The four causes of behavior: Aristotle and Skinner

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ABSTRACT

This article deals with an application of Aristotle's four causes, the material, the formal, the efficient, and the final causes. Based on an initial systematic application, a new application is proposed in which some previously unconsidered aspects of Aristotle are developed. According to this new application, the material cause would be found in the organism as a whole (and not just in neurobiological substrates), the formal cause would be the prior model on which a certain cause is based (and not an internal representation or a formal analogy of behavior), the efficient cause would be conceived as an agent (and not only an antecedent event), and the final cause would be the teleological function of the behavior. The main implications of this review of the four causes are consolidation of the analysis of behavior on the molar plane of an organism (with no "neuroscientific" reductionisms), establishment of the notion of the person as the origin of behavior (without resorting to the mechanicism of "private events"), and the possible consideration of a radically human behaviorism that would place behavior at the center of the historical-cultural context (not as dependent on laboratory analysis of animal behavior).
Key words: efficient cause, final cause, formal cause, material cause, teleological behaviorism, antecedent event, private event, person.

RESUMEN

Se trata de la aplicación de las cuatro causas de Aristóteles, la causa material, formal, eficiente y final. A partir de una primera aplicación sistemática, se propone una nueva aplicación, en la que se desarrollan algunos aspectos de Aristóteles no considerados anteriormente. Así, la causa material se encontraría, de acuerdo con la nueva aplicación, en el organismo como un todo (y no en los substratos neurobiológicos), la causa formal sería el modelo previo en el que se basaría una conducta determinada (y no una representación interna o una analogía formal de la conducta), la causa eficiente se concebiría como agente (y no solamente como evento antecedente) y la causa final sería la función de la conducta considerada en un sentido teleológico. Las principales implicaciones de esta revisión de las cuatro causas estarían en el afianzamiento del análisis de la conducta en el plano molar del organismo (sin reduccionismos 'neurocientíficos'), en la instaura-ción de la noción persona como origen de la conducta (sin incurrir en el mecanicismo de los 'eventos privados') y en la posible consideración de un conductismo radicalmente humano que sitúe de raíz la conducta en el contexto histórico-cultural (si depender tanto del análisis de la conducta animal en el laboratorio).
Palabras clave: causa eficiente, causa final, causa formal, causa material, conductismo teleológico, evento antecedente, evento privado, persona.

The four causes referred to here are the four causes of Aristotle, which, as you will recall, are the material, the formal, the efficient, and the final. Briefly, the material cause tells us what a thing is made of, the formal cause tells us about its form or what it is, the efficient cause tells us who made it or how it came to be what it is, and the final cause tells us what a thing is made for or what its purpose is.

Why four causes? Because, according to Aristotle, there are only four, no more no less. In this, Aristotle adheres to the knowledge of previous philosophers and to common evidence. Even today, our amazement about things does not seem to go beyond these four causes. When faced with something strange or unfamiliar, the first question might be, "What is this?" and the response is usually to say what the essence of it is, even if only approximately or superficially. For example, "This is a piece of designer furniture." This would be the formal cause. We might also want to know what it is made of. "It is made of wood" or " plastic" would be the material cause. Perhaps, at this point, or even from the beginning, our main interest might be in who designed it. "It's by that designer" or "manufacturer." We might also want to know what it is for, if this is not clear from its form or design. "It is for decoration" or "social distinction." In any case, one way or another, or at one time or another, we are interested in the four causes.

These four causes are necessary for us to have a complete idea about things. If things were stationary, two causes would suffice: the material and the formal, or even just one, the formal cause, because it would provide us with their essence. But in the sublunar world things are dynamic, that is, they are in movement and, therefore, undergo change. In fact, change is the problem of being, how *what is* can come from *what-is-not* and how the same thing can become something else without ceasing to be the same thing (Aubenque, 1962). How this table can come from that wood and be, to all effects, a table, without ceasing to be wood, or even a more elemental material (earth, water, air, and fire, the elements that made the tree the wood came from). Therefore, the efficient and final causes must be considered at the same time as the material and formal ones, in order to account for change. The four causes are, in fact, four ways of saying why something is what it is. They are all necessary and nothing else is missing.

