

CONTROLE AVERSIVO NA ANÁLISE DO COMPORTAMENTO: UMA ANÁLISE DAS  
PUBLICAÇÕES DO JEAB E JABA (1958-2018)

AVERSIVE CONTROL IN BEHAVIOR ANALYSIS: AN ANALYSIS OF JEAB AND JABA  
PUBLICATIONS (1958-2018)

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**RESUMO**

Analisamos a frequência de publicações sobre controle aversivo e as tendências de publicações sobre contingências específicas. Os artigos analisados foram publicados entre 1958 e 2018 em dois periódicos: *Journal of the Experimental Analysis of Behavior* (JEAB) and *Journal of Applied Behavior Analysis* (JABA). Foram selecionados artigos que apresentavam no título, resumo ou palavras-chave, pelo menos um dos seguintes descritores: aversivo, esquiva, fuga, reforço negativo e punição. Verificamos que a frequência de publicações sobre controle aversivo foi maior no JEAB do que no JABA até os anos 90, quando esta tendência se inverteu. A partir do ano 2000, houve um aumento irregular nas publicações do JEAB sobre o tema. A expansão da pesquisa aplicada sobre controle aversivo está relacionada a um crescente interesse no reforçamento negativo. A significativa redução nos estudos sobre controle aversivo pode estar relacionada a regulamentações éticas mais rigorosas em pesquisa e a declarações de alguns autores sobre a necessidade de evitar-se o uso do controle aversivo. O aumento dos estudos de aplicação a partir da década de 1990 parece estar relacionado ao maior uso da avaliação funcional e ao desenvolvimento de tratamentos para problemas de comportamento resultantes de contingências de reforçamento negativo.

*Palavras-chave:* controle aversivo, contingências aversivas, Análise do Comportamento, publicação.

**ABSTRACT**

We analyzed the frequency of publications on aversive control and publication trends concerning specific aversive contingencies. The articles were published between 1958 and 2018 in two journals: *Journal of the Experimental Analysis of Behavior* (JEAB) and *Journal of Applied Behavior Analysis* (JABA). We selected articles that presented at least one of the following descriptors in the title, abstract, or keywords: aversive, avoidance, escape, negative reinforcement, and punishment. We verified that the publication frequency on aversive control was higher in JEAB than in JABA until the 1990s, at which point the trend was reversed. An irregular increase has been observed in JEAB publications on the topic since 2000. The rise of applied research on aversive control is related to growing interest in negative reinforcement. This significant decrease in studies on aversive control may be related to stricter ethical regulations in research and related to the assertions of some authors to reduce the aversive control use. The increase in applied studies since the 1990s appears to be related to the greater use of functional assessments and the development of treatments for behavioral problems that result from negative reinforcement contingencies.

*Key words:* aversive control, aversive contingencies, Behavior Analysis, publication.

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Some authors (e.g., Lerman & Vorndran, 2002; Todorov, 2001) suggest that studies on aversive contingencies in Behavior Analysis have become significantly less frequent in recent decades. Given that aversive control is an important part of operant contingencies (cf., Himeline, 1984; Perone, 2003), the decline in the number of investigations in this area may result in a gap in our current knowledge about the ways in which operant behavior is affected by aversive contingencies and the development of effective techniques in applied settings.

Notwithstanding the generical comments of Lerman and Vorndran (2002) and Todorov (2001), the decrease in the frequency of publications on aversively controlled behavior has not been systematically demonstrated. Some surveys have evaluated this issue, but they have usually been interested in a particular topic. For example, Lyon, Picker, and Poling (1985) referred to the lower frequency of publications that reported research with electric shock as an aversive stimulus in the *Journal of the Experimental Analysis of Behavior* (JEAB). According to their survey, in 1958, 22% of JEAB publications used electric shock as the aversive stimulus. This percentage increased to 34% in 1963, followed by a systematic reduction to 3% in 1981. This reduction of the use of electric shock, however, does not necessarily indicate a lower frequency of studies on aversive control because aside from electric shock (i.e., the most commonly used aversive stimulus in basic research; cf., Carvalho Neto, Maestri, & Menezes, 2007), other types of aversive stimuli were also tested during this time period, including tail pinch (e.g., Brodie & Boren, 1958; Azrin, Hake, & Hutchinson, 1965), heating the floor of Skinner boxes (e.g., Ulrich & Azrin, 1962), and intense infrared light that is projected toward the rat's tail (Maier et al., 1980). In all of these cases, the aversive stimulation elicited aggressive behaviors, licking the hind paws, and tail-flick responses, which have been characterized as standard responses to painful stimulation in rats (cf., Hunziker, 1992; Jackson, Maier, & Coon, 1979).

