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# Conceptual and Experimental Directions for Analyzing Superstition in the Behavioral Analysis of Culture

## Direcciones Conceptuales y Experimentales para el Análisis de la Superstición en el Análisis Conductual de la Cultura

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### Resumen

Este trabajo examina las nociones de ilusiones y creencias, discutiendo algunas ventajas que ofrece estudiar tales fenómenos basándose en los conceptos de conducta supersticiosa, superstición y reglas supersticiosas. El trabajo pone de relieve la posibilidad de investigar estas nociones en diferentes niveles de análisis, no sólo a nivel individual, centrándose en el nivel cultural; por otra parte, se presenta el Materialismo Cultural como una propuesta antropológica basada en principios adaptativos, la cual se adecua para tratar estos fenómenos en este nivel, además, discute el Análisis Experimental de las prácticas culturales y señala cómo estos análisis pueden ayudar a entender cómo la gente, en grupo, se comporta como si tuvieran control de su ambiente (cuando, a veces, de hecho, no lo tienen). Este trabajo ofrece una propuesta integradora que facilita el diálogo entre analistas de la conducta y psicólogos sociales y ofrece algunas rutas para un análisis cultural de las ilusiones y las creencias.

*Palabras-clave: creencias, ilusiones, superstición, Análisis Conductual de la Cultura.*

### Abstract

This paper examines the notions of illusions and beliefs, discussing some advantages offered by the study of these phenomena based on the concepts of superstitious behavior, superstition and superstitious rules. Among these advantages, the study highlights the possibility of researching these relationships in different levels of analysis, not only at the individual level, focusing on cultural level, this paper presents Cultural Materialism as an anthropological proposal for the consideration of these phenomena on the cultural level and based on adaptive principles, besides it discusses the experimental analysis of cultural practices and points out how they can help to understand how people in groups behave such as they are being effective in the control of the surrounding environment (when, sometimes, in fact, they are not). The paper offers an integrative proposal which makes easier behavior analysts' dialogue with social psychologists and offers some routes from cultural analysis of illusions and beliefs.

*Keywords: beliefs, illusions, superstition, Behavioral Analysis of Culture.*

An important task in Psychology involves understanding about how people learn about how their own behaviors are effective in the surrounding world, (e.g., causal learning). Some lines of evidence in experimental psychology suggest that causal learning could be distorted or affected by bias. Thus, phenomena such as illusions of control (Langer, 1975), automatic thoughts and distorted rules (Beck, 1972) as well as expectancy of no control in learned helplessness (Seligman, 1975) are based on the theory of distorted and biased learning.

Illusion of control, for example, was defined by Langer (1975) as “an expectation of personal success probability inappropriately higher than the objective probability justifies” (p. 313). The question about “expectations” also appeared in the learned helplessness literature, defined as a learning disability resulting from exposure to uncontrollable environmental events (Seligman, 1975), particularly those which are aversive (Hunziker, 1997). According to Seligman (1975), the expectancy of no control is the critical independent variable for the occurrence of learned helplessness, not the uncontrollability experimentally established.

Although they are treated as phenomena resulting from bias and distortion, illusions of control and expectancy that do not match with the contingencies arranged by the environment can be dependent on adaptation mechanisms in different levels of analysis. In this case, the Skinnerian model of selection by consequences (Skinner, 1981), based on three levels of variation and selection to account human behavior, can help to identify adaptation mechanisms that explain why people sometimes act at odds with what is defined as reality.

This paper examines the notions of illusions and beliefs in social and cognitive psychology and in behavior analysis. We will discuss some advantages offered by the study of these phenomena based on the concepts of superstitious behavior, superstition and superstitious rules. Also, this paper discusses the experimental analysis of cultural practices and points out how they can help us understand how people in groups behave such that they are effectively in control of their environment. The analysis will provide an overview of data coming from studies in the behavioral analysis of culture, that is, studies that undertake, at a cultural level, an analysis of the behavior of individuals in groups, as well as relationships between interlocking behavioral contingences and its environmental effects.

