three term cultural contingency (TTCC) model. A (1) Cultural phenomenon is composed of (2) environmental settings (e.g. agriculture and educational methods, social systems) and (3) gene pool, individual behavior and practices. Environmental setting participates in the (4) cultural-selection of genes, individual behavior and practices and is influenced by its selection. Cultural phenomenon effects the (5) Selecting environment and (6) is selected by the effects of these changes (Selection of culture). The controlling properties of the environmental settings on gene pool, behavior and practices depend on (7) cultural antecedents (e.g. available resources, economy, climate).

intervention. At the individual level, a doctor may arrange verbal contingencies in order to favor correct behavior towards vaccination. Accordingly, if an environmental setting is proven to be well-designed and deviant behavior or practices occur, intervention may focus on the individual or group adaptation to the environmental settings. In turn, if the environmental setting does not provide the necessary contingencies to select individual behaviors and practices, intervention will take place on environmental settings (e.g. laws, incentives, verbal discrimination of correct practices). Individual behavior and cultural practices will also covariate with physiological responses to vaccines and virus/bacteria's adaptation, and disease and thus natural selection should also be taken into consideration.

Conclusion

Skinner refers to behavioral selection as the only level in which variation is selected in a moment-to-moment manner. For him, “biologists and anthropologists study the process through which variations arise and are selected, but they merely reconstruct the evolution of species or culture” (Skinner, 1981, p. 502). As we argued throughout this text, behavior analysts have the tools to take part in functional analysis encompassing all levels of selection. Even if not following a clear path, behavior analysts are already using this integrative approach and opening new research areas, as well as developing new models for analysis and intervention. A notable example of an integrated functional analysis of organic and behavioral level is the **Multimodal Functional Model (MFM)**. MFM is a biomedical-psychological-socioenvironmental approach to support assessment and treatment of behavioral problems associated to mental illness (Hunter, Wilkniss, Gardner & Silverstein, 2008). On the functional analysis of behavioral and cultural level, the metacontingency has been an important tool to experimentally investigate selection of IBCs and aggregate product (Ortu, Becker, Woelz, & Glenn, 2012; Tadaiesky & Tourinho, 2012; Vasconcelos & Todorov, 2015), and analyze social issues (Machado & Todorov, 2008; Sandaker 2009; Todorov, 2005). In this paper we describe a new conceptual tool (TTCC) to be tested as a complementary approach when analyzing organic, behavioral and cultural selection/ evolution in an integrated manner.

References

- Campbell, D. T. (1956). Adaptive behavior from random response. *Behavioral Science, 1*(2), 105-110. doi:10.1002/bs.3830010204
- Catania, A. C., & Harnad, S. R. (1988). *The selection of behavior: The operant behaviorism of BF Skinner: Comments and consequences*. Cambridge University Press.
- Dawkins, R. (1984). Replicators, consequences, and displacement activities. *Behavioral and Brain Sciences, 7*(04), 486-487. doi: 10.1017/S0140525X00026790
- Donahoe, J. W. (1984). Skinner—the Darwin of ontogeny? *Behavioral and Brain Sciences, 7*(04), 487-488. doi: 10.1017/S0140525X00026807
- Donahoe, J. W., & Palmer, D. C. (1994). *Learning and complex behavior*. Boston, MA: Allyn & Bacon.
- Glenn, S. S. (1986). Metacontingencies in Walden Two. *Behavior Analysis and Social Action, 5*, 2-8.
- Glenn, S. S. (1988). Contingencies and metacontingencies: Toward a synthesis of behavior analysis and cultural materialism. *The Behavior Analyst, 11*(2), 161.
- Glenn, S. S., & Madden, G. J. (1995). Units of interaction, evolution, and replication: Organic and behavioral parallels. *The Behavior Analyst, 18*(2), 237.
- Glenn, S. S., & Malott, M. E. (2004). Complexity and selection: Implications for organizational change. *Behavior and Social Issues, 13*(2), 89-106. doi: 10.5210/bsi.v13i2.378
- Holliday, R., & Pugh, J. E. (1975). DNA modification mechanisms and gene activity during development. *Science, 187*(4173), 226-232.
- Hunter, R. H., Wilkniss, S., Gardner, W. I. & Silverstein, S. M. (2008). The Multimodal Functional Model—Advancing Case Formulation Beyond the “Diagnose and Treat” paradigm: Improving Outcomes and Reducing

- Aggression and the Use of Control Procedures in Psychiatric Care. *Psychological Services*, 5, 11-25. doi:10.1037/1541-1559.5.1.11
- Jablonka, E., Lamb, M. J., & Zeligowski, A. (2014). *Evolution in Four Dimensions, revised edition: Genetic, Epigenetic, Behavioral, and Symbolic Variation in the History of Life*. Cambridge, MA: MIT press.
- Kennedy, C. H., Caruso, M., & Thompson, T. (2001). Experimental analysis of gene-brain-behavior relations: some notes on their application. *Journal of Applied Behavior Analysis*, 34(4), 539-549. doi: 10.1901/jaba.2001.34- 539
- Laland, K. N., Odling-Smee, J., & Myles, S. (2010). How culture shaped the human genome: bringing genetics and the human sciences together. *Nature Reviews Genetics*, 11(2), 137-148. doi: 10.1038/nrg2734
- Machado, V.L.S., & Todorov, J.C. (2008). A Travessia na faixa de pedestre em Brasília (DF/Brasil): exemplo de uma intervenção cultural. [Walking the crosswalk in Brasilia (DF/ Brasil): an exmple of cultural intervention]. *Revista Brasileira de Analise do Comportamento / Brazilian Journal of Behavior Analysis*, 4(2), 191-204.
- Malott, M. E., & Glenn, S. S. (2006). Targets of intervention in cultural and behavioral change. *Behavior and Social Issues*, 15(1), 31-56. doi: 10.5210/bsi.v15i1.344
- Moore, J. (1997). Some thoughts on the S-R issue and the relation between behavior analysis and behavioral neuroscience. *Journal of the Experimental Analysis of Behavior*, 67(2), 242-245. doi: 10.1901/jeab.1997.67- 242
- Ortu, D., Becker, A. M., Woelz, T. A. R., & Glenn, S. S. (2012). An interated four-player prisoner's dilemma game with an external selecting agent: a metacontingency experiment. *Revista Latinoamericana de Psicologia*, 44(1), 111-120. doi: <http://dx.doi.org/10.14349/rlp.v44i1.937>
- Pyles, D. A., Muniz, K., Cade, A., & Silva, R. (1997). A behavioral diagnostic paradigm for integrating behavior- analytic and psychopharmacological

- interventions for people with a dual diagnosis. *Research in Developmental Disabilities, 18*(3), 185-214. doi: 10.1016/S0891-4222(97)00003-6
- Riggs, A. D. (1975). X inactivation, differentiation, and DNA methylation. *Cytogenetic and Genome Research, 14*(1), 9-25. doi: 10.1159/000130315
- Sandaker, I. (2009). A selectionist perspective on systemic and behavioral change in organizations. *Journal of Organizational Behavior Management, 29*(3-4), 276-293. doi: 10.1080/01608060903092128
- Skinner, B. F. (1953). *Science and human behavior*. New York: Simon and Schuster.
- Skinner, B. F. (1981). Selection by consequences. *Science, 213*(4507), 501-504. doi: 10.1126/science.7244649
- Skinner, B. F. (1988) Responses to commentaries. In: *The selection of behavior: The operant behaviorism of B. F. Skinner*. A. C. Catania & S. Harnad (Eds.). New York, NY: Cambridge University Press.
- Symons, F. J., Fox, N. D., & Thompson, T. (1998). Functional Communication Training and Naltrexone Treatment of Self--Injurious Behaviour: An Experimental Case Report. *Journal of Applied Research in Intellectual Disabilities, 11*(3), 273-292. doi: 10.1111/j.1468-3148.1998.tb00067.x
- Tadaiesky, L. T., & Tourinho, E. Z. (2012). Effects of support consequences and cultural consequences on the selection of interlocking behavioral contingencies. *Revista Latinoamericana de Psicología, 44*(1), 133-147. doi: 10.14349/rlp.v44i1.939
- Todorov, J. C. (2005). Laws and the complex control of behavior. *Behavior and Social Issues, 14*(2), 86. doi: 10.5210/bsi.v14i2.360
- Vasconcelos, I. G. & Todorov, J. C. (2015) Experimental analysis of the behavior of persons in groups: Selection of an aggregate product in a metacontingency. *Behavior and Social Issues, 24*, 111-125. doi: 10.52010/bsi.v24i0.5424



A systematic replication of Skinner (1938) using a hot air blast as the punisher*

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ABSTRACT: the present study was a systematic replication of the classic study by Skinner (1938) using a hot air blast (HAB) as the punisher. After lever press training, six rats underwent two extinction sessions. During the initial 10 min of extinction in the first session, half of the subjects received a HAB for every lever press (punishment). Subjects that received punishment made fewer lever presses during first extinction session, but the total number of responses in both groups was equivalent by the end of the second extinction session. The present data corroborate the findings of Skinner (1938) that the punishment may have partial and temporary effects in certain contexts. We discuss the ways in which the elicitation of competitive responses, the intensity and nature of the stimulus, and the duration of exposure to the aversive contingency are important factors that may explain the divergent results in the literature.

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The behavioral processes that are responsible for suppressing behavior in punishment contingencies is a highly debated topic (Arbuckle & Lattal, 1987; Azrin & Holz, 1966; de Villiers, 1980; Dinsmoor, 1998; Kubanek, Snyder, & Abrams, 2015; Paton & Louie, 2012; Rachlin & Herrnstein, 1969; Rasmussen & Newland, 2008; Skinner, 1938/1991, 1953). Theories usually advocate either of two perspectives: direct or competitive suppression. Direct suppression presumes that the observed suppression is caused by a direct learning process between the behavior and consequence, decreasing the probability of the punished response (Azrin & Holz, 1966; Catania, 1998). Competitive suppression is presumed to result from behavioral displacement through responses that compete with the punished response. Such competitive responses can be respondent (i.e., produced by contact with a punishing consequence or by a conditioned stimulus) or operant (i.e., produced by an automatic reinforcement of any response that prevents contact with the punishing stimulus; Sidman, 1989; Skinner, 1953).

One of the earliest and most cited studies that favor the competitive perspective is the experiment that was described by Skinner (1938/1991, Chapter 4, p. 154). In this study, eight food-deprived rats were trained to press a lever for food pellets under a fixed-interval (FI) 4-min schedule. After three sessions, lever pressing was placed under extinction conditions in two 120-min sessions. For half of the subjects during the initial 10min of the first extinction session, each lever press produced a reverse movement of the lever that slapped the rat's forepaw. Skinner reasoned that if punishment directly reduces the probability of responding, then the subjects that are submitted to punishment would perform fewer responses during the course of extinction. During the first 10min of extinction, the subjects in the punishment group made fewer lever presses than the unpunished group. However, when the punishment contingency was discontinued, the response

rate abruptly increased in the punished group, indicating compensatory responding. By the end of the second extinction session, both groups made a similar number of total lever press responses.

Skinner (1938/1991) stated that the punishment did not affect the response probability itself but rather produced a range of responses that prevented the subjects from pressing the lever. He referred to such responses as “emotional responses.” As time elapsed and punishment was not in effect anymore, the competitive responses extinguished, and lever pressing occurred with its usual probability. Two replications of this experiment were found in the literature, and both of them used electric shock instead of the “bar-slap.” Estes (1944, Experiment A) reproduced Skinner’s results, whereas Boe and Church (1967, Experiment 1) used various shock intensities and observed fewer responses in the punished groups, even at the lowest shock intensity (35 V).

Electric shock is the default stimulus in punishment experiments with nonhuman subjects because it is effective, can be quickly introduced and removed, and can be tested with a broad range of intensities and duration with great precision (Dinsmoor, 1998). Such characteristics facilitate replication and comparisons between studies. However, electric shock can also produce an array of physiological reactions (Flaherty, 1985) that most likely do not occur with other aversive stimuli. Thus, many authors argue that alternative aversive stimuli should be used to test the generality of behavioral principles that were previously established with electric shock (Barker et al., 2010; Branch, Nicholson, & Dworkin, 1977; Carvalho Neto et al., 2005; Catania, 1998; Church, 1969; Lerman & Vorndran, 2002; Mayer, Silva, & Carvalho Neto, 2015). One issue is whether the same behavioral mechanism is in effect when the consequence of responding is either an electric shock or a milder and less disruptive stimulus (as in Skinner, 1938/1991).