Concerning applied behavior analysis research, a tendency toward a reduction of the number of studies on aversive contingencies was reported by Lerman and Vorndran (2002) and Northup, Vollmer, and Serrett (1993). Lerman and Vorndran (2002) found that the types of aversive contingencies, especially punishment procedures, were less frequently analyzed around 1990. Northup et al. (1993) reviewed all articles that were published in *Journal of Applied Behavior Analysis* (JABA) from 1968 to 1992 and found that the number of studies focused on assessments of punishment, time-out, and response cost decreased. On the other hand, the number of studies on negative reinforcement increased by the end of the 1980s. According to Northup et al. (1993), this increase in studies on negative reinforcement was fostered by the popularity of its usage in a wide range of functional assessment protocols attesting the role of negative reinforcement in maintaining behavior disorders (e.g., Cipani & Spooner, 1997; Miltenberger, 2005). Other studies observed a trend since the late 1980s toward an

increase in the use of reinforcement-based procedures to reduce severe behavior disorders (e.g., self-injury and aggressive behavior; e.g. Kahng, Iwata, & Lewin, 2002; Pelios, Morren, Tesch, & Axelrod, 1999).

Although they reported a systematic decline in the number of studies on aversive contingencies, Lerman and Vorndran (2002) and Northup et al. (1993) did not provide specific data or analytical tools for a broader analysis of publications on aversive control. Such a lack of information precludes us from evaluating the degree of this reduction and tracing for valid functional relationships between the scientific behaviors of researchers in the areas of basic and applied research (cf., Boswell & Smith, 2017) and extra-laboratory environments (e.g., the evolution of research policies and cultural practices within our verbal community). An analysis of publication trends can be useful for identifying issues that have been overlooked over the years, stimulating further interest in investigating basic and applied fields, and increasing general interest in topics on instances of operant behavior that are relatively understudied. The purpose of the present study was to examine the publication frequency of studies on aversive control and analyze publication trends of studies on specific contingencies from 1958 to 2018 in two important behavior analysis journals, one that focuses on basic research (JEAB) and one that focuses on applied research (JABA). Such a quantitative analysis can enable a more accurate evaluation of the proportion of studies that involve aversive contingencies among all contingencies that are surveyed within the time period and reveal the most studied contingencies in each time period.

## METHOD

The current review included all JEAB and JABA issues from 1958 to 2018, considering that JEAB and JABA began publication in 1958 and 1968, respectively. We evaluated articles that were made available through the journals' websites.

*Search procedures.* We searched the JEAB and JABA websites with no time-period restrictions. We used the following descriptors to select articles: "aversive", "avoidance", "escape", "negative reinforcement", and "punishment". We created one article list according to these descriptors. These descriptors were selected because they are commonly used in the behavior analysis literature (cf., Skinner, 1969; Sidman, 1989) to refer to operant contingencies that are based on aversive stimulation (i.e., positive and negative punishment and negative reinforcement). Additionally, the term "aversive" is commonly used to refer to several experimental and applied procedures that include aversive stimulation. The term "aversive" is also generically used in theoretical and philosophical work (e.g., Dinsmoor, 1977; Sidman, 1989). To select an article for further analysis, we checked the existence of at least one of these terms in the title, abstract, and keywords. Quotations, announcements, communications, errata, and editorials were not included in this analysis.

*Analytical procedure.* We first sorted by year all articles that presented the descriptors in the title, abstract,

and keywords. For the general analysis on aversive control (Table 1, Figure 1), we created a unique list and excluded duplicated articles (articles that presented two or more descriptors). After reading the abstracts, some articles were excluded because they did not refer explicitly to aversive contingencies or did not involve the use of aversive stimulation. For the analysis of specific aversive contingencies (Figure 2), an article that contained two or more descriptors was counted once for each contingency. For example, an article that contained the “avoidance” and “punishment” descriptors was counted in the “punishment,” “negative reinforcement,” and “avoidance” lists. The percentage of publications was then determined by considering the total number of publications by year in the journals: number of papers on aversive contingencies divided by total number of papers multiplied by 100. Our results are expressed as the percentage of publications by year that mentioned any of the selected descriptors and the percentage of publications for each aversive contingency by decade.