## Treatment of “beliefs” and “illusions”: variables that affect individual behavior

“Beliefs” and “illusions” are behavioral phenomena frequently described in social psychology and cognitive psychology in terms of “bias” or as products of an alleged “distortion of reality”, largely associated with pathological conditions like depression (e.g., Beck, 1972) or as a defensive and adaptive mechanism against criticism and problems (e.g., Taylor & Brown, 1988). Among the various types of illusion understood as products of a distortion of reality, the concept of “illusion of control” (Langer, 1975) gained an extensive area of discussion in Psychology, particularly in experimental social psychology, in such a manner that many experimental data have been interpreted based on that concept (Alloy, & Abramson, 1979; Alloy, & Clements, 1992; Fast, Gruenfeld, Sivanathan, & Galinsky, 2009; Rudski, 2004).

Langer (1975), in the seminal paper about illusion of control, evaluated this issue exposing participants to uncontrollable situations and manipulating variables such as: competition, opportunity for choice, stimulus or response familiarity, and passive or active involvement in a task. Probably due to the emphasis on expectation, among several dependent variables (such as amount wagered, price required to sell a ticket, willingness to trade tickets and relative performance reliability) the study includes the use of scales estimates of control and confidence. The data support the statement that “the more similar the chance situation [no control] is to a skill situation [control] in outcome-independent ways, the greater will be the illusion of control (Langer, p. 327). In her discussion, Langer also compares illusion of control with the phenomena of learned helplessness and considered that “illusion of control is in a sense the inverse of learned helplessness ... [viewed as] the perception of independence between action and outcomes” (p. 325)”. Conversely, therefore, illusion of control would be defined as a false belief that independent events are dependent on the subject’s behavior.

To analyze data obtained with such procedures, it is important to differentiate verbal behavior from non-verbal behavior. Measures such as amount wagered or price required in selling a ticket and effects upon these measures are non-verbal in nature. However, expectancy is a behavior that involves people behaving in a verbal community, with socially-mediated reinforcement (Skinner, 1957). Responses

to questionnaires or to scales that estimates degree of control over the environment – common procedures in studies with illusion of control or even superstitious behavior (see for example Aeschleman, Rosen & Williams, 2003; Bloom, Venard, Harden & Seetharaman, 2007) - can be, analyzed as verbal behavior, controlled by aspects of the speaker's own behavior (as antecedent stimuli) and/or by aspects of the social environment (as events that act subsequent to verbal report) (Skinner, 1945, 1974)

Individuals' estimates of their own control over their environment, a measure of illusion of control, may also depend on variables that are not verbal. For example, Matute (1996), Blanco, Matute and Vadillo (2009) and Blanco, Matute and Vadillo (2011) showed that the probability of a response, determined by variables such as instructions or uncontrolled characteristics of the participants exposed to independent environmental events, is a critical variable in determining illusion of control. The more the participant responds in a given situation, the more likely the participant will give a higher estimate of control over the situation. Based on this correlation, it is possible to suppose that illusion of control is related to superstitious behavior. Blanco et al (2009) suggested that it "is not too different from what has been described by B. F. Skinner's (1948) description ... in a context in which non-contingent reinforcer is occurring at a high rate, the more the animal (or human) responds, the greater the chance that responses and reinforcers will coincide" (p. 553)

The relationship between superstitious behavior and illusion of control is an intriguing and interesting way to a contingency-based analysis of illusion of beliefs. This relationship, however, must be viewed carefully because superstitious behavior is inclined to be a temporary phenomenon, both in humans and non-humans (Ono, 1987; Skinner, 1948). For example, pigeons show a considerable drift in response topography selected by accidental reinforcement. Ono (1987) also reported this kind of variability and drew attention to the temporary characteristics of superstitious behavior in an experiment with humans. Another reason for the caution is the fact that other types of behavioral relations (besides superstitious behavior) seem to be involved in the illusion of control. Skinner (1953), for example, draws attention to differentiate superstitious behavior from superstition, because "Superstitious rituals in human society usually involve verbal formulae and are transmitted as part of

the culture". (p. 87). Also, it is important to differentiate superstitious behavior from superstitious rules.