Since 2005, the hot air blast (HAB) has been tested with different aversive contingencies. It appears to be a promising alternative to electric shock because of its functional equivalence and because it does not elicit incompatible physiological responses or limit motor activity (Nascimento & Carvalho Neto, 2011). The HAB has been an effective punisher in both continuous and intermittent schedules (Carvalho Neto et al., 2005; Carvalho Neto, Maestri, & Menezes, 2007; Mayer et al., 2015) and in discriminated punishment (Carvalho Neto, Costa, Barros, Farias, & Rico, 2013). It has also been effective in strengthening escape responses and producing learned helplessness (Maestri, 2008) and conditioned suppression (Nascimento & Carvalho Neto, 2011; Nascimento, Monteiro, Gouveia, & Carvalho Neto, 2012).

Replication is a cornerstone of science that helps elucidate the necessary and sufficient conditions for a phenomenon to occur and limitations of analysis and conclusions. Although the aforementioned punishment experiment that was performed by Skinner (1938/1991) is still a classic study that supports Skinner's view on the subject among behavior analysts, only two replications of the study were found in the literature, and these two studies reported different results (Estes, 1944; Boe & Church, 1967) using the same stimulus (electric shock). The present study was a systematic replication of the punishment study by Skinner (1938/1991). We sought to verify the effects of the HAB as a punisher on the probability of a response class that is punished during extinction. We also discuss some issues that were raised by Skinner regarding the suppression of responding by punishment.

Methods

Subjects

The subjects were six male Long-Evans rats, 3 months old at the beginning of the experiment. They were provided by Instituto Evandro

Chagas (Ananindeua, Paraná, Brazil) and housed in individual cages with free access to food. Water was available for 10min after a minimum of 30min after each session. The experiment occurred during the light phase of a 12h/12h light/dark cycle. Care for the subjects was in accordance with the guidelines of the APA Ethical Principles and Brazilian College of Animal Experimentation (COBEA)¹.

Materials and Equipment

The experimental chambers comprised four Skinner boxes (Mod. 3, Insight Equipment) with one lever in the central position of the right wall and a dipper (20 ml cup of water) located below the lever. Two of these boxes were adapted for HAB use. The ceiling was replaced with an iron grate to enable delivery of the HAB. The floor grid was replaced by acrylic bars. An acrylic sheet was glued on top of the lever. These acrylic sheets were used to minimize the cumulative effect of heat from the HAB. Two common household blow dryers (Revlon, model RV429AB) were positioned on top of the box, one above the lever and another on the extreme left side of the box. The blow dryers were manually activated by the experimenter at their maximum intensity using a switch that was connected in series to an extension cord. After being activated for 5s, the chamber's temperature (about 24°C) increased by about 4°C. The air pressure of the HAB² was 216.5 dyn/cm², and the noise of each blow dryer was about 85 dB.

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1. The present study did not receive an ethics committee approval number because the data were collected in 2011, prior to the current national protocol for research with nonhuman animals. We followed the same principles that are promulgated by the APA Ethical Principles and COBEA.
 2. An automated version of the HAB, adapted to the MED equipment can be found in Mayer, Silva, and Carvalho Neto (2015).

Procedures

The subjects were water-deprived for 48h before each session. The deprivation time was justified by the high levels of humidity in the city where the experiment was conducted (usually > 80%).

During Phase 1, eight sessions were conducted, comprising lever press shaping, continuous reinforcement, and extinction. Sessions one through six lasted 30min and were performed once per week. Sessions seven and eight lasted for 1h, and each lever press produced one drop of water. From session seven onward, sessions occurred every 2 days. The rats that were used in this experiment were provided after being used in an undergraduate experimental psychology course. All of the procedures that were performed in this course are described in this Phase 1.

For Phase 2, the subjects were randomly assigned to one of two groups: HAB or Extinction (EXT). For the HAB group, sessions were conducted in the adapted chambers. Phase 2 comprised three 60min sessions, during which lever presses produced water on an FI-4 min schedule. During the first session, the intervals were progressively increased (five reinforcers for 30, 45, 60, and 90; three reinforcers for 120, 180, and 240s). Phase 3 comprised two 2h sessions of extinction (lever presses did not produce water). For the HAB group, during the first 10 min of the first extinction session, each lever press activated the HAB for 5s. Activation of the HAB was not cumulative, additional lever presses while the HAB was activated did not extend the duration of the HAB.

During each session, the number of lever presses per minute was recorded using an automated digital recorder that was connected to the lever. The percentage of responses during the extinction sessions was calculated based on the total responses in the last FI session to allow proportional comparisons among subjects.

Results

Figure 1 shows that the HAB group made fewer lever presses (14 vs. 95 responses) during the initial 10 min of extinction when the punishment contingency was in effect. This difference decreased throughout the extinction sessions. After 100 min of extinction, the two groups presented no differences in the number of lever presses.

The individual data that are presented in Figure 2 indicate mixed results for the HAB group compared with the Ext group. During first 10 min of Phase 3 when the punishment contingency was in effect, all of the subjects in the HAB group responded less than the Ext group, but higher response rates were observed in the HAB group during the next 20 min after punishment (i.e., minutes 10-30). From minute 30 to the end of Day 1, the curves for subjects HAB1 and HAB2 were indistinguishable from the curves for Ext subjects. Subject HAB3 exhibited a decrease in responding after minute 20 of Day 1, and the total responding for this animal remained below any frequency that was observed for Ext subjects until the end of the study. Subject HAB1 continued to respond similarly to the subjects in the Ext group during Day 2, with higher rates of responding during the first half of the session followed by lower and more spaced responding. Subject HAB2 responded at almost constant rates throughout the session (approximately 3 responses/minute), reaching the highest total responding observed (even compared with EXT subjects).

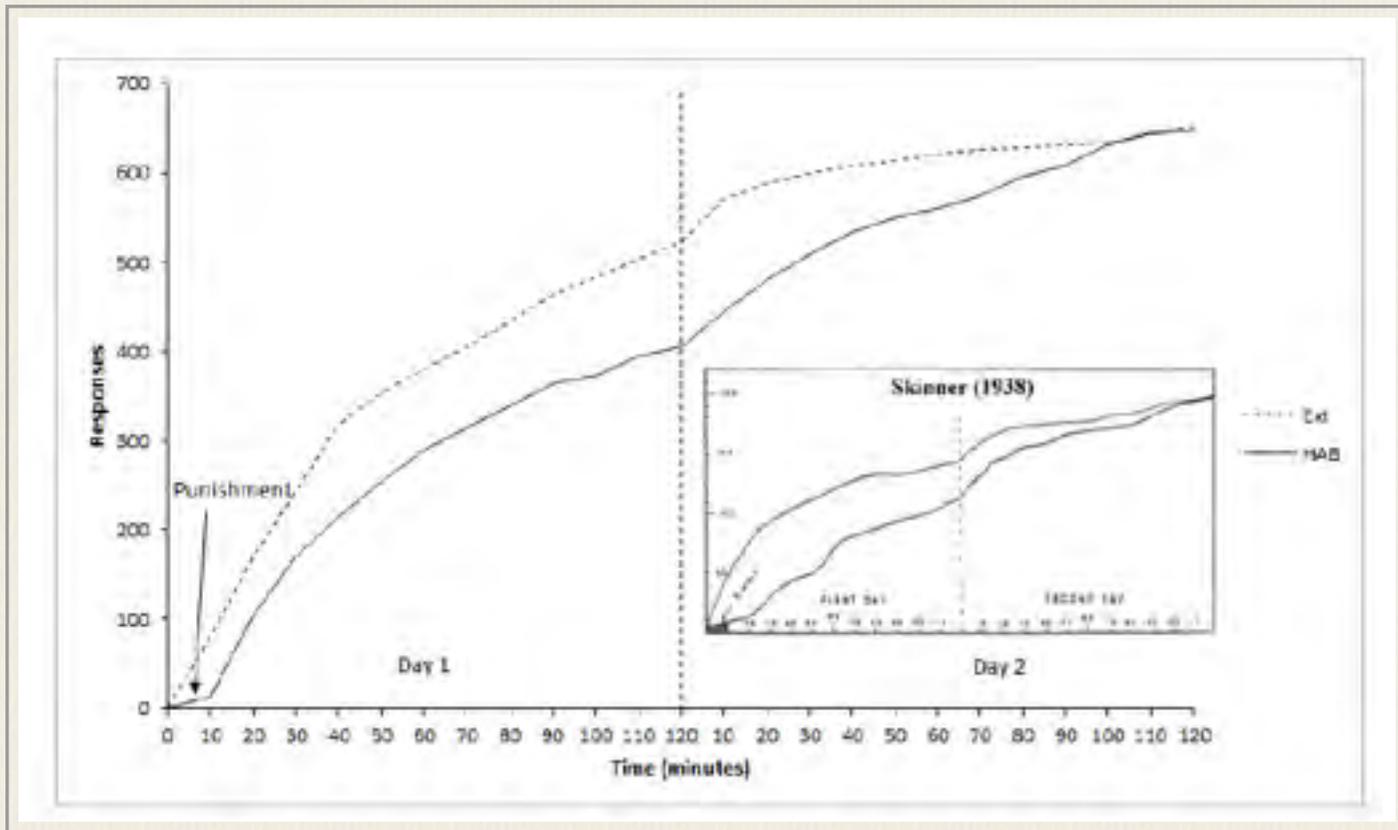


Figure 1. Mean cumulative record of lever presses during Phase 3 in each group compared with Skinner (1938) (inset; reproduced with permission).

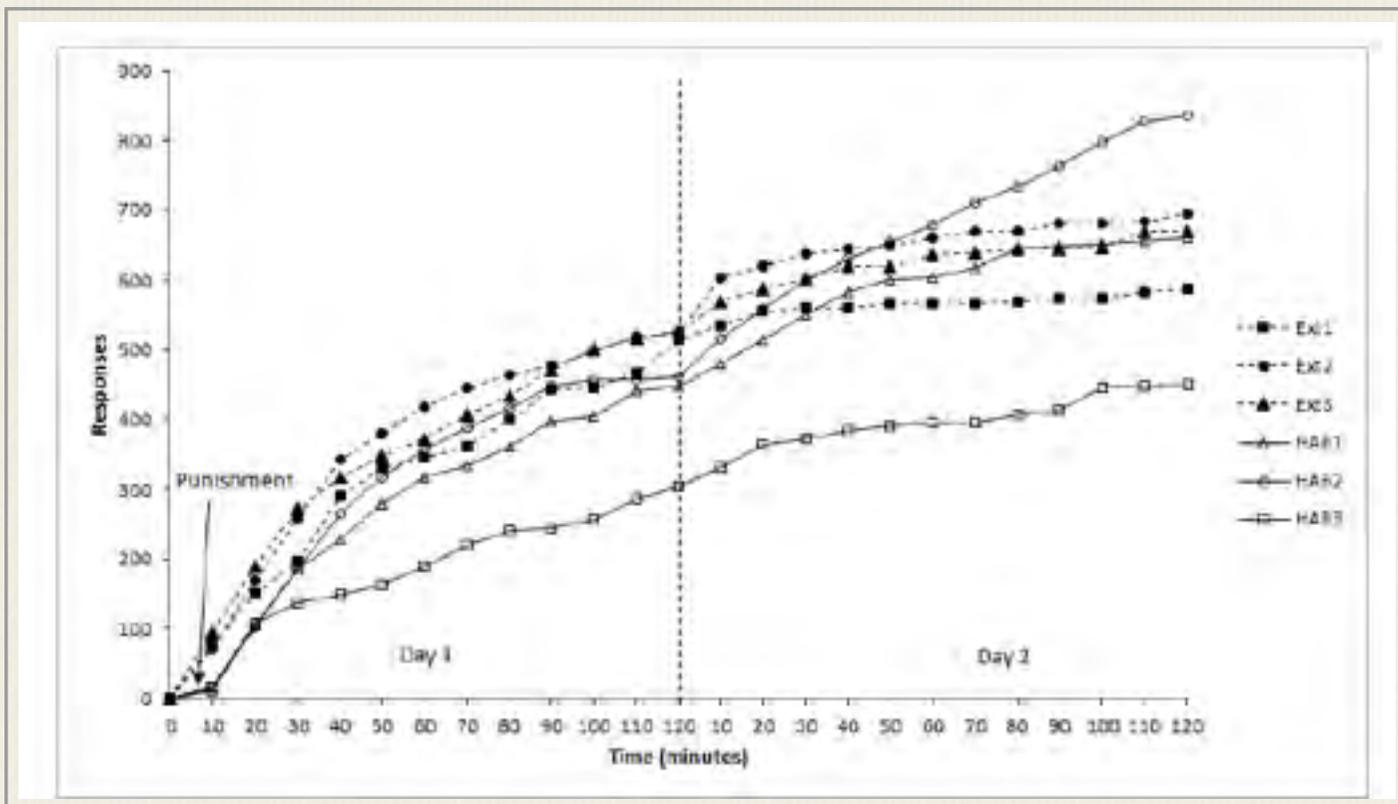


Figure 2. Individual cumulative records of lever presses during Phase 3. Dashed lines and filled shapes correspond to subjects in the Extinction group. Solid lines and open shapes correspond to subjects in the HAB group.