Aristotle expounds the doctrine of the four causes in his works, *Physics* and *Metaphysics* (Aristotle, 2002; 2003) in which he seeks a fundamental knowledge of being, as something can certainly exist in many ways but, no matter what, it *is*. We sense that the Aristotelian meaning of cause was different from the meaning it has today, even though "cause" is the best translation (Guthrie, 1981). The current meaning of cause is generally understood as an antecedent event that is sufficient to produce something (more or less reminiscent of the efficient cause). In contrast, Aristotle's causes are principles, foundations, the reason for being, or why something is the way it is. They are about fundamental knowledge; one could say metaphysical knowledge, not merely empirical knowledge. Their interest is not scientific-technical, but ontological. The four causes are considered fundamental to knowing about something with "causal knowledge", beyond merely empirical knowledge. Of course, the four causes do not take the place of, excuse, or disregard empirical knowledge, although it may be questioned.

In psychology, the four causes do not comprise a genuine psychological theory,

but rather a meta-psychology or ontology of psychology. Hence, we are not so much interested in Aristotle's psychology as in his metaphysics. However, we also have to mention Aristotle's *De anima*, which is more strictly speaking, a psychological work, and *Nicomachean Ethics*.

THE FOUR CAUSES IN PSYCHOLOGY

The systematic application of the four causes is certainly unusual in psychology. However, their presence and relevance can easily be observed, both in common and academic psychology. In common psychology, they seem to be applied when common sense, or in this case "ordinary psychology" is overwhelmed in its attempt to explain certain behavior. For instance, when we admire or are amazed by someone's behavior, we may ask why they behaved that way, how they came about doing that, why they did it, where it came from, or what its origin was, etc. It is clear that such common explanations do not satisfy our curiosity or our desire to know, which according to Aristotle, is the source of all knowledge.

The presence of the four causes in academic psychology can be recognized in different contexts and occur in different ways. Thus, in the history of psychopathology, the "formal cause" has been referred to as the "proximate cause," with respect to a supposed "internal mechanism," whereas the "efficient cause" is called the "distant cause," in reference to the biographic and demographic antecedents, what today would be called "risk factors" (Berrios, 2000). The "material cause" could be recognized as the "object of experience" or "sensible material," in reference to the subject, according to the modern subject-object distinction. On the other hand, the final cause does not appear in psychopathology until recently in what is called "evolutionary psychiatry", in an attempt to see the adaptive significance of symptoms.

Along this line, a modern cognoscitive version of the Aristotelian material-form pair would have to be observed in the subject-object pair. The subject would assume the formal cause, now understood as a "form of knowledge" (Kant), and would thus predominate over the object, which would become an "object of experience" or "sensible material". According to this version, the sensible material or object of experience would exist at the expense of the subject's supposed mental structures, and hence, the subject's primacy over the object and, indeed, the customary order in which they are presented, subject-object. This version of Aristotelian material-form as subject-object has not only presided over modern philosophy but also over psychology, including psychopathology, becoming the "official doctrine," and even the common-sense meaning of psycho(patho)logical understanding. The form imposed by the subject has not remained in the form-of-knowledge of a cognizant subject, but has been transferred to the neuronal structure, as a form that is now imposed not by the subject but by the brain.

This "fall" from the subject into the brain probably reflects cognitive psychology's lack of consistency and the resulting belief that a neurobiological explanation makes psychology more scientific. The implications of this supposedly neurobiological basis in psychopathology have led to the invention of mental disorders as if they were diseases, and in which, incidentally, the pharmaceutical industry has a strong interest

(Pérez Álvarez & García Montes, 2007).

