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AGRESSÃO INDUZIDA NO JEAB: UM LEVANTAMENTO DE PUBLICAÇÕES

INDUCED AGGRESSION IN JEAB: A SURVEY OF PUBLICATIONS

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RESUMO

Os primeiros experimentos sobre agressão induzida buscaram estabelecer a relação direta entre estimulação aversiva e comportamento agressivo. A generalidade do fenômeno foi avaliada com variações na espécie dos sujeitos e nos estímulos indutores. Estudos seminais sobre agressão induzida foram publicados no periódico *Journal of the Experimental Analysis of Behavior* (JEAB). Os objetivos do presente estudo foram apresentar sistematicamente a distribuição temporal das publicações sobre a agressão induzida no JEAB e descrever seus aspectos metodológicos. Os termos "aggress*", "fight*" e "attack*" foram buscados no banco de dados Wiley Online Library e critérios de seleção foram aplicados. Cinquenta e oito estudos foram analisados. A representatividade global de publicações sobre agressão induzida no JEAB foi de 1,1%. Entre 1962 e 1981, houve publicação regular sobre agressão induzida no periódico, o que representa 2,8% das publicações do JEAB no período referido. Neste intervalo, um primeiro período de publicações foi marcado por investigações envolvendo exposição de ratos e macacos-de-cheiro a choque elétrico, o que resultava em respostas agressivas de luta e de mordida, respectivamente; um segundo período foi marcado por trabalhos que envolviam a exposição de pombos a esquemas de reforço, resultando em respostas agressivas de bicar. O padrão de publicação sobre agressão induzida no JEAB está de acordo com indicações anteriores sobre a distribuição temporal das publicações gerais sobre a agressão induzida. Limitações do presente trabalho são discutidas e sugestões para pesquisas adicionais são fornecidas.

Palavras-chave: agressão induzida, JEAB, levantamento

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 inducing 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*" 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

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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, inducing 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).

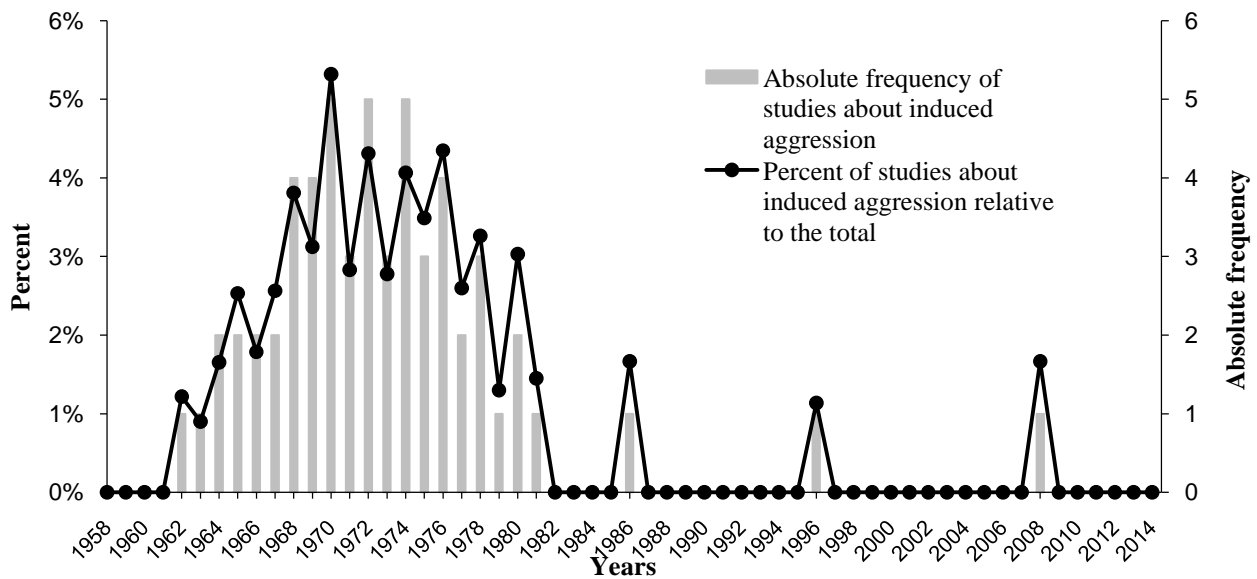


Figure 1. Distribution of publications from 1958 to 2014 in JEAB. The data is presented in relative percentage (representativeness) and in absolute frequency. Cumulative lines are ruled by the left axis; bars are ruled by the right axis.

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%, 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.