A detailed set of data from Phases 2 and 3 is presented in Table 1. Subjects in the HAB group made an average of 14% more lever presses in Phase 2 (training) than subjects in the Ext group. The number of HAB exposures equated with the number of responses during the initial 10 min of the first extinction session (Ext1[10']) in Phase 3 and varied between 11 for subject HAB1 and 16 for subject HAB2.

Table 1.

Individual and Mean Lever Press Responses in Each Session in Phases 2 and 3. Ext1(10') Indicates the Number of Lever Presses During the First 10 min of the First Extinction Session.

	Extinction Group (EXT)				Hot Air Blast Group (HAB)			
	Ext1	Ext2	Ext3	Mean	HAB1	HAB2	HAB3	Mean
FI1	884	597	745	742	835	701	1146	894
FI2	729	902	921	850.7	1110	658	899	889
FI3	587	851	755	731	935	726	941	867.3
FI Mean	733.3	783.3	807	774.6	960	695	995.3	883.4
EXT1(10')	76	70	95	80.3	11	16	15	14
EXT1+EXT2	590	695	670	651.7	659	836	451	648.7

Discussion

The present study reproduced the results that were reported by Skinner (1938/1991), in which subjects that were exposed to punishment made fewer responses during punishment and recovered responding after punishment ceased, presenting a similar total number of responses as the unpunished group by the end of the experiment. Table 1 shows no linear relationship between the number of responses during training (Phase 2) and Extinction (Phase 3) in the EXT group. The data from the HAB subjects, however, suggested an inverse relationship between the total number of lever presses in Phase 2 and the number of responses during extinction, which was contrary to expectations. The total number of contacts with the punisher was not a predictor of the maintenance of suppression; the subject that was most

exposed to the punisher also made more responses during extinction (subject HAB2).

To account for these similar results, Skinner (1938/1991) referred to competitive responses (i.e., conditioned or unconditioned) that were elicited. Although Skinner did not present any description of these alleged competitive responses and they were not recorded in the present study, Silva, Carvalho Neto, and Mayer (2014) both recorded and described such responses that were produced by activation of the HAB. A range of responses that could compete with lever pressing, such as stretching the body on the floor, sniffing the ceiling, and exploring the chamber, were documented and could also have interfered with lever pressing in the present study.

The counterintuitive relationship between the number of responses during training and extinction (after punishment) and the higher range of individual differences in the HAB group appears to be consistent with Skinner (1938/1991, 1953), in which punishment may have an “emotional” effect. In this case, suppression of the punished response occurs not through legitimate operant learning but rather through a disruption of ongoing behavior (see Church, 1969). Similar effects are produced when an abrupt and sudden environmental change occurs, such as a loud noise. Even if this event is unrelated to any behavior, it may make the subject stop what it is doing, resulting in heart rate acceleration, startle responses, freezing, or changes in attentional states. Because of the short exposure to the HAB (between 11 and 16 contacts) and because it was a stimulus that produced a very drastic environmental change (i.e., noise, heat, and blast), the subjects may have still been adapting to its novelty, and no genuine operant stimulus-response learning occurred. A replication of this study using response-independent presentations of the HAB would be an interesting way to test this hypothesis.

Nonetheless, we do not suggest that competitive responses or emotional states may be the cause of suppression in all punishment scenarios. In Boe and Church (1967), for example, suppression was maintained after 9h of extinction. Therefore, it would not be parsimonious to suppose that the alleged competitive responses (i.e., the emotional reaction to punishment) were still in effect to prevent the punished operant from occurring.

Rachlin (1966) observed two effects when a mild shock was used as punishment: (1) strong and immediate suppression of responding that dissipates and is unrelated to the correlation between the consequence and the response and (2) gradual stabilization of the levels of suppression that depend on the correlation between the response and the consequence. This author argued that these two effects overlap when intense electric shocks are applied. The first effect lasts longer, and the second appears sooner, resulting in a direct decrease in the probability of responding.

According to Bolles, Uhl, Wolfe, and Chase (1975), learning a response-consequence relationship may require several occurrences. In their study, rats were exposed to response-independent shocks in the absence of light and to contingent shocks in the presence of light. These rats required more than 30 sessions to exhibit differential response suppression between conditions, and learning occurred gradually. Moreover, the subjects that were initially exposed only to the contingent discriminated punishment increased their responses when the free-shock condition was added. These results indicate that long exposures to punishment conditions may be necessary for the contingency to be learned and that the eliciting properties of electric shocks do not always compete with the operant and are not solely responsible for suppression.

When we apply the analyses of Rachlin (1966) and Bolles et al. (1975) to the present experiment, longer exposures to the punishment procedure would be needed for effects on response probability to be observed (i.e., a lower number of responses during extinction as suggested by Skinner,

1938/1991). The present experiment also raises concerns regarding the search for a single explanation for the suppression of responding by punishment. Considering the variety of procedures, arrangements, and stimuli (e.g., electric shock, response cost, noise, light, drugs), a reasonable possibility is that more than a one mechanism of suppression may be in effect in these different conditions. Some combinations may produce suppression through indirect mechanisms, as suggested by Skinner (1938/1991, 1953), and other combinations may reflect a direct learning process as suggested by Azrin and Holz (1966). If so, then such perspectives would help explain the lack of consensus on this subject and orient empirical investigations and theoretical synthesis in a more productive direction (Carvalho Neto, Mayer & Ferreira, 2017).

The issue of response recovery in punishment experiments is also complex. Response recovery has been described in the literature using different terms, such as habituation (Linscheid, Iwata, Ricketts, Williams, & Griffin, 1990), behavioral contrast (Azrin & Holz, 1966), resurgence (Okouchi, 2015), behavior release (Rasmussen, 2006), renewal, reinstatement, lapse, and relapse (Bouton, 2014; Bouton & Schepers, 2015). Each of these constructs is based on different assumptions and independent variables. This results in a large and complex dataset that is difficult to group and compare because of their procedural and theoretical diversity.

With regard to specifically the HAB, despite the response recovery that was observed, it suppressed responding while in effect. The HAB is a compound stimulus, and its aversiveness appears to be related to a combination of its properties. When only the sound or sound plus air blast without heat were used as a consequence of responding (e.g., lever pressing in rats), little or no suppression was observed, even by the end of the first session (Rodrigues, Nascimento, Cavalcante, & Carvalho Neto, 2008). In contrast, relatively constant suppression by ~90% was found during 20 sessions of punishment when all of the properties of the HAB (i.e., sound, blast, heat) were used (Carvalho Neto et al., 2007). Yet another study

indicated that the aversiveness of the HAB is progressive and appears to be effective after at least 3s of exposure (Mayer et al., 2015). Further studies are needed to determine the extent of similarities between the HAB and electric shock.

The present study adds to the behavioral literature by providing another replication of a classic and widely cited study using a novel aversive stimulus. We reproduced the results of Skinner (1938) and raise important questions that will encourage further studies. When Skinner's experiment was previously replicated with an electric shock, the intensity of the stimulus was shown to be a critical variable for the maintenance of suppression (Boe & Church, 1967). In the present study, although the stimulus produced reliable and stable suppression of behavior (i.e., no recovery while the punishment contingency was in effect), the response recovered after punishment was discontinued, indicating that the initial suppression of responding may not necessarily be indicative of long-term effectiveness of the punishment procedures. It also raises the issue that stimuli that produce drastic environmental changes (e.g., in the present study, noise + heat + air blast) may take longer to produce operant learning (i.e., an association between the response and consequence). This calls attention to variables that may be related to the different processes that are involved in the suppression of responding.

References

- Arbuckle, J. L. & Lattal, K. A. (1987). A role for negative reinforcement of response omission in punishment. *Journal of the Experimental Analysis of Behavior*, *48*(3), 407-416.
- Azrin, N. H. & Holz, W. C. (1966). Punishment. In: W. K. Honig (Ed.), *Operant behavior: areas of research and application* (pp. 380-447). New York: Appleton-Century-Crofts.
- Barker, D. J., Sanabria, F., Lasswell, A., Thraikill, E. A., Pawlak, A. P., & Kileen, P. R. (2010). Brief light as a practical aversive stimulus for the albino rat. *Behavioural Brain Research*, *214*(2), 402-408.
- Boe, E. E., & Church, R. M. (1967). Permanent effects of punishment during extinction. *Journal of Comparative and Physiological Psychology*, *63*(3), 486-492.
- Bolles, R. C., Uhl, C. N., Wolfe, M., & Chase, P. B. (1975). Stimulus learning versus response learning in a discriminated punishment situation. *Learning and Motivation*, *6*(4), 439-447.
- Bouton, M. E., & Schepers, S. T. (2015). Renewal after the punishment of free operant behavior. *Journal of Experimental Psychology: Animal Learning and Cognition*, *41*(1), 81-90.
- Bouton, M. E. (2014). Why behavior change is difficult to sustain. *Preventive Medicine*, *68*, 29-36.
- Branch, M. N., Nicholson, G., & Dworkin, S. I. (1977). Punishment-specific effects of pentobarbital: dependency on the type of punisher. *Journal of the Experimental Analysis of Behavior*, *28*(3), 285-293.
- Carvalho Neto, M. B., Costa, J. R., Barros, R. S., Farias, D. C., & Rico, V. V. (2013). Discriminação com três diferentes contingências em SΔ: extinção, reforçamento e punição, extinção e punição. *Interação em Psicologia*, *17*(2), 171-179.

- Carvalho Neto, M. B., Maestri, T. C., & Menezes, E. S. R. (2007). O jato de ar quente como estímulo aversivo: efeitos de sua exposição prolongada em *Rattus norvegicus*. *Acta Comportamentalia*, 15(2), 171-190.
- Carvalho Neto, M. B., Maestri, T. C., Tobias, G. K. S., Ribeiro, T. C., Coutinho, E. C. N. N., Miccione, M. M., Oliveira, R. C. V., Ferreira, F. S. S., Farias, D. C., & Moreira, D. (2005). O jato de ar quente como estímulo punidor em *Rattus norvegicus*. *Psicologia: Teoria e Pesquisa*, 21(3), 335-339.
- Carvalho Neto, M. B., Mayer, P. C. M., & Ferreira, P. A. (2017). Simetrias e assimetrias entre reforçamento e punição: Uma proposta taxonômica. *Acta Comportamentalia*, 25(1), 73-84.
- Catania, A. C. (1998). *Learning*, 4th ed. Upper Saddle River: Prentice Hall.
- Church, R. M. (1969). Response suppression. In: B. A. Campbell & R. M. Church (Eds.), *Punishment and aversive behavior* (pp. 111-156). New York: Appleton-Century-Crofts.
- de Villiers, P. A. (1980). Toward a quantitative theory of punishment. *Journal of the Experimental Analysis of Behavior*, 33(1), 15-25.
- Dinsmoor, J. A. (1998). Punishment. In: W. T. O'Donohue (Ed.), *Learning and behavior therapy* (pp. 188-204). Boston: Allyn & Bacon.
- Estes, W. K. (1944). An experimental study of punishment. *Psychological Monographs*, 57(3), 1-40.
- Flaherty, C. F. (1985). *Animal learning and cognition*. New York: McGraw-Hill.
- Kubaneck, J., Snyder, L. H., & Abrams, R. A. (2015). Reward and punishment act as distinct factors in guiding behavior. *Cognition*, 139, 154-167.
- Lerman, D. C., & Vorndran, C. M. (2002). On the status of knowledge for using punishment: implications for treating behavior disorders. *Journal of Applied Behavior Analysis*, 35(4), 431-464.

