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EXPLORATORY BEHAVIOR IN INFANCY AND EARLY CHILDHOOD

CONDUCTA EXPLORATORIA EN LA INFANCIA Y EN LA NIÑEZ TEMPRANA

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ABSTRACT

A healthy child investigates and manipulates objects endlessly. He or she gets into cupboards and pulls out the pots and pans, inspects stones, repeats sounds made and heard, listens to the sound of running water, fingers the twitching nose of the family's pet rabbit, watches his or her toes disappear in the sand, gazes at his or her stomach as it moves in and out, peers into mother's nose, and on and on. These instances of exploratory behavior, and many others like them, have been attributed to the child's "natural curiosity," "a love of the natural," "an inherent desire to learn," and "a natural interest in the new and different." Whether any of these phrases is an adequate explanation of exploratory behavior, the activities referred to play an important role in a child's development. To illustrate how exploratory behavior has been treated in the past, I shall review and comment on two theories. One holds that exploratory behavior is triggered by the emotion of curiosity; the other maintains that it is brought about by an arousal drive. Then I shall describe, in some detail, how exploratory behavior is treated from a behavior analysis point of view.

Key words: exploratory behavior, infancy, curiosity, behavior analysis

RESUMEN

Un niño saludable investiga y manipula objetos eternamente. Se mete en las alacenas y saca las ollas, las cacerolas, inspecciona piedras, imita los sonidos que hace y escucha, escucha el sonido del agua, tira bruscamente de la nariz del conejo que es la mascota de la familia, observa cómo los dedos de sus pies desaparecen en la arena, contempla su estómago mientras lo mueve hacia dentro y hacia afuera, examina la nariz de su madre y así sigue y sigue. Estos ejemplos de conducta exploratoria y otros similares, se han atribuido a la "curiosidad natural" del niño, "a un amor hacia lo

natural," "a un deseo inherente por aprender," y "a un interés natural por lo nuevo y diferente." Aún cuando cualquiera de las oraciones anteriores representen o no una explicación adecuada de la conducta exploratoria, las actividades a las cuales se refieren, desempeñan un papel importante en el desarrollo del niño. Para ilustrar cómo se ha tratado la conducta exploratoria en el pasado, en este artículo revisaré y comentaré dos teorías. Una de las teorías sostiene que la conducta exploratoria es activada por el sentido de la "curiosidad," la otra teoría, mantiene que la conducta exploratoria es causada por un impulso de "excitación." Posteriormente describiré, con algún detalle, cómo se analiza la conducta exploratoria desde la perspectiva del análisis de la conducta.

Palabras clave: conducta exploratoria, infancia, curiosidad, análisis conductual

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Exploratory Behavior Triggered by the Emotion of Curiosity

"The first and simplest emotion which we discover in the human mind is curiosity." So said Edmund Burke over two hundred years ago. Many psychologists still adhere to this view. For example, Hurlock (1972), a normative developmental psychologist, states that "Curiosity is a pleasant emotional state. It provides motivation to explore and to learn new meanings both of which activities are satisfying and conducive to good personal and social adjustment. Curiosity adds a pleasant excitement to life. It acts as stimulus to physical well- being without disturbing body homeostasis as other emotions do" (p. 202). According to her view, certain kinds of new and strange situations elicit exploratory behavior, and the young infant responds by "...tensing the face muscles, opening the mouth, stretching out the tongue, and wrinkling the forehead. By the second half of the first year, he stretches his body, leans forward, and grasps the curiosity-provoking object. As soon as he gets it, he begins a more thorough exploration by handling, pulling, sucking, shaking, and rattling it" (p. 203).

In early childhood, exploratory behavior is mainly directed toward the physical world and toward the anatomical difference between boys and girls (Mussen, Conger, & Kagan, 1976). Because many kinds of direct exploration are punished, "...as soon as the child is able, he asks questions about things that arouse his curiosity. The 'questioning age' begins around the third year and reaches its peak approximately at the sixth year" (Hurlock, 1972, p. 203). These descriptions, Hurlock goes on to say, must be considered the general behavioral form of exploratory behaviors, with specific topographies varying among children of the same age. Particularly apparent are the differences between boys and girls and among children with contrasting personality patterns, such as the socially outgoing or the withdrawn child.