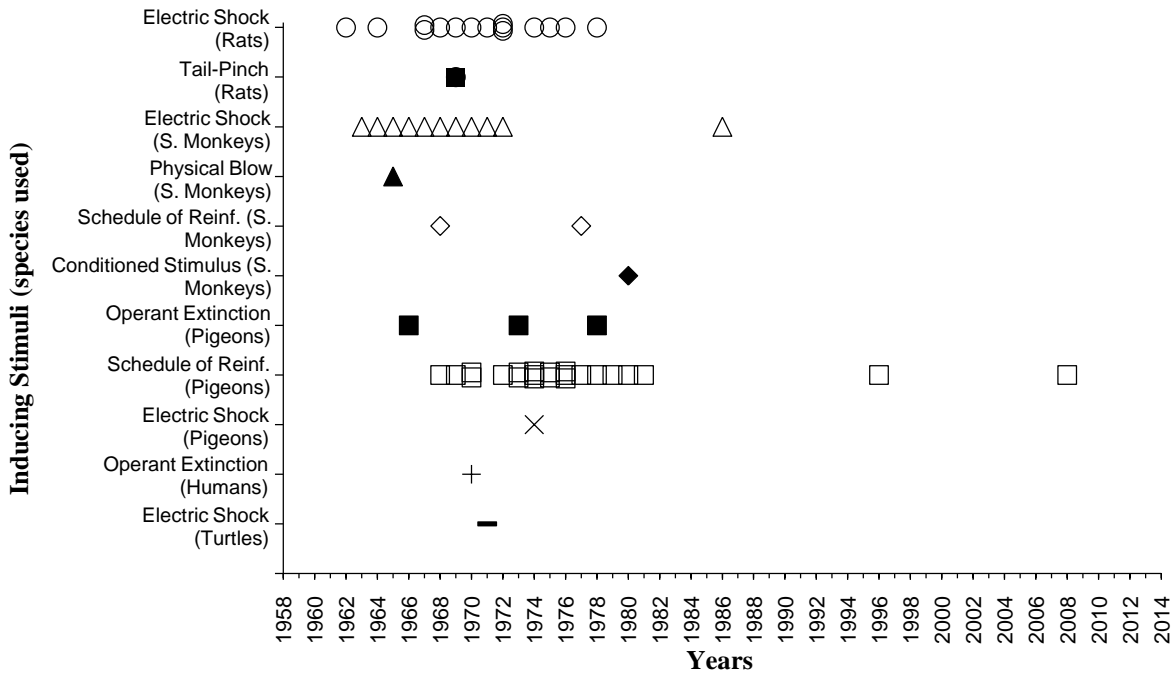


Figure 2. Distribution of the eleven inducing stimuli across years in which they were reported in the selected studies of JEAB, from 1958 to 2014. Each marker is for one occurrence. Circle markers are for rats, triangle and diamond for squirrel monkeys, square and “X” for pigeons, cross for humans, and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