- Linscheid, T. R., Iwata, B. A., Ricketts, R. W., Williams, D. E., & Griffin, J. C. (1990). Clinical evaluation of the self-injurious behavior inhibiting system (SIBIS). *Journal of Applied Behavior Analysis*, 23(1), 53-78.
- Maestri, T. C. (2008). *O estudo do desamparo aprendido em função de dois estímulos aversivos: jato de ar quente e choque elétrico*. Unpublished masters thesis. São Paulo: Instituto de Psicologia, Universidade de São Paulo.
- Mayer, P. C. M., Silva, G. F., & Carvalho Neto, M. B. (2015). Punishment of instrumental and consummatory responses with a hot air blast in rats. *Behavior Analysis: Research and Practice*, 15(1), 58-64.
- Nascimento, G. S., & Carvalho Neto, M. B. (2011). Supressão condicionada com diferentes estímulos aversivos: choque elétrico e jato de ar quente. *Acta Comportamental*, 19(3), 269-280.
- Nascimento, G. S., Monteiro, P. C. M., Gouveia Jr., A., & Carvalho Neto, M. B. (2012). Subchronic effects of fluoxetine on conditioned suppression produced by a hot air blast. *Psychology and Neuroscience*, 5(1), 117-122.
- Okouchi, H. (2015). Resurgence of two-response sequences punished by point-loss response cost in humans. *Revista Mexicana de Análisis de la Conducta*, 41(2), 137-154.
- Paton, J. J., & Louie, K. (2012). Reward and punishment illuminated. *Nature Neuroscience*, 15(6), 807-809.
- Rachlin, H., & Herrnstein, R. J. (1969). Hedonism revisited: on the negative law of effect. In: B. A. Campbell & R. M. Church (Eds.), *Punishment and aversive behavior* (pp. 83-109). New York: Appleton-Century-Crofts.
- Rachlin, H. (1966). Recovery of responses during mild punishment. *Journal of the Experimental Analysis of Behavior*, 9(3), 251-263.
- Rasmussen, E. B. (2006). “Behavior-releasing” effects of drugs: anti-punishment and anti-conflict procedures. *Revista Mexicana de Análisis de la Conducta*, 32(1), 73-91.

- Rasmussen, E. R., & Newland, M. C. (2008). Asymmetry of reinforcement and punishment in human choice. *Journal of the Experimental Analysis of Behavior*, 89(2), 157-167.
- Rodrigues, B. D., Nascimento, G. S., Cavalcante, L. C., & Carvalho Neto, M. B. (2008). Efeitos da punição de uma classe de respostas usando diferentes dimensões e intensidades do jato de ar quente. *Brazilian Journal of Behavior Analysis*, 4(2), 231- 241.
- Sidman, M. (1989). *Coercion and its fallout*. Boston: Authors Cooperative.
- Silva, G. F., Carvalho Neto, M. B., & Mayer, P. C. M. (2014). O jato de ar quente como estímulo aversivo antecedente. *Acta Comportamentalia*, 22(2), 135-151.
- Skinner, B. F. (1938/1991). *The behavior of organisms: an experimental analysis*. Cambridge: B.F. Skinner Foundation.
- Skinner, B. F. (1953). *Science and human behavior*. New York: MacMillan.



Induced aggression in JEAB: a survey of publications*

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ABSTRACT: Early experimental research on induced aggression aimed to set the direct relation between aversive stimulation and aggressive behavior. The generality of the phenomenon was evaluated with variations in the subjects' species and in the inducting stimuli. Seminal studies on induced aggression were published in the Journal of the Experimental Analysis of Behavior (JEAB). The objectives of the present study were systematically present the temporal distribution of publications on induced aggression in JEAB and describe the studies' methodological aspects. The terms “aggress*”, “fight*”, and “attack*”

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were searched in the Wiley Online Library database, and selecting criteria were applied. Fifty-eight articles were analyzed. The global representativeness of publications about induced aggression in JEAB is 1.1%. Between 1962 and 1981, there were regular publications about induced aggression in the journal, representing 2.8% of the publications in JEAB in the referred period. During this interval, a first period of publications was marked by investigations involving the exposition of rats and squirrel monkeys to electric shock, which would result in fighting and biting aggressive responses, respectively; a second period was marked by studies involving the exposition of pigeons to schedules of reinforcement, resulting in aggressive pecking responses. The publication pattern of induced aggression on JEAB is in agreement with previous indications regarding the temporal distribution of general publications on induced aggression. Limitations of the present work are discussed, and suggestions for additional research are provided.

Keywords: induced aggression, JEAB, survey

In a world widely grounded in aversive control, the side effects of aversive stimulation on the functioning of the organisms deserve detailed investigation (Sidman, 1989). Aggressive behavior is frequently listed as one of these side effects (e.g. Carvalho Neto & Morales, 2011), and Behavior Analysis has dedicated some basic experimental efforts in the investigation of its environmental causes (Hutchinson, 1973). As a contemporary topic of major concern (World Health Organization, 2015, 2016), the understanding of the environmental variables that control aggressive and violent behavior certainly has a relevant status. Behavior-analytic basic research about aggression induced by aversive stimulation is a traditional approach to the topic (Viken & Knutson, 1992). Its historical and methodological aspects seem important to be aware of, especially to support translational

investigation, i.e., the extension of knowledge from basic research to relevant social interventions (Mace & Critchfield, 2010).

In this sense, the first systematic investigation of the phenomenon of aggression induced by aversive stimulation in the field of Experimental Analysis of Behavior (EAB) was conducted by Ulrich and Azrin (1962). This work described a series of experiments, in order to show the causal relation between aversive stimulation and aggressive behavior, in an attempt to clarify the behavioral principles involved in a type of phenomenon already observed by some experimental psychologists. The experiments conducted by Ulrich and Azrin (1962) programmed the application of electric shocks to the feet of pairs of rats, generating a very consistent pattern of stereotyped fighting between the two animals. The experimenters manipulated variables such as frequency of shock presentation, shock intensity, use of electrode shock, size of the chamber, previous experience (housing of the rats), sex, intense heat as aversive stimulus, number of rats in the experimental chamber, among others variables, and verified the fighting response resulting with high probability, under the right conditions. Ulrich and Azrin (1962) described the phenomenon as “reflexive fighting”. Alternative explanations for the aggressive reaction (e.g., negative reinforcement of the response) were excluded, due to the specificity of the results.

The study of Ulrich and Azrin (1962) is considered seminal for the experimental research about aggression (Viken & Knutson, 1992). Ulrich (1966) reviewed the basic experimental studies about pain-induced aggression conducted in the first years of publications. He pointed out additional variables that could affect the fighting responses between rats, resulting from exposition to aversive stimulation. The effects of shock duration, intra-cranial stimulation, castration, age, and social isolation, among others, were reported. He also described the occurrence of pain-induced aggression in other species (mice, cats, pigeons, monkeys, and humans), the respondent and operant conditioning of aggression, and the

interactions between those learned responses. Ulrich (1966) classified fighting, and other aggressive responses, as reflexive behavior.

The first ten years of basic research about pain-induced aggression, in the field of EAB, were also documented by Hutchinson (1973). According to this author, the generality of pain-induced aggression increased over the years, giving to the phenomenon a scientific status. The application of physical blows and tailshocks (both in monkeys), air blasts (rats), loud noises (humans), the withdrawal of food (pigeons), morphine and money (humans), physical restraining (monkeys), and the subsequent application of appetitive stimuli (target contact, in monkeys; food, in pigeons; brain stimulation, in rats), and aversive stimuli (conspecific attack and tailshock, in monkeys), among others, would lead to aggressive responses against the social or physical environment. Hutchinson (1973) argued for the understanding of the aggressive phenomenon as a whole, through the variables and models described in the behavior-analytic basic investigations.

In parallel to those studies involving direct exposure of subjects to painful stimuli, the work of Azrin, Hutchinson, and Hake (1966) pioneered the investigation of induction of aggressive responses by exposition to operant extinction, based on unsystematic observations in other studies. The basic procedure consisted in the placement of two pigeons in the same experimental chamber; one of the pigeons was restrained, and the other one was exposed to alternate periods of food reinforcement of a key-pecking response, and extinction. Aggressive responses toward the restrained pigeon would occur shortly after the transition to the extinction condition. Azrin et al. (1966) pointed out that intermittent reinforcement should also induce aggressive behavior, since it includes periods of operant extinction.

The work of Azrin et al. (1966) started an entire branch of research about aggression induced by intermittent positive reinforcement, based on the pain-induced aggression model (Looney & Cohen, 1982). The first ten years of behavior-analytic basic research involving schedule-induced

aggression is documented in a review by Frederiksen and Peterson (1977). The generality of the phenomenon was expanded to induction of aggressive responses during fixed- and variable-ratio, fixed- and variable-interval, and DRL reinforcement schedules. Both humans and nonhumans (rats, monkeys, and pigeons) could emit aggressive responses toward the social and physical environment. Due to the different results with regard to the distribution of the aggressive responses within the types of schedule of reinforcement, Frederiksen and Peterson (1977) refrain from classifying schedule-induced aggression as respondent or operant; rather, they proposed that the phenomenon seems closer to adjunctive behavior.

A thorough review about schedule-induced aggression, by Looney and Cohen (1982), added more evidence to the generality of the phenomenon. The authors reported, in detail, the aggressive response topography for each species investigated until then: pigeons pecked the eyes and head of a live or stuffed pigeon, pulling out their feathers; rats threatened, stroked, and bit another rat; monkeys bit a rubber hose; humans punched cushions, and contracted their jaws. This review also reported the temporal organization of the aggressive responses under each schedule, their reinforcement through schedules, the effect of subject variables (e.g., age, sex), and a variety of targets utilized (emphasizing the transition from live ones, to inanimate). Looney and Cohen (1982) emphasized the non-learned aspect of the reaction and made considerations about the practice of using mostly pigeons as subjects, calling for research with mammalian species. The authors agreed with Frederiksen and Peterson (1977) about the similarity of the phenomenon with the ones called “adjunctive behavior”. However, Looney and Cohen discarded the possibility of induced aggression serving as a unique model to study the aggression phenomenon, and defended the idea that the induction by schedules is possibly one of the many ways of inducing this kind of behavior.

The basic research on pain- and schedule- induced aggression, roughly summarized above, was comprehensively reviewed and discussed by Ulrich

(1966), Hutchinson (1973), Frederiksen and Peterson (1977) and Looney and Cohen (1982). In these reviews, there are many references to experimental works published in the Journal of the Experimental Analysis of Behavior (JEAB). This journal also published the precursor experiments from Ulrich and Azrin (1962) and Azrin et al. (1966), above-mentioned. As JEAB can be considered the flagship journal of EAB (Laties, 2008), a literature survey in the journal can partially map the level of interest in the particular topic. In order to provide a systematic presentation of EAB length of concern with aggression induced by aversive stimulation (for unsystematic commentaries, see Archer, 1989, 1995; Berkowitz, 1993), our objective was to survey JEAB publications, showing the temporal distribution of studies on the subject matter, and presenting some of their methodological characteristics over time.

Literature surveys (e.g., Lyon, Picker, & Poling, 1985; Zimmermann, Watkins, & Poling, 2015) may serve to help the behavior-analytic community to acknowledge patterns and trends in their own research activity, fostering the identification of aspects that need improvement, such as overlooked areas of basic research, and/or neglected potentials of translational research, for example.

Method

Procedure

The terms “aggress*”, “fight*”, and “attack*” were searched in the Wiley Online Library database, through the website [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1938-3711](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1938-3711). This database indexed all the articles published in the Journal of the Experimental Analysis of Behavior (JEAB) at the time of the research. Due to the diversity of terminology (for instance, “pain-elicited”, “schedule-induced”, “biting

attack”, “reflexive fighting”), broader terms were also searched, and selecting criteria were applied to the outcomes.

Two criteria were considered to select a given study: a) the treatment of aggressive behavior both as dependent, and/or independent variable; b) the induction of the aggressive behavior by some event with aversive properties (as described in the study). The abstracts and, eventually, the entire articles were consulted, in order to verify if they meet the criteria.

Information from the selected studies were extracted according to the following categories: publications by year, species used, inducting stimulus, response topography, and target of the aggressive response. The organized information served as basis for the analysis.

Results

A number of 58 studies met the established criteria. Information obtained from these selected articles is exhibited in two major categories: “Publications by Year”, and “Methodological Aspects” - the latter divided in “Inducting Stimulus”, “Response Topography”, and “Target of the Aggressive Response”. All results are presented considering their chronological publication, paying attention to the species employed as experimental subject.

Publications by Year

The findings relative to “Publications by Year” category are presented in Figure 1. The publications’ distribution is presented in two sets of data: absolute frequency and percentage of publications about induced aggression, relative to the total of publications in the journal that year (representativeness). The option of presenting the data also in relative percentage accounts for a compensation: due to the smaller quantity of general publications by year in more recent issues (i.e., more pages by article), the presentation in relative percentage provides more accurately the

representativeness of the publications about induced aggression in JEAB year-by-year, compared to the presentation in absolute frequency (see Lyon et al., 1985).