Thus, in this context, Aristotle's causes are certainly diluted but, in this regard, not surpassed. Indeed, they are demanded as criticism of and objections to the fall of psychology into mentalism and, where applicable, into neurobiological reductionism.

Another context and way in which the Aristotelian material-form pair can be recognized is specifically in behavioral analysis, in the form-function distinction. Here, form, as topographical form, corresponds to Aristotle's material, and the function, as a defining essence of behavior, would actually be the Aristotelian form. In fact, what defines behavior is not so much its topographical form (material) as its function, which includes its purpose (one might say the "final cause"). This leads to a more systematic application of the four causes. First, an application already carried out is reviewed, and then a new application is proposed based on the first.

SYSTEMATIC APPLICATION OF THE FOUR CAUSES

The first systematic application of the four causes to behaviorism was probably by Peter R. Killeen (2001, 2004), and this author's application will be our starting point for the proposal mentioned above. As described by Killeen (2004), the concept of operant behavior has an Aristotelian causal structure. This would be true despite the fact that Skinner avoided and, in fact, rejected reference to "causes," using euphemisms like "the variables of which behavior is a function" (e.g., Skinner, 1953) instead. As mentioned, the doctrine of the four causes is at a different level of empirical-practical analysis, as a functional behavior analysis usually is, so this apparent incoherence is no problem.

The causal structure of operant behavior is given by the three terms it involves: the discriminative stimulus (S^D), the response (R), and the reinforcing stimulus (S^r), which make up the three-term contingency, most commonly expressed as $S^D: R \rightarrow S^r$. According to this causal structure, S^D would be the efficient cause, R would be the material cause, and S^r would be the final cause, and the three-term contingency, as a model of the structure itself, would be the formal cause (Killeen, 2001, 2004). But in any case, it is not merely a matter of making a correspondence or translation of the terms of one analysis (Skinner) into another (Aristotle). The issue is not only more complicated but also of more interest than such a translation might be. As noted by Killeen, it is rather an entire explanation or comprehension of a phenomenon, in the abovementioned sense of fundamental knowledge (more ontological than empirical). And so Killeen's application is reviewed here, if only to establish a new proposal. Specifically, Killeen's application is reexplained and an alternative suggested, also grounded in Aristotle but which is not usually emphasized (perhaps because of the impact of some modern philosophical concepts, which will be discussed in due time).

The *efficient cause*, according to Killeen, would be the event that occurs before a change of state and triggers it. Thus, SD would represent the position of the efficient cause in the causal structure of operant behavior or the three-term contingency (without going into the well known interdependencies in the three-term contingency for now).

On the other hand, let us recall that the "distant cause" as an antecedent event in classic psychiatry, is also the efficient cause. In fact, the efficient cause, thus understood, is what most people think of as *cause*. This concept of the efficient cause as an antecedent event is probably influenced by Hume's philosophy, according to which we never see causation, only previous events. Aristotle did not actually mention "events", but "agents" as the principle of movement, and gives the examples of father, builder, doctor, and teacher (*Metaphysics*, 9.4; *Physics*, 2.3). According to Lear (1988), the notion of event does not capture the importance of Aristotle's insistence that what constitutes the real cause is the builder who builds.

The *material cause* would be the series of elements involved in the process of change, according to Killeen. Thus, the response, or operant behavior, would represent the material cause in the three-term contingency, although Killeen places the emphasis on the substrates, or underlying mechanisms -the stuff one level down. This emphasis on underlying mechanisms is probably influenced by the prestige (in the double sense) of neuroscience. Be that as it may, the notion of material cause assumes some kind of moldable material which can be transformed from one thing into another. The notion of molding behavior corresponds to this cause. The question is whether neurobiological mechanisms are relevant to it. The Aristotelian distinction between potentiality and actuality (which will have to be discussed further below) assumes that either the potential of what material could become is contained within it (for example, the acorn to the oak), or else this potential is transmitted by someone who has it to someone else who can acquire it (for example, the teacher to the student). It would thus be hard to find the relevant moldable material in neurobiological substrates. In the end, whatever a human being can become is neither preconceived in them (there are no genes, for example, for speaking Portuguese), nor does what is transmitted operate on this scale (neurons certainly do not play the flute). The relevant material here is the organism as a whole, depending on its functional capability or potentiality.