**RESULTS**

Table 1 shows the percentage of publications that involved aversive control by decade and Figure 1 shows the percentage of publications by year, from 1958 to 2018. Each article was counted only once, regardless of the number of descriptors that it presented. According to the data, the incidence of studies on aversive control

did not occur analogously in basic and applied research, presenting variations in both journals. There were times in which publications on aversive control predominated basic research, whereas there was a predominance of publications in applied research at other times. Both journals sometimes presented a low frequency of articles on the theme. As shown in Table 1, the highest percentage of JEAB publications occurred between the 1950s and 1970s. In 1970 (15.96%), there was an approximately 20% reduction of the proportion of publications compared with the 1960s (19.50%). This reduction was even more pronounced in the 1980s (7.69%) and 1990s (6.31%). In the 2000s (11.46%), an 80% increase in the proportion of publications on aversive control was found in JEAB, but a further reduction was observed in the following decade (7.53%).

A higher percentage of publications was found in JABA in the 1960s (15.43%), but publications on aversive control substantially declined in the 1970s (6.96%; i.e., one decade before such a reduction was observed in JEAB). The percentage of publications remained low (5.60%) in the 1980s, followed by an approximately 140% increase in the 1990s when the percentage of publications exceeded those in JEAB in the same decade. This increase was maintained in the 2000s. A further reduction of publications was found in the subsequent decade, corresponding to 8.70% of the total number of JABA articles.

Table 1.

*Percentage of Publications on aversive control by Decades, From 1958 to 2018, in JEAB and JABA.*

Decade	% of Publication	
	JEAB	JABA
1950's	20.25	----
1960's	19.50	15.43
1970's	15.96	6.96
1980's	7.69	5.60
1990's	6.31	13.05
2000's	11.46	13.40
2010's	7.53	8.70

The analysis of journals articles by year (Figure 1) allowed us to identify when the tendencies of publications on aversive control changed. During the first 17 years of JEAB (1958 to 1973), articles on themes that are related to aversive control comprised as average of 20.1% of the journal’s total publications, exceeding 25% of its publications twice (in 1963 and 1972). However, between 1974 and 1999, this publication pattern changed. The proportion of publications on aversive control systematically declined, resulting in an average of 8.2% of publications during this period. The percentage of publications exceeded 10% only in some years during this period: 1974 (11.4%), 1977 (13.9%), 1978 (18.5%), and 1981 (11.4%). The lowest frequency occurred in 1989, when only 1.45% of JEAB publications were related to aversive control. Beginning in 2000, we observed an increase in publications on the theme, with massive irregularity between years. Between 2000 and 2010, the

average number of publications on aversive control was 11.3%, and such publications exceeded 15% in only four years (2001, 2002, 2007, and 2009). In 2002 and 2005, the percentage of publications was 2.9% and 1.8%, respectively. Since 2011, a gradual reduction of publications on the theme occurred with an average of 7.5% of the total number of JEAB publications by 2018. The frequency of publications was higher only in 2017, reaching 20% of the total number of JEAB publications in that year. We observed the lowest percentages in 2011, 2015, and 2016 (2%, 3.5%, and 2%, respectively).

When considering applied research articles, a reduction of publications on aversive control was observed in 1970, which remained relatively stable and less than 10% until 1993 (6.56% average during this period). The proportion of publications on aversive control was smaller in JABA than in JEAB until the early 1980s.