The concepts of superstitious behavior, superstition and superstitious rules can be viewed in a series of studies that discuss the notion developed by Skinner in 1948 with verbal behavior (Heltzer & Vyse, 1994; Higgins, Morris & Johnson, 1989; Leighland, 1996; Ninness & Ninness, 1998; Ono, 1987, 1994; Rudski, Lischner & Albert, 1999). In a conceptual review, Benvenuti (2010) argued that superstitious behavior must be understood as defined by Skinner (1948): as behavioral patterns established and maintained by environmental events independent of the response and only subsequent to it. Superstition, on the other hand, involves practices of groups of people or, at least, consists of individual behaviors affected by social variables such as verbal instructions and descriptions. Superstitious rules, ultimately, are descriptions of alleged contingency relations between events that, in fact, are only contiguous.

Among the advantages of a treatment of illusions and beliefs based on these concepts, this alternative favors the identification of controlling variables of these events, enabling a higher degree of predictability and control. The functionalist notion of "environment" (rather than a naturalistic view that permeates discussions about distortion of reality), in turn, also offers advantages in a behavior-analytic interpretation of psychological phenomena that seem to indicate distortions in contact with a supposed reality. Behavior analysts do not ask how someone contacts reality, but how the reality in which a person behaves is constructed, directing research to the environmental conditions that select these alleged distortions, even though those are, at first sight, difficult to identify.

Regarding this topic, another advantage offered by the study of beliefs and illusions based on the concepts of behavior analysis (such as superstitious behavior, superstition and superstitious rules) is the possibility that such investigation be directed at different levels of analysis, not only at the individual level. Indeed, since they are complex relations, illusions and beliefs may not be sufficiently accounted for by processes involved in the ontogenetic level, requiring more complex contingencies of selection established by culture (contingencies mediated by other humans).

The following topic approaches the analysis of beliefs and illusions (superstitious behavior, superstitious rules and superstitions) as phenomena which could be analyzed from a third level of selection. This analysis is initially presented from the anthropological paradigm known as Cultural Materialism.

### Analysis of beliefs and illusions at the cultural level: from Cultural Materialism to Behavior Analysis

The consideration of beliefs and illusions based on adaptive principles is similar to the analysis conducted by the North-American anthropologist Marvin Harris (1927-2001), proponent of Cultural Materialism. According to Harris' (1974, 1977, 1980, 1983, 1985) analysis, cultural practices (including those that may seem to be "irrational" or "superstitious") are maintained by "material benefits" achieved by the group in the long run.

Cultural Materialism (Harris, 1980, 1983) states that cultural development can be understood as a joint product of modes of production (the methods by which people in a community transform nature and obtain resources to survive and how they administrate such resources) and modes of reproduction (ways that members organize strategies regarding population growth, including nutrition and resource sharing). In agreement with this approach, such characteristics comprise the *infrastructural* components of a culture. Cultures grow in complexity when they also develop elements of *structure* (that comprises organization among populations, such as family, clans, governments, etc.), and *superstructure* (such as art, science, and religion).

While anthropologists from other approaches claim that their primary interest is in "world views, symbols, values, religions, philosophies, and systems of meanings" (Harris, 1983, p. 326), Harris proposes that myths and legends are part of the superstructure. What has been called "superstition" previously in this paper, according to Harris, is a result of adaptive processes that emerged and are maintained by material advantages. One example is the Hindu myth of the sacred cow (Harris, 1974). From the external observer, this can be irrational and counterproductive for a member of the culture. However, the maintenance of the cow myth, in the long run, results in more food and other material benefits (manure used in planting, milk, animal traction for field work etc).