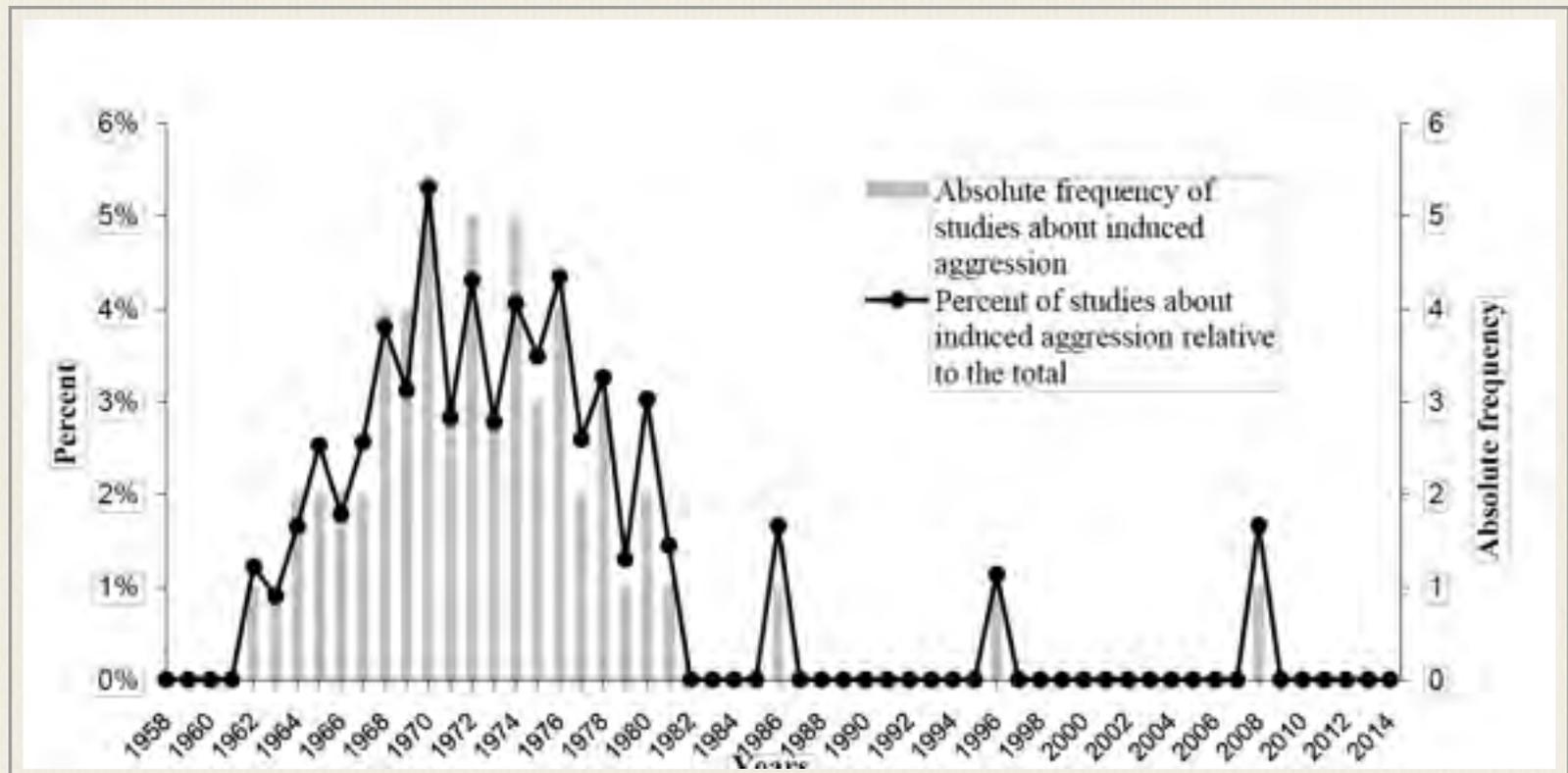


Figure 1. Distribution of publications from 1958 to 2014 in JEAB. The data is presented in relative percentage (representativeness) and in absolute frequency. Cumulative lines are ruled by the left axis; bars are ruled by the right axis.

The representativeness of studies about induced aggression in JEAB was 1.1% of the total of general publications. The absolute values of representativeness and frequency were quite similar, and almost coincident, from 1958 to 2014. Differences in representativeness are clear even when the number of publications is the same, though. For instance, in 1963 and 2008 there was one publication by year, but representativeness was 0.9% and 1.6%, respectively; in 1970, 1972, and 1974, there were five publications by year, but representativeness was 5.3%, 4.3%, and 4.0%, respectively.

Studies about induced aggression were reported regularly (at least one publication per year) from 1962 to 1981, representing 2.8% of the publications in JEAB in the period. There was an increase in representativeness from 1962 to 1970, and a gradual decrease until 1981.

Over 20 years of regular publication, there were 55 studies (average 2.8 articles by year), varying from 1.0 (1962, 1963, 1979, and 1981) to 5.0 (1970, 1972, and 1974) by year. In the year 1970, the field reached its maximum in representativeness: 5.3%, with five publications.

Methodological features of published studies

Figures 2-4 synthesize the methodological features of the selected studies (Inducting Stimulus [Figure 2], Response Topography [Figure 3], and Target of the Aggressive Response [Figure 4]). Figures present all the inducting stimuli, response topographies, and targets of the aggressive responses in the 58 selected works from JEAB. One of the selected works (i.e. Azrin, Hutchinson, & Hake, 1967) had both rats and squirrel monkeys as subjects, consequently employing two categorically different inducting stimuli, observing two different response topographies, and employing two different targets. That is why the methodological aspects are described by year of occurrence, not in terms of number of publications.

Inducting stimuli

Six inducting stimuli were found (electric shock, tail-pinch, physical blow, schedule of reinforcement, conditioned stimulus, and operant extinction). They were expanded to 11 categories in order to account for the different species exposed to the stimuli: two categories for rats, four for squirrel monkeys, three for pigeons, one for humans, and one for turtles. Figure 2 shows the absolute distribution across years, in which the 11 stimuli were reported.

The use of the category “Electric Shock (Rats)” as inducting stimulus was reported 15 times, from 1962 to 1978, regularly between 1967 and 1972. “Electric Shock (Squirrel Monkeys)” was reported 11 times, from 1963 to 1986, with regularity during 1963 to 1972. The use of “Schedule of

Reinforcement (Pigeons)” was reported 21 times, from 1968 to 2008, and regularly between 1972 and 1981. The use of other stimuli was mostly reported during the same period in which the same species was used with regularity.

Response topography

Four response topographies were found (fight, bite, peck, and punch). These response topographies were expanded to seven categories to account for the different species-specific aggressive response topographies: two categories for rats, two for squirrel monkeys, one for pigeons, one for humans, and one for turtles. Figure 3 presents the absolute distribution of years in which the seven topographies were observed/reported.

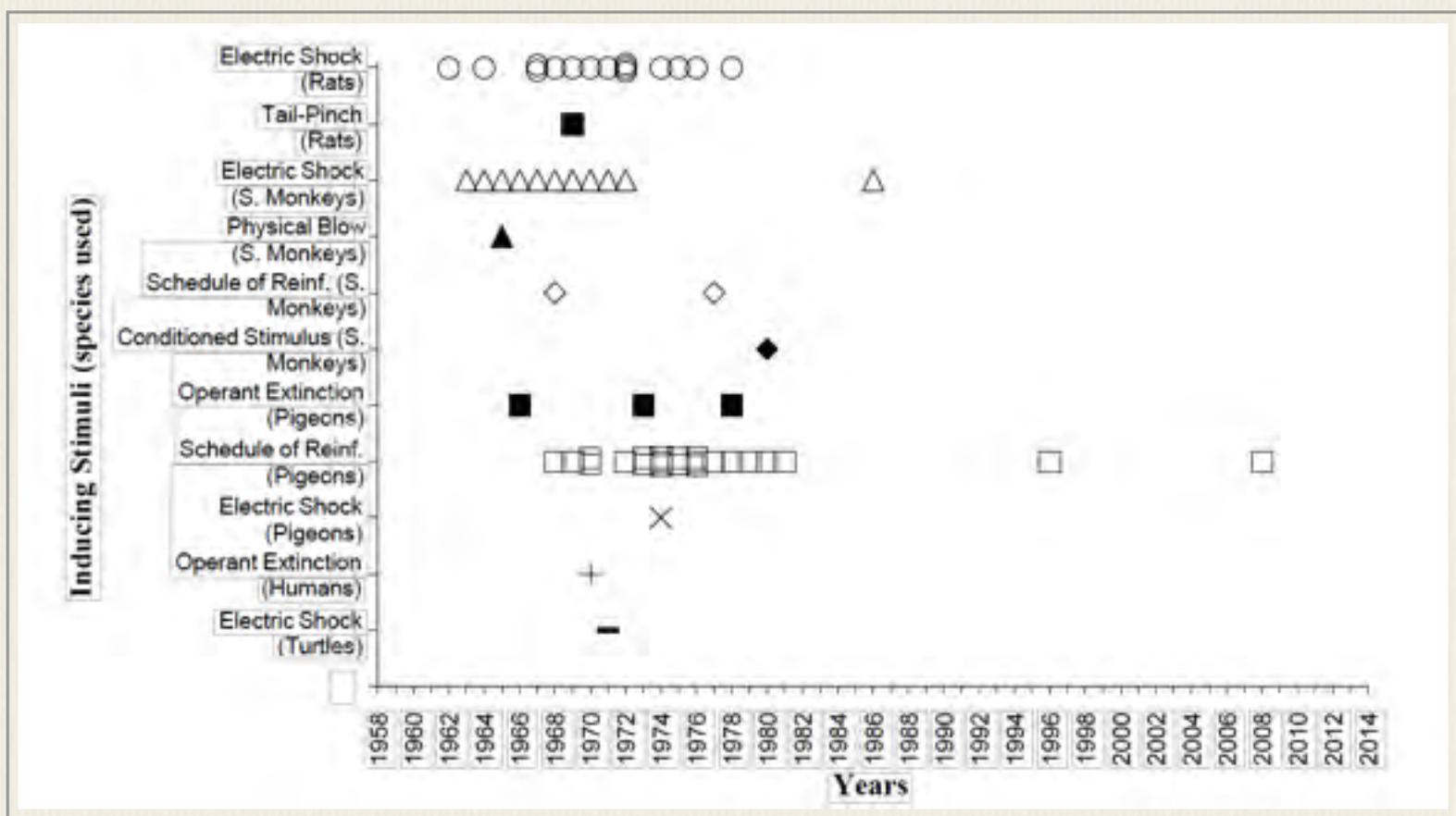


Figure 2. Distribution of the eleven inducing stimuli across years in which they were reported in the selected studies of JEAB, from 1958 to 2014. Each marker is for one occurrence. Circle markers are for rats, triangle and diamond for squirrel monkeys, square and “X” for pigeons, cross for humans, and dash for turtles.