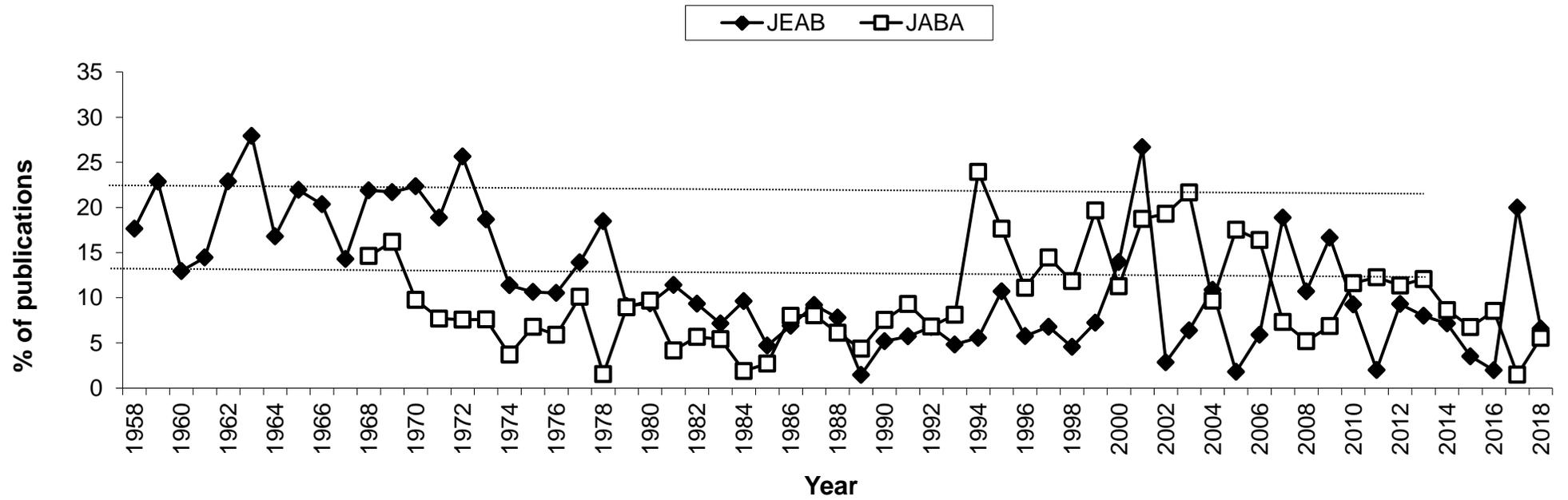


Figure 1. Percentage of publications/year mentioning any of the selected descriptors (aversive, avoidance, escape, negative reinforcement, and punishment) from 1958 to 2018, in JEAB, and 1968 to 2018, in JABA

During the first 11 years of JABA (1968-1978), there were fewer publications on this theme than in JEAB in each of these years. From 1979 to 1993, this difference between journals was reduced to the point of presenting the same proportion of articles. Since 1994, an increase in publications on aversive control occurred, remaining higher until 2006 (16.4% average during this period). The proportion of applied research publications exceeded the proportion that was found in JEAB during this period, with the exception of 2000, 2001, and 2003, during which years the percentages of basic research articles were equal or slightly higher. As of 2007, another reduction of JABA publications was observed, and this reduction was maintained until 2018 (8.14% average during this period).

Figure 2 shows the percent distribution of articles on aversive contingencies over the decades. This figure provides a comparison of publications on punishment and negative reinforcement and allows an analysis of which type of negative reinforcement contingency (i.e., escape or avoidance) was studied more during each period. Negative reinforcement studies were more frequent in basic and applied research (7.56% and 5.72% average, respectively, considering all decades) than punishment studies (3.67% average in JEAB and 4.12% average in JABA). Avoidance was the most frequent (6.43% average considering all decades) negative reinforcement contingency in basic research, whereas escape, was more frequent in applied research (3.75% average).

In basic research, articles that involved punishment were uncommon in the 1950s and frequent (6.2% average) in the 1960s and 1970s, followed by a sharp decline in the following decades, maintaining a percentage of approximately 3%. Articles that involved negative reinforcement were frequent until the 1970s (15.7-10.4% average), with a low and regular frequency in the following decades (3.74% average). This decrease in frequency appears to have occurred in both escape and avoidance studies. The term “avoidance” appeared more between the 1950s and 1970s, with a significant reduction that began in the 1980s. The term “escape” was more frequent until the 1960s, followed by a sharp reduction to approximately 1% of articles in the following decades.

In applied research, punishment was the most discussed theme in the 1960s (12.8% of JABA publications), showing a significant decrease in subsequent decades (2.4% average). Studies that involved negative reinforcement, which were less frequent until the 1980s (2.5% average) significantly increased in the following decades, with an average of 9.0% in the 1990s until the 2010s. Studies that involved escape significantly increased beginning in the 1980s, with an average of 6.5% in the 1990s until 2010. Studies that involved avoidance were not very frequent during the entire period, with an increase to 2.8% of publications in the 1990s and representing only 0.4% of publications in the last decade.