Comment

The curiosity-emotional theory of exploratory behavior in infancy and early childhood is open to question on several counts. First, the environmental conditions said to produce exploratory behavior--"certain kinds of new and strange situations"--is too vague to permit identifying them as antecedent conditions with any degree of reliability. Second, the description of the exploratory behavior of infants and young children--"tensing the face muscles, opening the mouth, stretching out the tongue, and wrinkling the forehead"--is a response pattern that is also difficult to identity and measure. Third, the claim that the high frequency of questions asked by a typical child during the questioning period of development is substitute verbal behavior for punished direct (motor) exploratory behavior is not supported with research. And finally, while this explanation of exploratory behavior may provide information for those interested in the norms of development--the average ages at which individuals display various behaviors and abilities--it is less than helpful to those seeking to understand the exploratory behavior of an individual child.

Exploratory Behavior Brought about by an Arousal Drive

The view that the immediate cause of exploratory behavior is an arousal state--a hypothetical drive--is shared by many psychologists (Berlyne, 1960, 1963; Harlow, Harlow, & Meyer, 1950; Hunt, 1965; Reese & Lipsitt, 1970). Berlyne, who has developed this view in some detail, states, "Exploratory responses have the function of altering the stimulus field," and then he rightly adds, "...all responses change the stimulus field in some way, and one might very well claim that any one response must have the production of a change in the stimulus field as a part of its function..." (1963, p. 287). He goes on to say that a distinction can, nevertheless, be made between exploratory and non-exploratory behavior, "...the stimulus changes introduced by non-exploratory behavior are accompanied by biologically important effects on issues other than the sense organs and the nervous system, and this in not true of the changes dué to exploration" (p. 287). Thus, he differentiates exploratory behavior from non-exploratory behavior on the basis that the former does not have hemostatic functions but only serves to change the stimulus field, while the latter has hemostatic functions.

Furthermore, Berlyne maintains that the strength and direction of exploratory behavior come under the control of the state of the organism and the properties of external stimuli which may be divided into two classes. One pertains to those properties that are important in other areas of behavior, such as stimulus intensity and stimulus affective value. By stimulus affective value,

he means those properties that have evolved from pairing with biologically beneficial stimuli (conditioned appetitional stimuli) or aversive stimuli (conditioned aversive stimuli). The second class of properties, called *collative* properties, depends on information derived from comparing the stimulus in question with others accompanying it, or a present stimulus with stimuli encountered in the past. Collative properties include novelty, surprise, change, ambiguity, incongruity, blurredness, and the power to induce uncertainty. These properties of stimuli induce a state of arousal (a drive state), which naturally leads to *specific* exploratory behavior, which in turn lowers the arousal state, and in so doing strengthens the antecedent exploratory behavior.

Berlyne (1960) and other psychologists (e.g., Hutt, 1970) claim that in addition to specific exploratory behavior, there is *diversive* exploratory behavior which is motivated by the hypothetical state of boredom, which in turn leads to a change in the environment. It is as though the person becomes satiated or "fed up" with the same situation and does something to change it.