The *final cause*, according to Killeen would be why something exists, or perhaps what for, that is, its teleological function. Thus reinforcement in the three-term contingency would be the final cause. Reinforcement refers to the consequences of behavior that have a selective effect on it, precisely what Skinner called selection by consequences. Explanation of behavior through consequences is an explanation in terms of final causes, in the teleological sense emphasized here. In fact, reinforcement is probably the clearest example of final causality in psychology.

The *formal cause* would be the structure with which the phenomena are represented, often analogies, metaphors, or models. Thus the three-term contingency would be the causal structure of operant behavior, as a model of its internal organization. It is worth mentioning that this "internal organization" refers to the very structure of the phenomenon observed, in this case, behavior, and not to a hypothetical "internal structure" within the central nervous system, as the formal cause is usually understood in psychology (Hogan, 1994). This tendency to consider the formal cause as an internal structure, whether mental or a neural, is probably influenced by Kant's philosophy, according to which the subject imposes the form of structuration on the object. On the other hand, Killeen's application is Aristotelian, insofar as it refers to the causal structure with which we, in

fact, operate (we do not actually sit down on the neural or mental representation of a chair but rather on the chair itself). Aristotle did not refer so much to models in the sense of analogical, metaphoric, or formal representations as to models themselves in the sense of objective forms (for example, the model of a chair would be another chair). Even though a carpenter may have a mental representation of a chair, the chair still refers to preexisting chairs. The notion of the model as a mental representation not only does not exhaust the notion of formal cause, but, in all likelihood, does not capture its essence as an objective causal structure.

A new application is proposed here based on this one, but attempting to make use of the abovementioned aspects of Aristotle that are usually ignored. It is not a matter of correcting Killeen's application, as it rigorously abides by Skinner and Aristotle, although perhaps a little too strict. In this sense, this proposal is not as strict as and rather more flexible than Killeen's, not to say daring or adventurous. But if it contributes something worthwhile, it would have to be along the lines of Killeen.

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NEW PROPOSAL

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The new proposal adopts the expositive order usually followed by Aristotle: material, formal, efficient, and final causes. This order suggests the ontological nature of Aristotle's four causes, as opposed to the empiricist and idealist nature suggested by an exposition that starts with the efficient or formal cause with the mediation of modern philosophy.

The Material Cause as an Organism

According to this new proposal, the relevant material with regard to behavior would be the organism, considered as a whole, according to its functional potential, and not a specific organ (for example, the brain) or sub-organic substrates -whether those studied by modern neurobiology or by the old doctrine of the elements (ultimately, earth, water, air, and fire). It is not "elements" of this kind that make up the material of which behavior is made, nor surely with which the builder or instructor (referring here to the efficient cause) of behavior operates. The "material" out of which behavior is shaped and on which the master imposes the form is the *psyche*, or soul, which is really a composite of matter and form.

It must be taken into account that the material is always somehow determined for us; otherwise it would not be knowable. As stated by Aristotle, "we know things by their *eîdos*" (*Metaphysics*, 1010a 25). Thus, an organism's material would consist of flesh and bones, which are already given as forms ("bones," "muscles," "organs"). On the other hand, these forms are made of more elemental matter, which is also given in certain recognizable forms ("earth, "water," etc.). The point is to know which matter is relevant for the study of the phenomena of interest, in this case, behavior. An infinite recurrence of causes would not make things more intelligible but rather obscure them. The relevant material with regard to behavior would then be the organism as a whole, including its functioning, and in view of the activities it is capable of performing during

its lifetime. Thus conceived, the organism is the *soul*, which as Aristotle says (1983), is neither the body nor does it occur without the body (*De anima*, II.2, 414a 20).