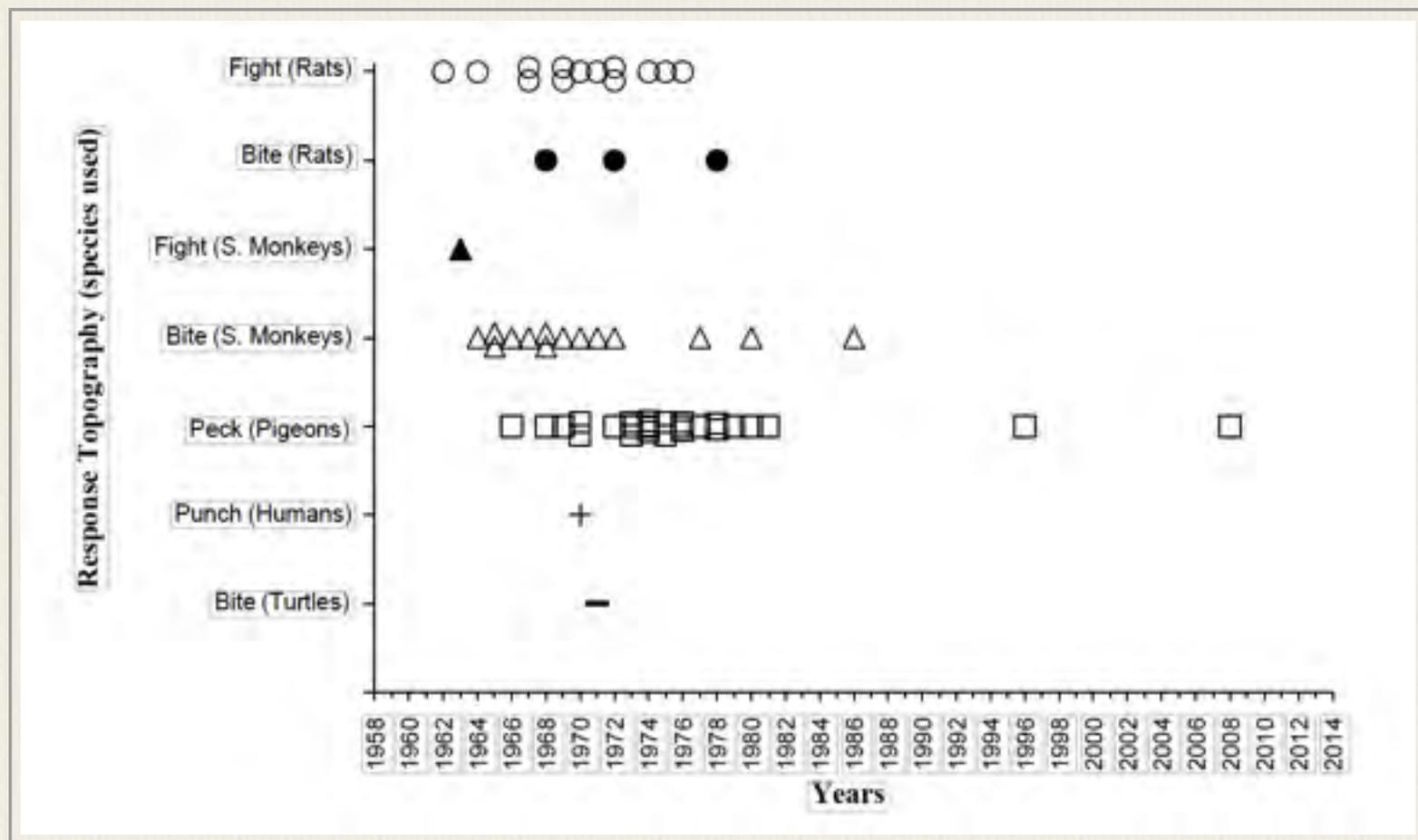


Figure 3. Distribution of the seven topographies across years in the selected publications of JEAB, from 1958 to 2014. Each marker is for one occurrence. Circle markers are for rats, triangle for squirrel monkeys, square for pigeons, cross for humans, and dash for turtles.

“Fight (Rats)” was observed 13 times from 1962 to 1976, with regularity between 1969 to 1972. “Bite (S. Monkeys)” was noted 14 times since 1964 to 1986, regularly from 1964 to 1972. “Peck (Pigeons)” was observed 26 times from 1966 to 2008, with regularity from 1972 to 1981.

Target of the aggressive response

Twenty categories accounted for targets to aggressive responses emitted by different species: seven for rats, six for squirrel monkeys, five for pigeons, one for humans, and one for turtles. Figure 4 exhibits the absolute distribution of response topographies across years in which the twenty targets were reported.

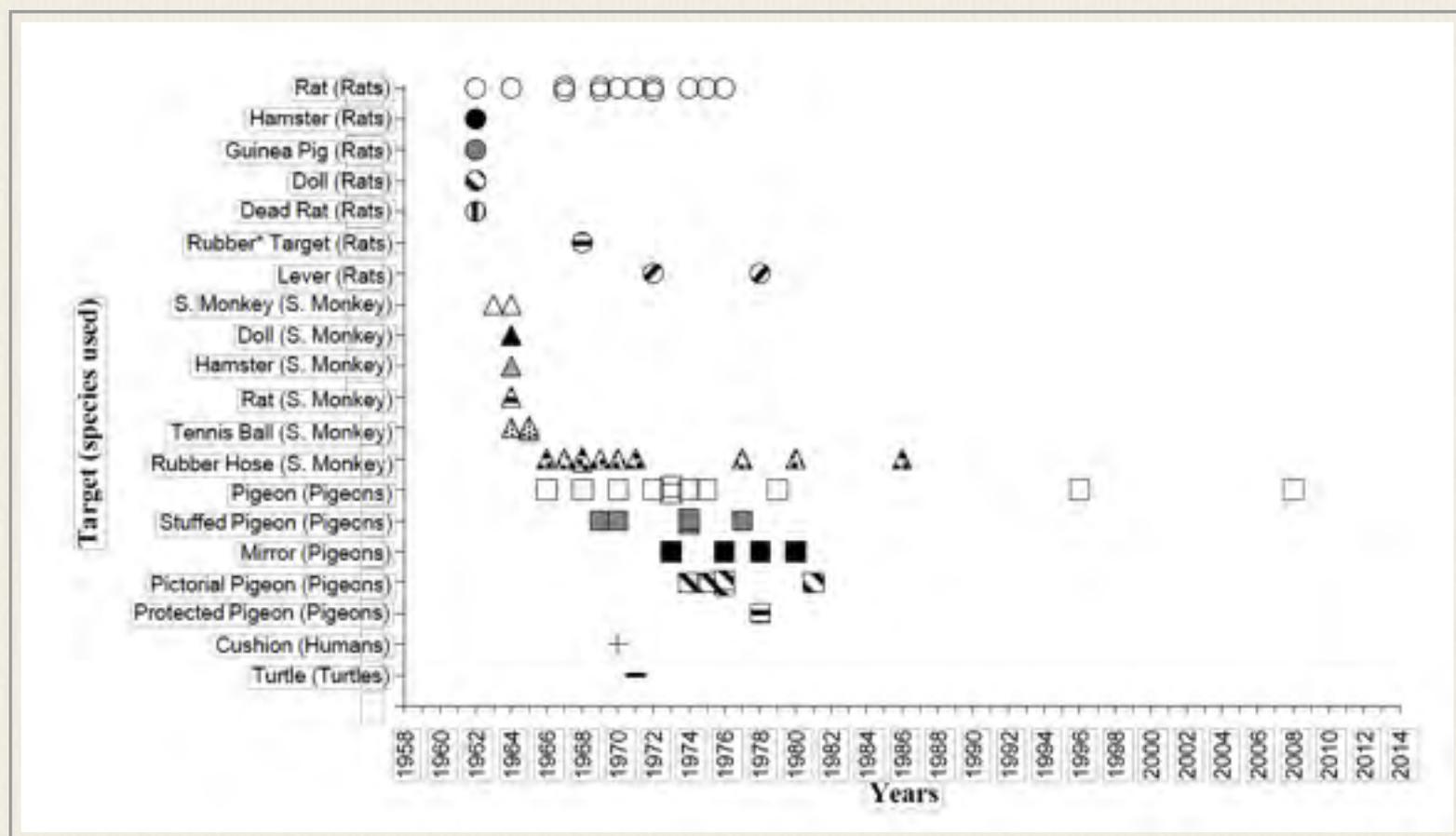


Figure 4. Distribution of the twenty targets reported in the selected works of JEAB, from 1958 to 2014. Each marker is for one occurrence. Circle markers are for rats, triangle markers for squirrel monkeys, square for pigeons, cross for humans, and dash for turtles. * = Rubber/Wood/Metal.

“Rat (Rats)” was employed as a target 13 times (matching the data from previous graph, and the regularity presented). “Rubber Hose (Squirrel Monkeys)” was used as a target ten times, as from 1966 to 1986, regularly since 1966 to 1971. “Pigeon (Pigeons)” was employed as a target 11 times, between 1966 to 2008, with regularity from 1973 to 1975. The general variability of targets is higher, when compared to the variability of inducing stimuli and response topographies. The targets employed for rats and squirrel monkeys were, more frequently, conspecifics and rubber hoses, respectively. For pigeons the frequency of use of different types of targets was more distributed.

Discussion

The objectives of this survey were to systematically show the temporal distribution of publications about induced aggression in the *Journal of the Experimental Analysis of Behavior* (JEAB), and describe their methodological features. Studies about induced aggression in JEAB had a continuous life span of 20 years (1962-1981), with sparse publications in the following years. Their representativeness during the years of regular publication was 2.8%. Since the journal first issue in 1958, until the last issue in 2014, their representativeness was 1.1%. These results are consistent with the unsystematic indications of Archer (1989, 1995) and Berkowitz (1993), about the concentration of experimental behavior-analytic studies about induced aggression in the 1960's and 1970's.

During the referred timespan, there was a change of priority concerning the manipulated/observed variables. The period of increase in number of publications (1962- 1970) comprehends regularities in two groups of variables. The first one exposed rats to electric shock and observed fighting responses. The second group applied electric shocks to squirrel monkeys and obtained bite responses toward rubber hoses. These two groups of studies were thoroughly reviewed by Ulrich (1966) and Hutchinson (1973). The period of gradual decrease in number of publications (1970-1981) comprehends regularities in one group of variables: exposition of pigeons to schedules of reinforcement, verifying pecking responses against another pigeon. Frederiksen and Peterson (1977), and Looney and Cohen (1982) documented this group of studies.

The variability of inducting stimuli and response topographies was not high for any group of studies, with a restrict number of stimuli used (electric shock, schedule of reinforcement, operant extinction), and of measured responses (fight, bite). On the other hand, variability of targets was high for both groups. In regard to the studies developed during the period of increase in number of publications (1962-1970), two of them seem to be

“exploratory” studies: Ulrich and Azrin (1962) and Azrin, Hutchinson, and Sallery (1964). They can be classified as exploratory, due to the innumerable targets employed (see Figure 4), and to the recency of the publications on the topic. However, the relation was inverse for the studies developed during the period of decrease in number of publications (1970-1981): The variability of targets increased, as the studies were being published (Figure 4). This was due to the search for inanimate, but reliable targets (Looney & Cohen, 1982).

Concluding Comments

The lack of recent publications on induced aggression in JEAB suggests that the topic is not an important part of the contemporary basic research agenda of Behavior Analysis. The pattern we found is the same for the broader area of research on aversive control (Critchfield & Rasmussen, 2007). This does not mean, of course, that Behavior Analysis has been neglecting the general topic of aggressive behavior as a relevant subject. Actually, recent contributions of Behavior Analysis to the understanding of certain aspects of aggressive behavior can be found in applied research areas as problem behavior (e.g., Beavers, Iwata, & Lerman, 2013), and in basic psychopharmacological research, as a reliable laboratory test of human aggressive behavior (e.g., Gowin, Green, Alcorn, Swann, Moeller, & Lane, 2013). It is noteworthy that late behavior-analytic research on aggression focus on human subjects, while the surveyed studies showed a tendency to employ nonhuman subjects (cf. Figures 2-4). In JEAB, the tendency of early research to emphasize mostly in nonhuman subjects and of late experiments to focus mostly in humans was reported (Zimmermann et al., 2015).

As the restrict scope of the present study is assumed, other limitations arise. In JEAB itself, a number of 11 studies dealt with aggressive behavior not induced by aversive stimulation, but they were not analyzed due to the selecting criteria. Moreover, it is a research question in its own, to explain the reasons that led JEAB to focus on induced aggression, instead of other

manipulations involving aggressive behavior (e.g., aggression as a positive reinforcer, as studied by May & Kennedy, 2009).

Departing from JEAB specificities, the conceptual and methodological principles of Behavior Analysis were applied in experiments published in non-behavior-analytic journals such as “Aggressive Behavior”, “Journal of Comparative and Physiological Psychology”, “Psychonomic Science” (later “Bulletin of the Psychonomical Society”), and “Physiology and Behavior”, for instance. As a way of widen our knowledge about the temporal interest of EAB on induced aggression, a thorough survey of those journals would help to systematize this information and could be used as a basis to further bibliometric and historical studies.

References

- Archer, J. (1989). Pain-induced aggression: An ethological perspective. *Current Psychology: Research & Reviews*, 8(4), 298-306.
- Archer, J. (1995). What can ethology offer the psychological study of human aggression? *Aggressive Behavior*, 21(4), 243-255.
- Azrin, N. H., Hutchinson, R. R., & Hake, D. F. (1966). Extinction-induced aggression. *Journal of the Experimental Analysis of Behavior*, 9(3), 191-204.
- Azrin, N. H., Hutchinson, R. R., & Hake, D. F. (1967). Attack, avoidance, and escape reactions to aversive shock. *Journal of the Experimental Analysis of Behavior*, 10(2), 131-148.
- Azrin, N. H., Hutchinson, R. R., & Sallery, R. D. (1964). Pain-aggression toward inanimate objects. *Journal of the Experimental Analysis of Behavior*, 7(3), 223-228.
- Beavers, G. A., Iwata, B. A., & Lerman, D. C. (2013). Thirty years of research on the functional analysis of problem behavior. *Journal of the Applied Behavior Analysis*, 46(1), 1-21.