Comment

Berlyne's analysis raises several questions. First, his distinction between exploratory and non-exploratory categories on the basis of the occurrence of biological functioning has not as yet been demonstrated and cannot serve as a feasible criterion. Second, the claim that specific exploratory behavior is aroused by the stimulus properties of novelty, surprise, change, ambiguity, incongruity, blurredness and the power to induce uncertainty has not served to delineate the situations in which exploratory behavior takes place. For the most part, investigators working in this area concentrate on stimulus complexity and novelty (see Hutt, 1970), either ignoring the other categories or treating them as part of complexity or novelty. This is not to say, however, that the terms "complexity" and "novelty" themselves are easily definable (Nunally & Lemond, 1974). The definition of complexity is unclear because it includes both the physical dimensions of stimuli (the number of distinguishable elements and the extent of the physical similarity among them and the degree to which the elements in a stimulus pattern are responded to as a unit). In as much as the physical and the functional dimensions of stimuli refer to different phenomena, they should be treated separately. Third, the hypothetical variables and processes, such as arousal, arousal-balance, boredom, and drive reduction, have equivocal meanings. Hutt (1970), for example, stated that "any drive is defined by the operations chosen to demonstrate it; the precise relationship between the dependent and independent variables is still insufficiently explained to make the term 'curiosity' much more than a description of the observed phenomena" (p.71). Cofer and Appley (1964) also

suggested in their comprehensive review that the drive concept of exploration is a poor one and a liability to an analysis of exploratory behavior.

Behavior Analysis of Exploratory Behavior

To provide the necessary background for a behavior analysis of exploratory behavior, we preface our discussion with a brief review of the original equipment of a human infant. A normal infant is born with two sets of behaviors: reflexes, and random behavioral movements (Bijou & Baer, 1965; Kantor & Smith, 1975). Reflexes, which are relatively simple interactions, can be classified on the basis of whether they are internal (introceptive) or external (extroceptive). They may also be classified on the basis of whether they are conditionable (psychological) or not conditionable (physiological). The external, conditionable reflexes are involved in many forms of psychological behavior, particularly emotional reactions.

Random behavior movements, the other category of original psychological equipment, consist of uncoordinated, unorganized responses. They are the raw materials for the discriminated and differentiated reactions referred to as gross and fine motor skills and abilities. When they are developed, even at primitive levels, they enable the infant and young child to explore the physical environment. Such behavior, often referred to as ecological behavior to show that it is parallel to biological ecological behavior, is operant behavior in relation to any antecedent temporal, spatial, or movement properties of objects, including the physiological aspects of the infant's body and the bodies of others (Antonitis & Barnes, 1961; Bijou, 1980; Friedlander, 1966; Hutt,1966; Rheingold, Stanley, & Doyle, 1964). To be more specific, we must add that exploratory behavior is a special class of operant behavior, one that is automatically reinforced by the stimuli generated by the response (Baumeister & Forehand, 1983; Skinner, 1957; Sundberg, Michael, Partington, & Sundberg, 1996; Vaughan & Michael, 1982). Skinner (1953) pointed out that:

> Some forms of stimulation are positively reinforcing although they do not appear to elicit behavior having biological significance. A baby is reinforced, not only by food, but the tinkle of a bright object. Behavior which is consistently followed by such stimulation shows an increased probability. It is difficult, if not impossible, to trace reinforcing effects to a history of conditioning. (p. 83)

Some exploratory interactions are occasional and fleeting and play no part in building the child's behavior equipment; however, most of them remain

with the child as acquisitions. Through exploratory behavior the child learns (a) the qualities of objects and things, such as wetness, stickiness, and shapes; (b) the conditions of things, such as solid, liquid, and stability; (c) what things can do to the individual and others, such as scratch, push, and keep him or her awake; and (d) the possibility of things and persons, such as dependability, resistance, and changes in form (Kantor & Smith, 1975).

Exploratory behavior is weak compared to behavior reinforced by homeostatic stimuli because extended deprivation of homeostatic stimuli can make such stimuli powerful operant contingencies. It is also weak because it is on a naturally occurring continuous reinforcement, that is, it is immediately reinforced every time it occurs (Hutt, 1966). However, the strength of exploratory behavior can be augmented by other reinforcers. For example, social reinforcement may be added to the reinforcement of exploratory behavior by members of the child's family and teachers who believe that such behavior should be encouraged. Furthermore, social reinforcers frequently accompany exploratory behavior because of their natural coexistence in many social situations. (Little brother watches big brother's goldfish, not only because of their fascinating colors and movements but also because it gives him an opportunity to be near his idol.) Further, there are situations in which hemostatic reinforcers may augment the reinforcement of exploratory behavior, as in the case of a child examining a bush at the side of the road and "discovering" that shiny red berries taste sweet.