Malott (1988) complemented Harris' analysis about the Hindu cow myth arguing that much of the behaviors presented in Harris' analysis are rule-governed. For Malott, social consequences responsible for myth maintenance are delayed and cannot control individual behavior. Rules act, at the molecular level, to increase the probability that a social practice will occur at the molar level.

The analysis of cultural selection (Skinner, 1981) took a significant step forward with Glenn's (1986, 1988, 1991, 2003, and 2004) development of the concept of *metacontingency*. With a unit of analysis which described the relationship between the coordinated behavior of a group of individuals (interlocking behavioral contingencies) and its effects on the environment, a research area began to seem possible, which eventually gave birth to experimental investigations (as showed later). Next session of the paper presents some experimental designs in the behavioral analysis of culture which show data concerning superstition and offer alternatives to experimental analyze the participation of these phenomena in cultural practices.

### Analysis of beliefs and illusions at the cultural level: some designs in Behavioral Analysis of Culture

The field of research that is dedicated to the procedures regarding culture belongs, in behavior analysis, to which Tourinho (2009) called the behavioral analysis of culture, and, although primarily covers theoretical works, experimental data (e.g., Baum, Richerson, Efferson & Paciotti, 2004; Caldas, 2009; Leite, 2009; Martone, 2008; Tadaiesky, 2010) recently began to spring from the influence of Glenn's developments. Many of these experimental procedures were largely developed from the work of Vichi (2004, later published as Vichi, Andery & Glenn, 2009). The results of some in this area involve the presence of superstitious behaviors, superstitions and superstitious rules, although the data obtained have not been appropriately interpreted in this manner (e.g., Baum et al., 2004; Leite, 2009; Martone, 2008; Vichi et al., 2009).

Aiming to investigate the operant relationships involved in the transmission of a cultural practice in laboratory microsocieties, Baum et al. (2004) evaluated the evolution of what they called "adaptive traditions": fixed patterns of behavior (verbal or non-verbal) maintained by participants over generations. Assuming that the adaptive traditions

were transmitted through verbal behavior, the authors classified the verbalizations of the participants in terms of three categories: “informative rules” (statements consistent with the operating condition); “mythological rules” (rules inaccurate, mythical interpretations of environmental contingencies) and “coercive rules” (propositional statements, and not descriptive - rather than describing the conditions in place, such statements only indicated the choice that should be made by the listener).

The category designated as “mythological rules” in the study of Baum et al. (2004) related to inaccurate rules, including the description of contiguous events as if they were contingent. In the latter case, although they have not made use of this concept, the verbalizations categorized as “mythological rules” correspond to what was previously described as superstitious rules. In this sense, it is possible to point to the experimental arrangement used by the authors as an alternative to the study of cultural transmission of superstitious rules.

The experiment conducted by Vichi et al., (2009) focused on the selection of a practice of resource allocation in a laboratory microculture. To this end, two groups were formed, each with four subjects. The participants executed a task which consisted on betting on chosen rows in an 8x8 matrix. Thus, although participants were instructed to explore a “complex pre-defined system” that guided their wins or losses, there was not an actual given system, that is, the cultural consequence (more tokens earned) was contingent on the distribution of resources made by the group and the experimental condition in effect. In the procedure used by the author, a notebook and pencil were given to participants to take notes or make some form of register, if they found necessary. All participants made some kind of record at some point during the sessions, and three out of four participants from Group 2 maintained the record until the last session. From sessions 6 to 9 (last session), these participants did not change the type of register held, i.e., recorded the same sets of variables.