- Berkowitz, L. (1993). Pain and aggression: Some findings and implications. *Motivation and Emotion, 17*(3), 277- 293.
- Carvalho Neto, M. B. D., & Mayer, P. C. M. (2011). Skinner e a assimetria entre reforçamento e punição. *Acta Comportamentalia, 19*(4), 21-32.
- Critchfield, T. S., & Rasmussen, E. R. (2007). It's aversive to have an incomplete science of behavior. *Revista Mexicana de Análisis de la Conducta, 33*(1), 1-6.
- Frederiksen, L. W., & Peterson, G. L. (1977). Schedule- induced aggression in humans and animals: A comparative parametric review. *Aggressive Behavior, 3*, 57-75.
- Gowin, J. L., Green, C. E., Alcorn, J. L. III, Swann, A. C., Moeller, F. G., & Lane, S. D. (2013). The role of cortisol and psychopathy in the cycle of violence. *Psychopharmacology, 227*(4), 661-672.
- Hutchinson, R. R. (1973). The environmental causes of aggression. In J. K. Cole, & D. D. Jensen (Ed.) *Nebraska Symposium on Motivation, 1972* (pp. 155-181). Lincoln: University of Nebraska Press.
- Laties, V. G. (2008). The Journal of the Experimental Analysis of Behavior at fifty. *Journal of the Experimental Analysis of Behavior, 89*(1), 95-109.
- Looney, T. A., & Cohen, P. S. (1982). Aggression induced by intermittent positive reinforcement. *Biobehavioral Reviews, 6*, 15-37.
- Lyon, D. O., Picker, M., & Poling, A. (1985). Use of electrical shock in nonhuman research: A survey of JEAB studies. *The Behavior Analyst, 8*(1), 93-94.
- Mace, F. C., & Critchfield, T. S. (2010). Translational research in behavior analysis: Historical traditions and imperative for the future. *Journal of the Experimental Analysis of Behavior, 93*(3), 293-312.
- Sidman, M. (1989). *Coercion and its fallout*. Boston: Authors Cooperative.

- Ulrich, R. E. (1966). Pain as a cause of aggression. *American Zoologist*, 6, 643-662.
- Ulrich, R. E., & Azrin, N. H. (1962). Reflexive fighting in response to aversive stimulation. *Journal of the Experimental Analysis of Behavior*, 5(4), 511-520.
- Viken, R. J., & Knutson, J. F. (1992). Relationship between shock-induced aggression and other laboratory tests of agonistic behavior in rats. *Aggressive Behavior*, 18, 53-63.
- World Health Organization. (2015). *Youth violence*. Retrieved in February 15, 2016, from <http://www.who.int/mediacentre/factsheets/fs356/en/>.
- World Health Organization. (2016). *Violence against women*. Retrieved in February 15, 2016, from <http://www.who.int/mediacentre/factsheets/fs239/en/>.
- Zimmermann, Z. J., Watkins, E. E., & Poling, A. (2015). JEAB research over time: Species used, experimental designs, statistical analysis, and sex of subjects. *The Behavior Analyst*, 38(2), 203-218.



Toward true matching to sample in capuchin monkeys

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ABSTRACT: This paper briefly discusses some concepts which are necessary for the analysis of stimulus control in simple and conditional discrimination experiments –visual simultaneous simple discrimination, identity matching to sample and arbitrary matching to sample- conducted with capuchin monkeys (*Sapajus* spp.) in the Experimental School for Primates, in the search for coincident planned and obtained stimulus control relations. The relationship of human and animal research on equivalence class formation to language is also discussed.

Keywords: stimulus classes, conditional discrimination, true matching, *Sapajus* spp.

The concept of matching-to-sample (MTS) refers both to a procedure and a performance. The concept of *true* MTS, proposed by Sidman (1994), refers to the performance which is obtained when associated pairs of stimuli are related by equivalence (Sidman, 2000). True MTS is, therefore, an inference based on performances in MTS procedures, and is not necessarily present when correct choices are made in MTS procedures.

In the simplest, usual MTS procedures, a sample and two choices are displayed in three stimulus locations, the sample in the center and the choices on the sides. Two samples alternate in the center, and two choices are presented simultaneously, one in each side. Four configurations are possible in this arrangement:

Left	Center	Right
Comparison 1	Sample 1	Comparison 2
Comparison 2	Sample 2	Comparison 1
Comparison 1	Sample 1	Comparison 2
Comparison 2	Sample 2	Comparison 1

In a given trial the correct comparison has the same number as the sample. An individual may choose systematically the correct choice learning the correct side for each of the four trial configurations. Responding to the right comparison stimulus is correct for two configurations, and to the left for the remaining two. Other possible outcome of a two choices MTS procedure with two samples and two comparisons is, for example, that the subject may learn one sample-comparison pair, and respond correctly in trials with the other sample rejecting the incorrect comparison and thus reaching perfect performance that is not dependent on the “content” of the second stimulus pair (Johnson & Sidman, 1993).

In choice procedures, therefore, subjects may reach correct performances in different ways, as far as there is reinforcement for those behavior-environment controlling relations. Cumming and Berryman (1965), already identified some “tactics” that may allow high level of correctness in matching to sample procedures, which do not involve “matching the comparison to the sample”.

The analysis of the usual acceptance of levels of correctness above chance and below perfection by McIlvane, Serna, Dube and Stromer (2000),

showed that the presence of a proportion of errors in MTS procedures may indicate the presence of non-matching stimulus control topographies in a similar proportion of correct trials. If there are two choices and ten percent of errors in a given trial type, for example, most possibly the subject was doing something else than MTS in twenty percent of the trials, being correct in half of them by chance.

In a two stimulus, two choices MTS, performance of 75% may indicate, if the performance is perfect when one sample is presented, that the subject is responding at chance level in the presence of the other sample.

In fact, in the equivalence literature there are many reports of non-emergence of derived relations (Arntzen & Holt, 2012) for which the individual differences in tests of emergent performances could possibly be traced to baselines performances well above chance but not perfect, which may still indicate the presence of mixtures of stimulus control, like the above described.

In such baselines conditional discriminations do not represent true MTS, but mixtures of controlling relations which happen to lead the subject to choose the experimenter's defined correct stimulus in most of the trials.

The level of correct performances required in MTS baselines with animals should be compatible with the inference that the subject is matching the comparisons to the samples. More than that, certification of coherence among planned and evolved stimulus control should be obtained before class formation or derived relations tests. Procedures to verify stimulus control topography coherence will be presented later in this paper.

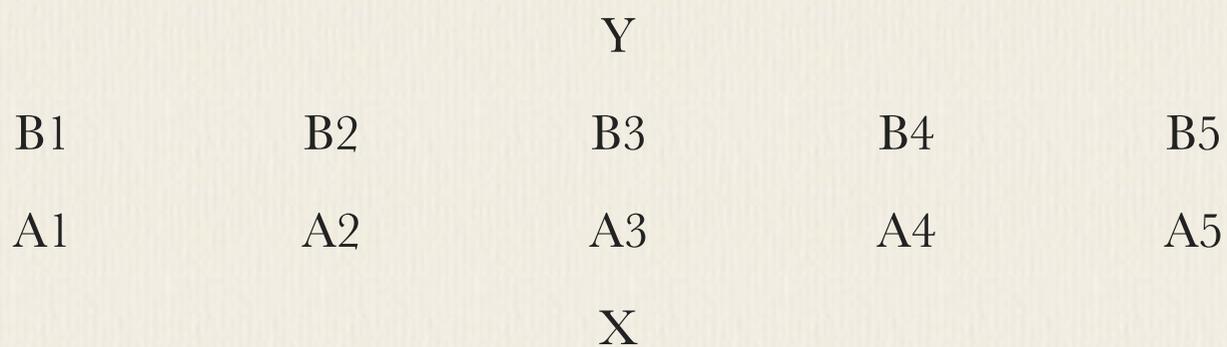
What is the relationship between human language and equivalence relations?

It is generally accepted that human language is based on symbolic relations, which are cases of equivalence relations. The demonstration of

stimulus class formation in language abled individuals demands an exercise of designing tests that produce novel responding which is consistent with the baseline training. The equivalence class formation capability of the individual is granted, negative results indicate that the experimental design lead to stimulus control in tests that is different from the expected.

Non language-abled individuals are also capable of forming equivalence relations in natural conditions, however, in these populations the experimental demonstration of the emergence of equivalence from a set of taught stimulus relations is a matter of delicate stimulus control engineering. The test context may bring about different stimulus control than the expected, as a result, for instance, of the behavior variability which is characteristic of a new baseline phase. Again, failure to demonstrate the emergence of equivalence relations indicates that the experimental design felt short of the objective.

Language is far more than the bricks which it is built of. The primary arbitrary relations are one to one relationships between events in the world which become substitutable one for each other. This is the indexical relationship. When many events are related to one, new relationships among these many events may emerge in such a way that, besides all those events being equivalent, they also may develop and maintain “horizontal” relationships that resemble to syntactic relationships which by their turn give rise to classes of those events that share an ordinal position, for example.



When horizontal relationships between events become functional and the individual learns to respond to a set of events that control a different response than any of them separately we start to reach the language realm.

When our hominid antecessors started to bury the dead with their things, for example, they demonstrated that all things belonging to an individual shared a property of evoking that individual. Things started to be used as symbols. Burying a body with the spear in the hand mean that men was a good hunter. Then, assembling things started to have complex meaning and our antecessors showed the capacity to react to composites instead of reacting to each separate indexical relationship brought to bear by each thing separately. A standing spear with a crane trespassed mean territory defended against invasion by conspecifics. When the speech control evolved sounds came handy to stay as things which are indexical and guard relationships to each others to form complex meanings fairly independent of each indexical reaction that each utterance separately evokes (Deacon, 1999).

Equivalence relations are the basis for all this imagined scenario of development. The capacity for class formation must develop before, so as to exist indexical relationships upon which symbolic relationships can develop. Out of and before behavior analysis starts researching behavior under control of equivalence relations, the concept of equivalence relations is useful to describe meaning, and is basic to understand classes and categorization, which language is all about.

How to relate equivalence experiments with humans and animals?

As we stated before, negative results are not taken as indication of subject's incapacity to form classes, but of the experimenter capacity to prepare appropriate baseline performances and tests.

The demonstration of class formation in language abled individuals, on the other side, is an exercise of obtaining responding under contextual control in individuals which otherwise have known equivalence class formation capability.

The few positive results of emergence of equivalence relations in animals reported in the literature are enough to include the statement that equivalence is privative to language-abled individuals in the class of mistaken assumptions.

On the other side, if we are capable of experimentally lead animals to show arbitrary stimulus class formation we will be demonstrating that given some conditions they show this prerequisite to language. However, we cannot take these eventual results as indication of full potential for the development of a human-like language, but as indication that this prerequisite developed long before our species developed human language.

The Experimental School for Primates - ESP

The objectives of the research program of the ESP (Barros, Galvão, & McIlvane, 2003; Delage et al., 2012; McIlvane et al., 2011) are

1. To obtain precise directly taught identity and arbitrary conditional discriminations,
2. Understanding the function of every stimulus in choice behavior,
3. To obtain true matching to the sample performances,
4. Development of sequences of procedures preparing the subject for precise baseline performance in novel behavior test sessions.

Partial attainment of these objectives until now indicates that this approach may qualify as an advanced behavioral experimental model for cognitive behavior research.

The approach to complex behavior analysis carried in the ESP follows that of Donahoe and Palmer (1994), a selectionist approach to behavioral complexity that considers that reinforcement selects environment-behavior

relations in an organism that is more and more complex as result of the individual history. Such approach is necessary when we aim to develop complex repertoires that are build over strings of prerequisites.

Research of complex behavior needs accordingly complex procedures. The traditional naïve subjects used in experimental psychology have to be substituted for subjects with known previous history, based in the supposition that the highly complex conditional discriminations taught and tested in the ESP are reached after long individual training, and depend on those histories. Instead of running experiments with naive experimental subjects, a sequence of simple to complex performances are taught to every subject, which start each new study with known previous experimental history, assumed as prerequisite –or even hamper- to the ever more complex relations taught.