Aversive contingencies for exploratory behavior from *physical sources* can weaken exploratory behavior. In many situations, exploratory behavior may produce aversive consequences and may thereby reduce or eliminate such behavior in the future. For example, a child playing in a tub of water, falls down and almost drowns, and thereafter may be fearful of playing in or near water. Thus, exploratory behavior may be weakened, modified, or inhibited through the aversive contingencies brought about by exploratory behavior itself.

Aversive consequences from *social sources* can also weaken exploratory behavior. New and strange situations, *per se*, are probably not naturally fear producing stimuli (Rheingold & Eckerman, 1969, 1973). However, aversive contingencies for exploratory behavior can arise from conflicts with the moral practices of a society. Some instances of exploratory behavior may be perceived by parents and teachers as immoral and, as such, is punished. The best-known example is a young child's examination of the anatomical differences in a child of the opposite sex. Another social source of aversive contingencies is the practice of parents and teachers who restrict exploratory behavior because the child might hurt or might inconvenience somebody. ("The swing will come back and hit you on the head if you push too hard," or "Tim's mother will have to tie up their dog if you go into their yard

because he barks and jumps up on people.") Punishment of exploratory behavior for any reason may change its natural positive reinforcing properties to aversive properties and thereby reduce or eliminate the behavior.

A child's exploratory behavior may be weak with respect to some physical stimuli and strong with respect to others. It may be weak in relation to stimuli in the external environment because of the lack of opportunities to explore it or because of the overly restrictive practices of parents and teachers as mentioned above. However, it may be relatively strong in relation to stimuli from the child's own anatomy and physiological functioning because it is always "there." Is this why some grossly underdeveloped children, for instance, those with very limited behavioral equipment, engage in stereotypical behavior? Is this why therapists attempt to eliminate this behavior by encouraging the development of socially acceptable competitive behavior?

SUMMARY AND CONCLUSSION

The first part of this paper is a description and critique of two theories of exploratory behavior: one which holds that exploratory behavior is triggered by the emotion of curiosity and the other that it is "impelled" by a hypothetical arousal drive. The second part of the paper is a behavior analysis of exploratory behavior. From the behavioral point of view, exploratory behavior is automatically reinforced operant behavior. Treated this way, exploratory behavior cannot be identified as a set of response topographies, as suggested by the curiosity-emotional approach. The responses in an exploratory interaction can be any response in a person's repertoire: motor, verbal, overt, and covert. It also follows that the antecedent stimuli for exploratory behavior cannot be "certain kinds of new and strange situations" or stimuli with Berlyne's concept of collative properties. The antecedent stimulus for exploratory behavior can be any dimension or any combination of dimensions of physical objects or physical aspects of the person or of other persons.

Exploratory behavior is weak compared to behavior reinforced by homeostatic reinforcers because extended deprivation of hemostatic stimuli can make the preceding operant behavior extremely powerful. They are also weak because the reinforcers for exploratory behavior are always on a continuous schedule and because of restrictions imposed by the physical and social environment. However, exploratory behavior can be made strong by the addition of social reinforcers from members of the person's family and teachers. Finally, exploratory behavior can have differential strengths for stimuli from the

external environment and for stimuli from the person's own anatomy and physiology.

By far, the most important implication of a behavior analysis of exploratory behavior is that a tremendous amount of a person's behavior repertoire is acquired and maintained by non-homeostatic reinforcers. When one thinks of the thousands and thousands of reaction patterns that evolve from a person's interactional history, one must keep in mind that much of it has evolved from automatically reinforced operant behavior. The fact that so much of this learning seems to come from "trivial" or "unimportant" activities, such as play, should encourage research on the conditions that produce and maintain exploratory behavior and to pinpoint its relationships to other behaviors.

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