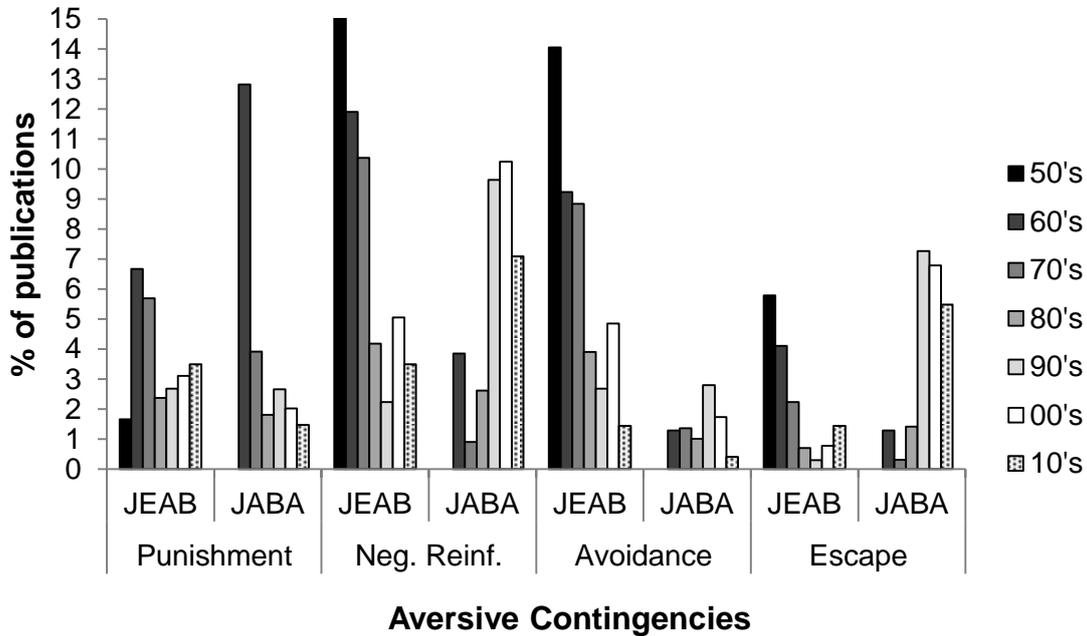


Figure 2. Percentage of publications for each aversive operant contingency by decades, from 1958 to 2018, in JEAB and JABA.

## DISCUSSION

The present study examined the publication frequency of studies on aversive control and analyzed publication trends with regard to specific aversive contingencies from 1958 to 2018 in two important journals that focus on behavior analysis, one that focuses on basic research (JEAB) and one that focuses on applied research (JABA). We selected articles that presented in the title, abstract, or keywords at least one of the following terms: aversive, avoidance, escape, negative reinforcement, and punishment. The percentage of publications was then determined by considering the total number of publications per year in each journal.

Some authors (e.g., Lerman & Vorndran, 2002; Todorov, 2001) suggested that studies on aversive contingencies significantly declined over the last decades. In fact, the data in the present study confirmed these prior statements, corroborated by the number of publications that involved different kinds of aversive contingencies over time. The results showed a high percentage of articles in the 1950s and 1960s, followed by more than 20 years of few publications on the theme. In basic research, this reduction remained until the 1990s, with an increase in the number of articles with an irregular distribution in the 2000s. This increase appears to be related to a higher frequency of articles that involved negative reinforcement, especially avoidance contingencies, and aversive stimulation. Lerman and Vorndran (2002) indicated that current knowledge about punishment is insufficient, and these gaps in the literature need to be filled to further develop effective behavioral change strategies. Our data corroborate the assertions by Lerman and Vorndran (2002) and Todorov (2001) with regard to the extent to which research on punishment in behavior analysis significantly decreased, both in basic and applied research. Therefore, such a gap in the literature persists until today.

In applied research, an increase in the number of articles on aversive control occurred in the 1990s to levels that were higher than those that occurred during the first years of JABA. This increase appears to be related to a higher frequency of articles on negative reinforcement, especially escape contingencies. From 2010 to present, a reduction of the number of publications on aversive control has been observed in both journals.

Although the present study did not investigate the reasons for these changes in the frequency of articles on aversive control, some factors may provide an explanation. First, the decrease in basic research on aversive control may be related to an overall decrease in animal behavior research. Animal rights policies have become stricter and systematically enforced, thus imposing greater restrictions on animal experimentation (Benedict & Stoloff, 1991; Gallup & Eddy, 1990; Hunziker, 1995; Innis, 1992; Thomas & Blackman, 1992). Therefore, research that imposes some sort of injury or discomfort on animals has become more difficult to perform. In the last decades, ethical

regulations on the use of animals in research have become institutionally mandatory.

Second, such policies have influenced the scientific community to the extent that research funding agencies have imposed restrictions on some types of research. Therefore, changes in research funding policies may have consequently reduced the resources that are available for basic research on aversive contingencies.