When identifying the soul with life's activity, it could be conceptualized as an act (what it actually does) and as a potential (what it is capable of doing). The soul as act makes up the form or function carried out or being carried out (behavior). The soul as potential is the ability to live, perform and behave according to one's possibilities (to be determined in each case). Within this important Aristotelian distinction, the most general conceptualization of the soul is in terms of potential. According to Aristotle's famous analogy, "if the eye were an animal, sight would be its soul," which he says can be applied to the whole living body, (*De anima*, II.1, 412b 18-20). Potentiality assumes a series of possible acts, thus its more general nature. However, it is worth noting that potentiality does not come before actuality, but on the contrary, actuality is prior to potentiality, as Aristotle himself indicated (*Metaphysics*, IX.8). This means that no potential can be known or defined without recurring to the act or activity. In any case, the potentiality-actuality relationship must be understood as dialectic, so that perhaps it would be more appropriate to talk about reciprocity than precedence. Even Aristotle authorizes this interpretation when he says that "some things are reciprocal causes of one another: thus, exercise causes fitness and fitness causes exercise" (*Physics*, II.3, 195a 5-10).

Insofar as this is concerned, the material behavior "comes" from is the organism understood as the soul, and the soul, in turn, understood as potentiality. The question would be to see how it works, and where this potentiality comes from, which leads us to the following causes.

The Formal Cause as a Model

The sense of form proposed here as more relevant to behavior emphasizes the aspect of model, an aspect rather neglected in previous applications. As mentioned above, the sense of the formal cause most commonly found in psychology is that of an internal mechanism or structure (Hogan, 1994), otherwise far from the notion of *psykhé* or soul as a functional form of the organism. When used as a model, it is in the sense of the scientist's "model of representation" of the organization and functioning of something, for example, the "three-term contingency" with regard to behavior (Killeen, 2001, 2004). Although this idea of a model corresponds to the Aristotelian meaning of form as an organizational structure inherent to the phenomenon observed, it does not undertake the meaning of model as a prior figure or example to be followed (transmits or is imitated).

This sense of model appears in Aristotle when he says that "everything that comes into being becomes something from something else and by the action of something else, which is the same species as the previous one" (*Metaphysics*, IX.8, 1049b 25). According to Aristotle, in the same paragraph, "a musician [is generated] by the action of another musician, there is always something that produces the initiation of the movement. And whatever produces that movement is already actual." The potential for playing the sitar assumes the act of playing it, which comes, at least initially, from

someone else who already knows how to. This other person would be the efficient cause, but here the point is that the act prior to the potential, in this case, becoming a sitarist, comes from another person, and is not self-originating in the individual himself, although, of course, the individual's own practice develops the maximum potential. As Aristotle says, "[one learns] how to play the sitar by playing it, the same as in any other case." The master sitarist will in turn have acquired the potential to play the sitar from someone else whose potentiality was actual. Aristotle says, "one act always precedes another in time" (*Metaphysics*, IX.8, 1050b 5), but here the issue is that the master's potentiality was actual when it was transmitted or taught to the apprentice, who begins by playing the sitar somehow, as a prior step to potentiality and competence as a musician.

In any case, to become a musician or anything else would be prefigured in the preexisting models of the world presented as cultural forms, emphasized here as "formal causes". Formal causes as models would condition the possibilities for what we can become, not to detract from any variation or recombination that could lead to new, even unforeseeable forms. Variations that can become a new actuality are conceived by Aristotle in terms of chance (*týche*) and causality (*autómaton*), studied after the four causes (*Physics*, II.4). Formal causes would thus have the Aristotelian meaning of act and activity, because they are presented precisely as models for action, whether self-defined or leading to something different from themselves, according to Aristotle's well-established distinction (Arendt, 1958).