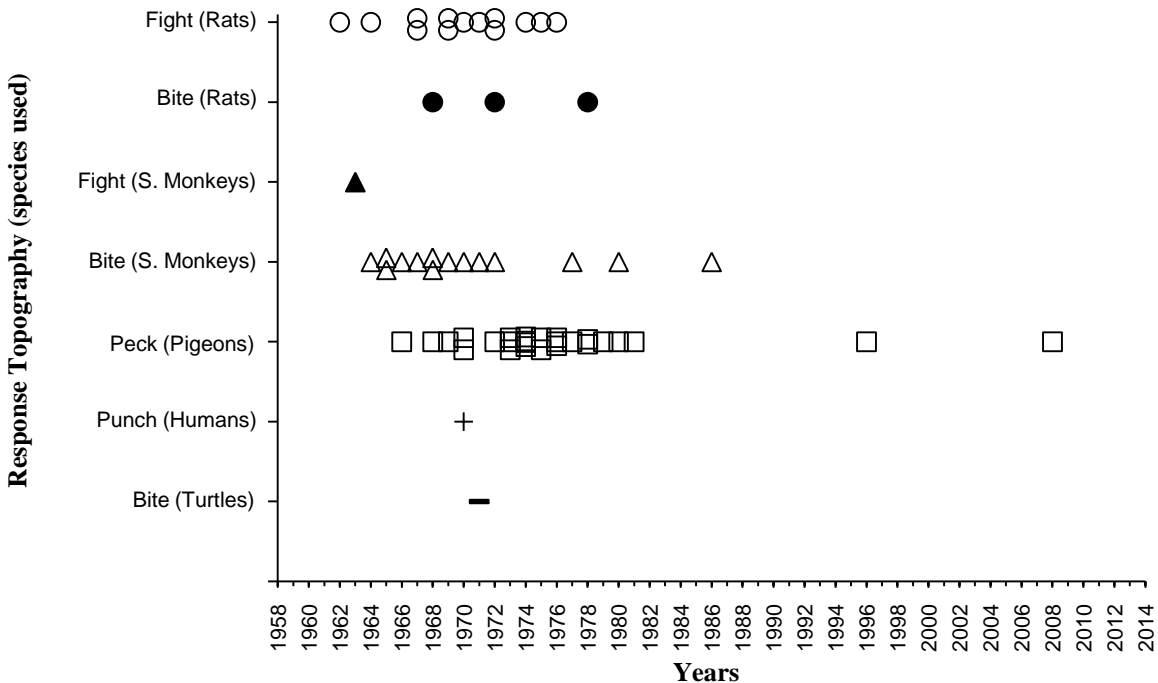


Figure 3. Distribution of the seven topographies across years in the selected publications of JEAB, from 1958 to 2014. Each marker is for one occurrence. Circle markers are for rats, triangle for squirrel monkeys, square for pigeons, cross for humans, and dash for turtles.

“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.

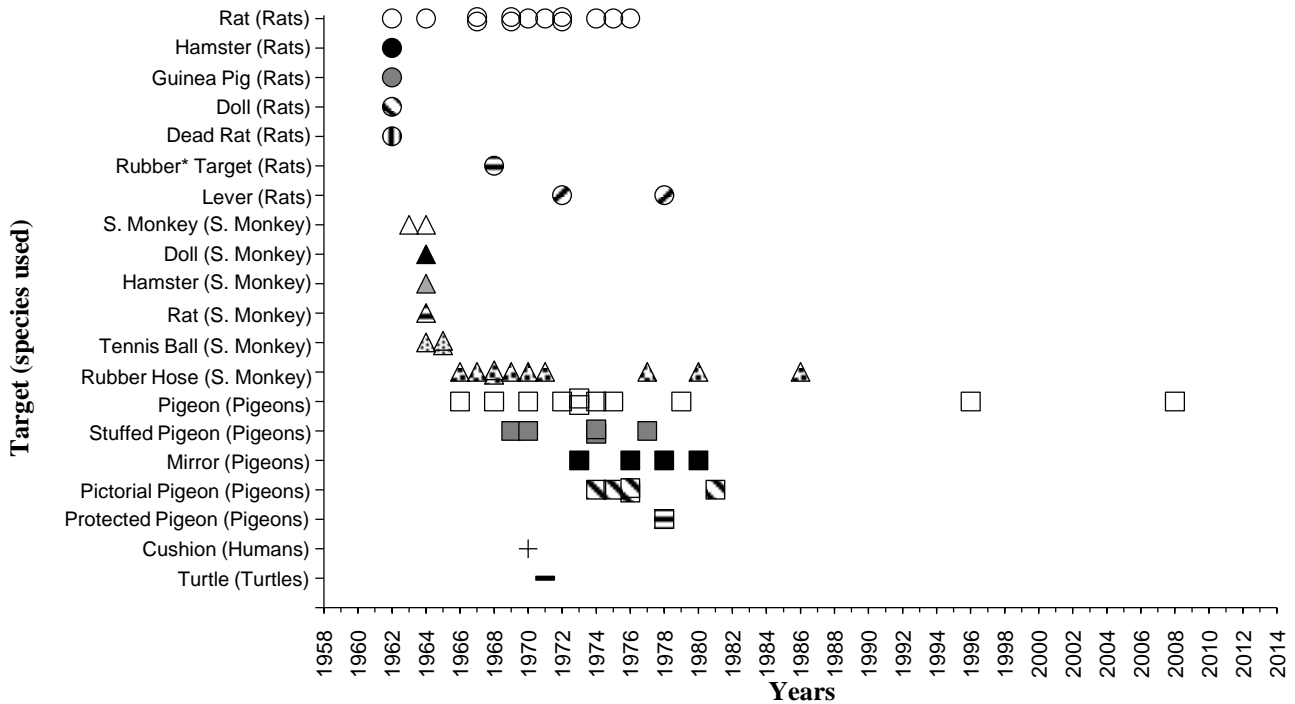


Figure 4. Distribution of the twenty targets reported in the selected works of JEAB, from 1958 to 2014. Each marker is for one occurrence. Circle markers are for rats, triangle markers for squirrel monkeys, square for pigeons, cross for humans, and dash for turtles. * = Rubber/Wood/Metal.

“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 inducing 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.

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