Third, the reduction of research on aversive control may be attributable to some researchers' reluctance to expose other organisms to uncomfortable or painful conditions because this is aversive for themselves.

Fourth, behavior analysis recommends the avoidance of using aversive control, instead favoring positive reinforcement (Skinner, 1953, 1968, 1974; Sidman, 1989). Although these authors never suggested that aversive contingency research was unnecessary, it seems that such recommendations may have affected the frequency of studies on the subject. It is necessary to distinguish between research on aversive contingencies and the use of aversive control in applied situations. In fact, limiting research on a particular subject area can limit the development of effective behavioral strategies that can be applied to human problems (Iwata, 1987; Lerman & Vorndran, 2002). Humans are often exposed to aversive stimuli in their natural environment, and scientists are tasked with producing knowledge about the consequences of such exposure. If we want to understand behavior as a whole, then we cannot discount the fact that this theme needs to be investigated while adhering to ethical standards. This is the only way to advance our understanding of global behavioral processes.

The resumption of studies on aversive control in the 1990s and 2000s appears to be largely related to an increase in the number of studies on negative reinforcement and the use of functional analysis in applied research. In fact, reports of publications that involved applied behavior analysis (e.g., Kahng et al., 2002; Northup et al., 1993; Pelios et al., 1999) revealed a decrease in the use of punishment and an increase in the use of positive reinforcement, correlated with an increase in the use of functional analysis that began in the late 1980s. Only one of these studies (Northup et al., 1993) indicated an increase in negative reinforcement applications in the late 1980s, coinciding with an increase in functional analyses and demonstrations of the role of negative reinforcement in maintaining severe behavioral disorders. Pelios et al. (1999) considered that these changes may reflect the influence of other variables, such as changes in journal editorial policies.

Iwata (1987) warned behavior analysts about the insufficiency of applied research on negative reinforcement. He described three aspects of negative reinforcement that are presented by applied behavior analysis: behavior that is acquired or maintained through negative reinforcement, the treatment of negatively reinforced behavior, and negative reinforcement as therapy. In fact, the articles that we identified in the present study referred to these three aspects. We chose to

consider all of these articles in the present study, understanding that studies on mechanisms of aversive contingencies and studies on behavior modification that is maintained by aversive contingencies are both contained within the field of aversive control.

The present data show that the increase in research that involved aversive control in JEAB occurred years after the increase in JABA (more specifically in 2000). This increase may indicate that basic research attempted to investigate gaps founded in the applied research. This increase in basic research is reflected by the number of studies on negative reinforcement.

In the present study, we performed a quantitative survey of articles on aversive control based on descriptors that are related to aversive contingencies and aversive stimulation. Our objective was to analyze possible trends in publications in JEAB and JABA in this area. We selected only articles that used the names of the contingencies that are traditionally used in behavior analysis. Thus, the descriptors that we used may not necessarily represent all possible terms that are related to aversive control. Performing such a search that considers all variations of these terms to describe aversive stimulation would be impracticable. Perone (2003), for example, described the ways in which positive reinforcement contingencies can also include aversive functions (e.g., food deprivation). Northup et al. (1993), in turn, selected papers for their analysis that used response cost or timeout as procedures that were related to punishment. Many other procedures in behavioral analysis research involve aversive contingencies or aversive stimulation and following all advances in behavioral technology is somewhat difficult. Moreover, “the range and scope of JABA articles are so broad that it is impossible to accurately classify them all” (Northup et al., 1993, p. 537).

The present analysis of publication trends may be useful for identifying gaps in the literature and stimulating interest in relatively understudied topics. This type of research may help reveal contingencies that are associated with the behavior of scientists. A broader historical view of scientific publications on aversive contingencies in behavior analysis will require further studies that focus on specific criteria, such as research purpose, type of subjects, type of aversive stimulation, response class, and type of aversive contingency.

#### DECLARATION OF CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

#### CONTRIBUTION OF EACH AUTHOR

All authors participated sufficiently in the work to make public their responsibility for the content. M. B. de Carvalho Neto and V. V. Rico contributed to the conception of the article and were responsible for the methodological design; M. V. Silveira and V. V. Rico were responsible for collecting and tabulating the data; M. B. de Carvalho Neto, R. S. Barros and V. V. Rico were responsible for the analysis and discussion of the data; All authors were responsible for the final writing of the manuscript.

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