The Efficient Cause as an Agent

The meaning of the efficient cause to be underlined here in regard to behavior is that of the agent as builder, or perhaps instructor, or even educator (not in vain "education," from the Latin *ducere*, has to do with "conduct" and "ductile"). In fact, this seems to be Aristotle's original meaning. A cause, says Aristotle, is "where change begins." Thus, for example, continues Aristotle, "he who gives advice is the cause […] and, in general, the agent is the cause of what is done, and what produces the change is the cause of what is changed" (*Metaphysics*, V.2, 1013a 30). The example above of the musician for the formal cause is also holds true here. The question is that what is transmitted is the form, and therefore, the efficient cause is intrinsically linked to the formal cause. Hence also, the notion of event does not capture the Aristotelian sense of the efficient cause.

However, the activity of someone who has been influenced to act in a certain way (for example, a person who starts to play the sitar) has the potential to act in a variety of circumstances that no longer depend on the original "efficient cause." Thus, for example, the sitarist may act without the master's presence or even without a model in view, but this does not mean that neither the master nor the model are completely absent, but rather that they are somehow co-present in his "habits" and soul. Not without reason, says Aristotle, the soul is the home of forms and, in this sense, the "form of forms," comparable to the hand, which would be the "instrument of instruments" (*De anima*, III.8, 132a).

This potentiality for doing something leads us to wonder whether we are the agent of our own acts. The sitarist who has learned how to play the sitar can now do so deliberately, that is, at will. Considering oneself an agent or efficient cause of one's own action is not merely suggested to avoid an infinite recurrence, whereby we would always have to refer to a prior efficient cause -in the case of the master sitarist, to the master he would have had, and so on. The consideration of oneself as an efficient cause is based on the human condition itself of having to act in a world in constant movement, and therefore indeterminate, like the "sublunary world."

The sublunary world, or the world where human life takes place (phenomenology's "life-world") is not completely determinate and invariable (like the world of God, or the world of plants, according to Aristotle), but neither is it completely indeterminate and chaotic (like a random event), but depends on the human being's deeds and actions. If the world were completely determinate or completely random, we could do nothing about it, and nothing would make any difference. But things may be or not, depending on human action. Things do not happen to man just because. He is able to do things, but there are no guarantees. Human life goes on in a world of contingencies (*tyche*) or, as Aristotle says (2004), of "what may or may not be" and, in general, of "what could be different from the way it is" (*Nicomachean Ethics*, VI.5, 1140b; 6, 1141a). The contingency not only leads to the possibility of human deeds and actions, but also places us in a position of constantly having to discern, to "discriminate."

This contingent condition of human life, a "tragic source" in Aristotelian philosophy, according to Pierre Aubenque (1963), one of the principal interpreters of Aristotle in the 20th century, helps to understand the importance of prudence (*phrónesis*) in Aristotle's anthropology, in particular in *Nicomachean Ethics*, as Aubenque explains in the work cited above. "Prudence" in this context means practical knowledge, in the sense of knowing the right thing to do at all times, doing one's best under the circumstances. It refers to discriminatory behavior directed at a possible end (in terms of behavioral analysis).

At this point, it becomes necessary to review the structure of human action in Aristotle. Suffice it to remember that desire (*orexis*) is the motor of action. However, desire is preceded by the desirable goal or end, which guides the organism's movement. Thus, desire is not something prior or internal that propels action, but rather the action itself already incorporates the desired end. The *desire* for the goal is correlative to the *goal* of desire. This refers to a "deliberative desire" for things that depend on us, that is, that are contingent, that may or may not be, and hence their deliberative nature, and thus also, the decisive importance of the "art of prudence," to use a baroque expression.