According to Vichi et al (2009), one possible explanation for this finding may involve the accidental reinforcement of a certain type of record, since from session six (when it was established the pattern of record that would last until the end of the experiment) the number of plus signs produced the group improved considerably, although the record was not very helpful in the selection and

arrangement of choices. If the author’s hypothesis is correct, the standard recording by participants represents an example of conduct established and maintained by mere contiguity relationship between the recording of certain categories and tokens earned by the group. Although not addressed by the author, the false statement given to the players about a supposed “complex pre-defined system” may have favored the development of superstitious rules and/or superstition.

The study conducted by Martone (2008) had the objective to observe the transmission of operant behaviors and possible modifications in a cultural practice along different generations. To this end, the author adopted as a starting point the procedure of Vichi (2004). Among the changes, a replacement procedure similar as the one used by Baum et al. (2004) was used to simulate generation changes. Among the results reported by Martone (2008), one could identify the presence of superstitions (designated by the author as “superstitious behavior of the group”) and superstitious rules in Group 4. Martone (2008) noted, by recording the verbal behavior of the participants, that they declared to each other that the doubling of earnings (contingent to the distribution of resources from the previous cycle) were due to the choice of the row with the largest number of positive signs. Accompanying these verbalizations, it was observed, throughout the experiment, the greater frequency of choice of rows with larger amount of positive signs. According to the author, the maintenance of such a pattern may have occurred because of the intermittency of earnings contiguous to the choices, since in many trials tokens were doubled after they chose a row with the highest number of positive signs.

The experiment conducted by Leite (2009) also recorded the presence of superstitious behavioral patterns. The study aimed to examine interlocking behavioral relations in a problem-solving situation in small groups, including the transmission of problem-solving strategies to successive generations. The task consisted of choosing a row on a matrix in white and black colors, with the black rows leading to higher earnings in the long run. In two of five experimental conditions manipulated, confederates (i.e., participants trained by the experimenter) were used to manipulate the choice of the group in a less advantageous manner (choices towards white rows), who were gradually replaced by non-confederates participants. Among the results discussed by Leite (2009), one can point the

generation of various inaccurate verbal descriptions of experimental contingencies, which were accompanied by changes in non-verbal choice behavior. As the author points out, the recurrence of some of these verbal and non-verbal patterns may be due to accidental reinforcement, since the errors never occurred in succession and the participants were scheduled to be reinforced in 75% of the trials. As an example, one of the participants formulated a rule stating that certain events were contingent when they were merely contiguous (superstitious rule), and this rule was maintained by the group until the end of the session, having being passed on to new members group. Over the generations, as the author points out, there was a refinement of the rule, which generated an increase in the earnings of the group.

It has to be pointed out that the presence of confederates could have influenced the compliance to superstitious rules as an avoidance behavior, whereas non-compliance sometimes led to social sanctions. Therefore, it cannot be affirmed that superstitious behavior and superstitious

rule-following were directed towards contiguous non-contingent relations with the programmed consequences, but the data presented by Leite (2009) indicates that the high probability of cultural consequence could encourage the emergence and maintenance of superstitious behavioral patterns in interlocking behavioral contingencies.

Table 1 presents the studies described above, characterizing what was studied and manipulated in each and the phenomena regarding superstition that could be found in them.

The frequent emergence of superstitious behaviors, superstitious rules and superstitions in studies conducted in the experimental analysis of cultural practices suggests the possibility of studying these phenomena in a cultural level of analysis. But while some studies in this field discuss the occurrence of these events (as shown), they did not directly manipulate variables in order to produce such a pattern of responding. Therefore, they do not explain a number of issues relating to these phenomena, such as

**Table 1.**

*Analyzed experiments with their respective objectives, dependent and independent variables and phenomena related to superstition.*