The educational metaphor applied to the laboratory, in addition to address the gradual building of gradually more complex new performances, was meant to control researchers' behavior as to define procedures upon detailed, daily, analysis of individual performances, as opposed to the methodology based on the comparison of stable data collected along previously defined conditions. The prerequisites assumption is object of cautious experimental verification, as it was the case of the demonstration that experience with repeated shifts of simple discriminations with a stimulus set made more probable to succeed in generalized IDMTS tests with those stimuli (Galvão et al., 2005; Goulart, Galvão, & Barros, 2003).

Understanding the difference between procedure and performance in MTS, the need of near to perfect performances, therefore reducing inter-subjects variability, and the coherence between planned and evolved stimulus control, helps engineering adaptations of the regular MTS design to solve long lasting research findings of variables interfering with desired true matching, and generating similar performances with different stimulus control.

In the research of choice behavior different sets of parameters have been developed for different animals. Touch sensitive screen and software development is now allowing extraordinary development of experiments with independent control of an expressive number of variables. An intricate interdependence of contextual stimuli in choice experiments are waiting for research and analysis: inter-trial interval, sample-comparisons delay, number of stimulus in a baseline, schedules of reinforcement in training and testing, location of sample and comparison stimuli, response requisites -as the required number of touches to the sample and comparisons, and many others. Important adaptations of the MTS format already in use is the variation of samples and comparisons stimulus location, which solved the known interference of location in matching-to-sample with animals (Iversen, 1997). With this modification the stimulus location was practically eliminated as an interfering variable Galvão et al., 2008).

Generalized identity MTS has been demonstrated using two and three comparisons, with varying stimulus locations (Barros, Galvão, & McIlvane, 2002; Galvão et al., 2005), and four-comparisons MTS procedures (Rico et al., 2015). Development of arbitrary MTS baselines aiming the development of stimulus control topographies which characterizes true arbitrary MTS are still studied.

A general structure of sequencing baseline training and tests has been developed, such as the baseline sessions structure is gradually made more similar to test session, with insertion of trial types that have part of the discriminations to be tested. The symmetry test preparation, with individual adaptations, is presently like this:

1. AA and BB IDMTS retraining in separate and in mixed sessions;
2. Reduced proportion of trials with reinforcement,;
3. Sample-S+ relation checked with blank comparison or new stimuli substituting S+;

4. AB shaping using gradual changes in sample or comparisons or fading out A samples superposed to staying B samples;
5. Reduced proportion of reinforcement in AB training;
6. Sample-S+ relation checked with blank comparison or new stimuli substituting S+;
7. IDMTS sessions occasionally intermixed;
8. Probe AA or BB trials are inserted among AB trials, with no reinforcement for the first probe trial of each trial type;
9. Symmetry test: Probe BA trials inserted among AB trials, with no reinforcement for the first probe trial of each trial type.

Regularly, after reaching criterion in a given baseline, tests of the controlling relations have been applied, and further training provided if necessary, to obtain the desired controlling relations, which in the MTS procedure are the sample-S+ select relations. Blank comparisons substituting S+ and S- in alternance have been useful to reveal the function of the remaining stimulus in two choices simple and conditional discriminations, although blank comparisons in three-choices procedures, with the blank comparison substituting the S-s in shifts were also used with similar results. However, the introduction of the blank comparison may disrupt the baseline, making necessary some habituation to the presence of the blank comparison before getting clear results.

Brino et al. (2014) define the sequence of procedures to teach IDMTS upon analysis of the results obtained in previous condition, aiming the facilitation of the development of sample-S+ control, using up to five choices.

To test hypotheses of the importance of select and reject control in producing emergent performance and stimulus class formation, we

require a reliable methodology for measuring and perhaps promoting the topographies of stimulus control (cf., McIlvane & Dube, 2003). A small amount of prior work addressed this needed methodological development. For example, two studies showed that capuchin monkeys can acquire arbitrary stimulus-stimulus relations consistent with the development of select and reject control (cf., Brino, Assumpção, Campos, Galvão, & McIlvane, 2010; Brino, Galvão, Barros, Goulart, & McIlvane, 2012). To date, however, no study has used the methodology to systematically assess whether necessary select or reject relations have been established within a stimulus equivalence framework with nonhumans. Notably, such methods have been used with humans, and the results have been consistent with past hypotheses about the importance of establishing select and reject relations to support equivalence class formation (e.g., Stromer & Osborne, 1982; de Rose, Hidalgo, & Vasconcellos, 2013). (Brino et al., 2014, p.194)

Using indications from the literature of matching to sample with animals, response requirements were incorporated and now a number of touches to the sample and to the comparisons have been programmed. First attempts proved useful, with indication of faster acquisition, compared to one touch responses procedures. A correction procedure re-presents the same trial until the correct comparison is touched; the number of S- is gradually enlarged. After the first baseline of four stimulus is reached, new stimuli are inserted one at a time, substituting for a baseline stimulus, and the number of S- starts up again from one to four in steps of one. After two baselines are learned, the S-s are picked from both sets, to make it more difficult to respond based on sample-S- control. Performance criterion of 90% correct, and no more of one error for each sample was always applied (Campos, Brino & Galvão, 2013).

But all right is not enough. Perfect matching may not be true matching. In a MTS task a correct choice may be under control of the sample-S+

relation, or can result, for example, of a response to the stimulus location. Incorrect choices' analysis can reveal the eventual functioning of other controlling variables than the planned sample-S+ relation. It is not just a desire of perfection, it is the necessity of the most complete knowledge of controlling relations in the baseline to lift the chances of the expected performance in tests. Even criterion of at least 90% correct trials in each trial type in a baseline may be not enough if in successive sessions the same errors – errors in the same trial types – are repeated.

The ideal of errorless discrimination is a daily pursued task through careful manipulation of variables, changed one at a time as a rule (Sidman, 1960). Near future software will detect errors and reprogram the sequence of trials immediately, following previous decisions taken in the same condition, but now we have to enter criteria at the start of sessions, with some restrictions as for example the lack of automatic counting of correct and incorrect choices by trial type.

Summarizing, in the ESP results have been obtained that indicate that we are advancing toward the demonstration of pre-symbolic potential of *Cebus apella*, using the equivalence paradigm, the concept of SCTC and the metaphor of behavioral momentum. A set of procedures efficient to generate generalized IDMTS in six subjects was described (Galvão et al., 2005), and we are pursuing the objective that all 17 subjects reach generalized IDMTS. The development of select and reject controlling relations in simple and conditional discriminations with capuchin monkeys was detected, and procedures to produce these relations were described for the first time (Goulart et al., 2005). Subjects that already showed generalized IDMTS are participants in experiments to develop efficient procedures for the development of arbitrary MTS, with tests for the controlling relations developed. Two positive symmetry tests with two subjects indicate that the methodology will eventually allow us to demonstrate other emergent performances that indicate symbolic potential of the genus *Sapajus*.

References

- Arntzen, E. & Holt, P. (2000). Equivalence Outcome in Single Subjects as a Function of Training Structure. *The Psychological Record*, 50, 603-628.
- Barros, R. S., Galvão, O. F. & McIlvane, W. J. (2002). Generalized identity matching-to-sample in *Cebus apella*. *The Psychological Record*, 52, 441-460.
- Barros, R. S., Galvão, O. F., & McIlvane, W. J. (2003). The search for relational learning capacity in *Cebus Apella*: A programmed "educational" approach. In Sal Soraci Jr., & Kimiyo Murata-Soraci (Eds.), *Visual Information Processing*, pp. 223-245, Westport, CT: Praeger.
- Brino, A. L., Assumpção, A. P. B., Campos, R. S., Galvão, O. F., & McIlvane, W. J. (2010). *Cebus cf. apella* exhibits rapid acquisition of complex stimulus relations and emergent performance by exclusion. *Psychology & Neuroscience*, 3, 209-215.
- Brino, A. L. F., Campos, R. S., Galvão, O. F., & McIlvane, W. J. (2014). Blank-comparison matching-to-sample reveals a false positive symmetry test in a capuchin monkey. *Psychology & Neuroscience*, 7, 193-198. <https://dx.doi.org/10.3922/j.psns.2014.008>
- Brino, A. L. F., Galvão, O. F., Barros, R. S., Goulart, P. R. K., & McIlvane, W. J. (2012). Restricted stimulus control in stimulus control shaping with a capuchin monkey. *Psychology & Neuroscience*, 5, 83-89.
- Campos, R. S.; Brino, A. L. F.; Galvão, O. F. (2013). Expansão de repertório de relações arbitrárias em *Sapajus* sp. via exclusão. *Temas em Psicologia* (Ribeirão Preto), 21, 31-48.
- Cumming, W. W. & Berryman, R. (1965). The complex discriminated operant: studies of matching-to-sample and related problems. In D. J. Mostofsky (Ed.), *Stimulus generalization* (pp. 284-330). Stanford, CA: Stanford University Press.

- Deacon, T. W. (1998). *The symbolic species: The co-evolution of language and the brain*. N. York: Norton.
- Delage, P. E. G. A.; Goulart, P. R. K.; Brino, A. L. F.; Borges, R. P.; Galvão, O. F. (2012). Escola Experimental de Primatas: 10 Anos. *Boletim Contexto*, 1, 84-140.
- de Rose, J. C., Hidalgo, M., & Vasconcellos, M. (2013). Controlling relations in baseline conditional discriminations as determinants of stimulus equivalence. *Psychological Record*, 63, 85-98.
- Donahoe, J. D. e Palmer, D. C. (1994). *Learning and complex behavior*. Boston: Allyn & Bacon.
- Galvão, O. F., Barros, R. S., Lima, S. B., Lavratti, C. M., Santos, J. R., Brino, A. L., Dube, W. V., & McIlvane, W. J. (2005). Extent and Limits of the Matching Concept in *Cebus apella*: A Matter of Experimental Control? *The Psychological Record*, 55, 219-232.
- Galvão, O. F., Soares Filho, P. S. D., Barros, R. S., Souza, C. B. A. (2008). Matching to sample as model of symbolic behavior for biobehavioral investigation. *Reviews in the Neurosciences*, 19, 149-156.
- Goulart, P. R. K., Mendonça, M. B., Barros, R. S., Galvão, O. F., & McIlvane, W. J. (2005). A note on select- and reject-controlling relations in the simple discrimination of capuchin monkeys. *Behavioural Processes*, 69, 295-302.
- Goulart, P. R. K., Galvão, O. F. & Barros, R. S. (2003). Busca de formação de classes de estímulos via procedimento de reversões repetidas de discriminações simples combinadas em macaco-prego (*Cebus apella*). *Interação em Psicologia*, 7(1), 109-119.
- Iversen, I. H. (1997). Matching-to-sample performance in rats: A case of mistaken identity? *Journal of the Experimental Analysis of Behavior*, 68, 27-46.

- Johnson, C. & Sidman, M. (1993). Conditional discriminations and equivalence relations: Control by negative stimuli. *Journal of the Experimental Analysis of Behavior*, 59, 333-347.
- McIlvane, W.J., & Dube, W.V. (2003). Stimulus control topography coherence theory: foundations and extensions. *Behavior Analyst*, 26, 195-213.
- McIlvane, W. J., Dube, W.V., Serna, R. W., Lionello-DeNolf, K. M., Barros, R.S., & Galvão, O.F. (2011). Some current dimensions of Translational Behavior Analysis: from laboratory research to intervention for persons with autism spectrum disorders. In E. A. Mayville, & J. A. Mulick (Eds.), *Behavioral foundations of effective autism treatment* (pp. 155-181). Cornwall-on-Hudson, NY: Sloan Publishing.
- McIlvane, W. J., Serna, R. W., Dube, W. J., & Stromer, R. (2000). Stimulus control topography coherence and stimulus equivalence: Reconciling test outcomes with theory. In J. Leslie & D. E. Blackman (Eds.), *Issues in experimental and applied analyses of human behavior* (pp. 85-110). Reno: Context Press.
- Rico, V. V.; Brino, A. L. F.; Goulart, P. R. K.; Galvão, O. F. (2015). Da discriminação simples à condicional: Um programa de ensino para macacos prego. *Revista Brasileira de Análise do Comportamento*. 11, 37-52.
- Sidman, M. (1960). *Tactics of scientific research: Evaluating experimental data in Psychology*. New York: Basic Books.
- Sidman, M. (1994). *Equivalence relations: a research history*. Boston: Authors Cooperative.
- Sidman, M. (2000). Equivalence relations and the reinforcement contingency. *Journal of the Experimental Analysis of Behavior*, 74, 127-146.
- Stromer, R., & Osborne, J.G. (1982). Control of adolescents' arbitrary matching-to-sample by positive and negative stimulus relations. *Journal of the Experimental Analysis of Behavior*, 37, 329-348.