The art of prudence assumes deliberation (*boúleusis*) about what is fitting and appropriate at all times and in any situation (*kairós*) which is imposed by the contingency of the world. We can understand the importance of the "right time" or "favorable occasion" (*kairós*) for an action for a desired end. We can also understand the importance of deliberation (*boúleusis*), which, incidentally, is a term taken precisely from political deliberation. In the present context, it refers to "deliberation with oneself," but notice that the model is political and comes from social practice and, ultimately, from education (in this sense). Deliberation leads to decision or choice (*proaíresis*) of means. The

choice would be the desire or wish for the purpose that, as mentioned, is embodied in operant action.

The issue here is the consideration of oneself as an efficient cause, which for Aristotle would be no problem, but would be for behaviorism and behavioral analysis (wary of self-initiation of behavior). This consideration means behaviorism would have to incorporate the notion of a person who unambiguously assumes the authorship of his or her behavior. Behaviorism has concepts that allow us to do this without forsaking its coordinates, although perhaps not without exceeding its terms (Pérez Álvarez & García Montes, 2006). Aristotle enables "originating causes" of behavior to be considered from a holistic, inter-behavioral perspective, without recurring to the notion of "private events," as does Overskeid (2006). The notion of event, including the "private event," incurs in "mechanicist causation" derived from converting the efficient cause into an "antecedent event," which, as mentioned, does not capture the Aristotelian meaning.

The Final Cause in a Teleological Sense

There is no special problem in applying Aristotle's final cause to operant behavior. As mentioned, the notion of operant behavior offers a clear example of final causality. However, let us return to some basic concepts of radical behaviorism, if only to assist in comprehending the Aristotelian teleological sense of operant behavior. It goes without saying that this is a meaning built on the reality of things, so that the teleological meaning should not present any problem, as it does, however, for Hogan (1994) for example.

In fact, operant behavior in Aristotelian teleological terms has already been introduced by Howard Rachlin (1992). The basic concepts are the notion of operant behavior itself as a dialectic behavior-reinforcement relationship, the reinforcement contingency as a causal structure, and the reinforcement history as the potentiality or possibility condition of what can be done.

It is important to see the behavior-reinforcement relationship as a dialectic relationship, in which the meaning of one term is related to another, for example, the head and tail of a coin or uncle-nephew relationship. As each term assumes the other, behavior assumes the reinforcement or purpose it was related to when it became operant (regardless of whether or not a particular behavior is followed by a reinforcer). Thus, the behavior-reinforcement relationship, far from circular and *tautological* (which, incidentally, the cognitive schema-behavior relationship is, when behavior is explained by means of a schema which, in turn, is explained by the behavior itself), would be a circular *dialectic* relationship, which would allow us to understand the teleological sense of operant behavior (along with the above-mentioned concepts).

Furthermore, the reinforcement contingency could be conceived as a causal structure of the individual behaviors that it comprises. Reinforcement alone would not be a final cause. But the contingency includes the behavior itself, which, alone, might seem to be the "efficient cause" of reinforcement. In fact, specific behavior correlates with previous behavior forming an entire functional class, so that the consequences of the class are prefigured in each specific behavior. Thus, for instance, going back to our sitarist, any

act of playing the sitar incorporates and updates all the previous acts, including the foreseeable consequences or functions of the musical composition.

The reinforcement history comprises the condition of possibility of what someone can do under certain circumstances. In fact, the reinforcement history as presented by Rachlin (1992) is a concept similar to Aristotle's concept of the *soul* and, in our view would be a material cause (in the above-mentioned sense).

Thus, final causality may be seen as a kind of teleological holism. This holism is precisely the (Aristotelian) behaviorist teleological holism, which embraces an organism's past and future, as well as current overt behavior (Rachlin, 1992). This would be different from the holism of cognitive psychology, which embraces an organism's current internal as well as its current overt behavior (peripheralism plus centrism) (Rachlin, 1992). In cognitive psychology, holism, if it can even be called holism, would be a holism of space, whereas the Aristotelian-behaviorist holism would be a holism of time (Rachlin, 1992, p. 1378). The "holism of space" is closer to mechanism than to genuine teleological holism, which has an essentially temporal structure. (See Pérez Álvarez, Sass & García Montes, in press).