Reference	Objective	Dependent Variable	Independent Variable	Phenomena Related To Superstition
Baum et al. (2004)	Investigate the operant relationships involved in the transmission of a cultural practice in laboratory microsocieties	Adaptive traditions (fixed patterns of behavior maintained by participants over generations)	Earning money individually	Occurrence of mythical interpretations of environmental contingencies
Vichi (2004, later as Vichi et al. 2009)	Investigate the selection of practice of resources allocation in a laboratory microculture	The practice of resources allocation	Tokens won by the group	Accidental reinforcement of a certain type of record
Martone (2008)	Observe the transmission of operant behaviors and possible modifications in a cultural practice along different generations	The practice of resources allocation	Tokens won by the group	Participants described relations between the choice of rows with the highest number of positive signs and gain double points as if there is a contingent relationship between these variables; Higher frequency of choice of rows with larger amount of positive signs
Leite (2009)	Examine the effects of instructions and experimental history on the transmission of choice practices in a laboratory microculture	Transmission of practices choice	Tokens won by the individuals; Type of instruction: Presence of "confederates"	Rules stating experimental variables merely contiguous as if they were contingent;

the role of verbal behavior and cultural practices in the control of superstitious behavior. They are inconclusive as to whether the maintenance of these behavioral patterns through mechanisms of cultural selection could be inferred. However, the analysis of studies that report the occurrence of these events can provide conceptual and experimental directions for the analysis of beliefs and illusions at the cultural level, expanding the contributions offered by behavior analysis to the study of these phenomena.

### Conclusion

The analysis of beliefs and illusions is an important topic in psychology and several behavioral phenomena have been interpreted based on these concepts. In social and cognitive psychology, beliefs and illusions are frequently described in terms of “bias” as well as the products of an alleged “distortion of reality”. From a behavior-analytic perspective, by contrast, beliefs and illusions must be understood as behavioral relations, governed by the same laws as other behaviors. From this perspective, bias is something that probably hides conflicting products of selection in phylogenetic, ontogenetic or cultural histories that are responsible for behavior.

This paper discusses some advantages offered by the study of beliefs and illusions based on concepts such as superstitious behavior, superstition and superstitious rules. Among the advantages of this model, one can point to: (a) the emphasis on the identification of controlling variables of beliefs and illusions, enabling a higher degree of predictability and control, (b) the functionalist notion of “environment” directing research to the environmental conditions that select these alleged distortions, even though those are, at first sight, difficult to identify; (c) the study of beliefs and illusions in different levels of analysis, not only at the individual level.

The discussions undertaken as part of Cultural Materialism about cultural practices seemingly “irrational” or “superstitious”, besides offer an alternative to the study of illusions and beliefs (superstitious behaviors, superstitions and superstitious rules) at the cultural level, identifying relationships that allow the maintenance of these practices in the long term, supporting the arguments about the benefits offered by the study of beliefs and illusions based on adaptive principles.

In discussions of Cultural Materialism, other considerations have been incorporated in relation to the control mechanisms present in cultural practices that seem to involve superstitious phenomena. As noted by Malott (1988), the role of verbal control in maintaining these practices is emphasized. In addition, the current paper discussed: (a) the possibility that verbal descriptions facilitate superstitious behavior, (b) the possibility that social consequences are responsible for interlocking behavioral contingencies which involves verbal descriptions that do not match with the ones arranged by the environment (description of contiguous events as if they were contingent), and (c) the possibility that cultural practices maintained by contingent “material benefits” involve phenomena related to superstition, such as superstitious behavior, superstitions and superstitious rules.

The discussions undertaken in this paper regarding the treatment of beliefs and illusions in psychology, and more specifically in behavior analysis, offer an integrative proposal that facilitates behavior analysts’ dialogue with social psychologists. Moreover, such discussions may contribute to directing the analysis of these phenomena to an adaptive perspective that seems more advantageous than analysis based on the theory of distorted and biased learning.

Finally, since it shows alternatives to a theoretical and empirical analysis of beliefs and illusions at the cultural level, this work can contribute to the development of research specifically aimed at the treatment of these phenomena in the cultural sphere, which would extend the existing knowledge about these phenomena to another level of selection, besides increasing the set of data ever produced on culture in behavior analysis.

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