Final causality includes apparent causality as a particular case, in which the consequence accidentally follows the behavior, without really being operated by it. This is the phenomenon known as "superstitious behavior." Despite the fact that such behavior is not really operant, it can be self-molded so that it even generates its own reinforcing consequences, for example, relief.

Conclusions and Implications

Above all, Aristotle's four causes have been shown to be fertile for acquiring a fundamental knowledge, even more basic than scientific knowledge, of what they are applied to, in this case, human behavior. However, the four causes cannot replace scientific-technical analysis (in particular, "behavioral analysis"), but are rather proposed as a meta-scientific, not to say metaphysical (in the Aristotelian sense), basis supporting such analysis. The four causes respond more to the ontological question about the way something is, rather than a truly scientific question. Thus, the four causes could be applied to more concrete phenomena than general behavior, as they have been here, in order to see what they are like, their reality status, or nature. Applications to hypnosis (Killeen & Nash, 2003) and to mental disorders (Pérez Álvarez, 2004; Pérez Álvarez, García Montes & Sass, in press) might be mentioned in this sense.

Application of the four causes as proposed here has implications with regard to behaviorism and behavioral analysis.

Consideration of the material cause as the organism, conceived in its functional totality (Aristotle's *psykhé*), invalidates Hogan's (1994) definition of behavior as the expression of nervous system activity, and Killeen's (2001, 2004) resorting to neural mechanisms, which even he acknowledges as recurring to reductionism. In light of the four causes, the neuroscientific explanations of behavior are not more scientific because they refer to the brain. This is not to belittle the importance of studying the neural

system in relation to behavior, but as an explanation of behavior, this may be the wrong path, as Skinner would say. A neo-Aristotelian neurobiology is possible. "The Aristotelian idea of the soul as a form of the body, explicated through a variety of contemporary philosophical and scientific investigations, offers an important counterpoint to the Platonic, Cartesian, and functionalist-computational traditions. The very shape of the human body, its lived mechanics, its endogenous processes, and its interactions with the environment work in dynamic unity with the human system to define necessary constraints on human experience" (Gallagher, 2006, p. 152).

The consideration of the formal cause as the model, in the sense of example and origin of the subject's behavior (and not the behavior analyst's model), places behaviorism and behavioral analysis within the context of culture as the human being's natural environment, without having to force the terms derived from animal behavior laboratory studies. This is an attempt to establish a new basis for a radically human behaviorism, rooted in human behavior, whose "Skinner box," to borrow the term, would be the historical culture context (Pérez Álvarez & Sass, in press).

By considering the efficient cause the agent (and not an event as is usually done), leads to a concept of the person in behaviorism and behavioral analysis, and to understanding behavior as originating within oneself. The concept of person allows us to understand the self-initiation of behavior without incurring in the problems of the traditional notions of *self*, *ego*, subject, and even personality (about which behaviorism was always reticent, and rightly so). It also allows us to understand self-initiation without resorting to "private events," which, although more in accordance with behaviorism and behavioral analysis, still remain a mechanicist version of the "efficient cause" as an "antecedent event" (Pérez Alvarez & García Montes, 2006).

The final cause in the teleological sense places behaviorism and behavioral analysis in the lead in psychology in understanding intentionality and the purposiveness of behavior without resorting to mentalist explanations such as those that refer to mental representation, expectations, and so on. As Skinner (1974) says, "Possibly no charge is more often leveled against behaviorism or a science of behavior than that it cannot deal with purpose or intention. A stimulus-response formula has no answer, but operant behavior is the very field of purpose and intention. By its nature it is directed toward the future: a person acts in order that something will happen, and the order is temporal" (pp. 55-56).

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