

- Greenwald, L. (1975) A do-it-yourself heart. *Physiol. Teacher* 4(2):3.
- Hogue, R.S. (1971) Demonstration of Koch's postulates. *Amer. Biol. Teacher* 33:174-175.
- Krutch, J.W. (1956) *The Great Chain of Life*, Pyramid Books, New York, N.Y., p. 142.
- Orlans, F.B. (1970) Painless animal experimentation for high school students. *Scholastic Teacher*, April 6, p. S-4.
- Orlans, F.B. (1977) *Animal Care from Protozoa to Small Mammals*, Addison-Wesley, Menlo Park, CA., and Reading, p. 1.
- Poland, J.L. et al. (1975) Trends in physiology laboratory programs for first year medical students. *Physiol. Teacher* 4(2):6-8.
- Rodbard, S. et al. (1976) A simplified teaching model of the heart and circulation. *Physiol. Teacher* 5(4):1-3.
- Russell, G.K. (1972) Vivisection and the true aims of education in biology. *Amer. Biol. Teacher* 34:254-257.
- Russell, G.K. (1978) *Laboratory Investigations in Human Physiology*, Macmillan, New York, N.Y.
- Schweitzer, A. (1949) *Out of My Life and Thought*, Henry Holt, New York, N.Y., p. 203.
- Stake, R. and Easley, J. (1978) *Case Studies in Science Education*, Center for Instructional Research and Curriculum Evaluation, University of Illinois at Urbana-Champaign, IL.
- Stevens, C. (1970) Attitudes toward animals. *Amer. Biol. Teacher* 32:77-79.
- van Lawick-Goodall, J. (1971) *In the Shadow of Man*, Dell, New York, N.Y.

Pain-infliction in Animal Research*

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Abstract

A summary of research outlining the main sources of pain and stress to animals in laboratories provides the background for the results of a survey conducted by the author on how students feel about experimentation involving animals. The psychological aspects of student reaction to animal experimentation are examined. The conclusion outlines specific recommendations on ways to minimize pain and discomfort of laboratory animals.

Attitudes Toward Pain-infliction in Animal Research

It has been observed that willingness to cause injury or death to others varies with degree of dehumanization of the victim (Bernard et al., 1971), physical proximity (Milgram, 1965), and visibility (Johnson, 1972). Among situations in which pain is commonly inflicted is psychological research using animal subjects. The study reported in this article explores reactions to such research as a function of (1) the species of the animal subject, and (2) a verbal context which stresses either benefits to human beings or painful research procedures.

A brief questionnaire was designed to determine whether, when asked to participate in a pain-infliction animal research project, subjects would consent or refuse primarily (1) on the basis of the pain and discomfort to be experienced by the animal (assuming those phylogenetically closest to humans would be more likely to experience pain as we know it), or (2) on the basis of evaluation of the species in terms of its relationship and familiarity to human beings. It has been demonstrated that attitudes toward pain infliction vary among human categories (Berkowitz, 1964; Johnson, 1972). Species differentiation was conceived of as analogous to differentiation among human categories as well as of interest in itself.

Subjects were 688 undergraduates from introductory psychology classes. At the beginning of the class session, a one-page flyer was distributed. There were three basic forms: (a) **TORCH**, which began with "Although human beings have undoubtedly benefited in the process, research animals have been subjected to such extremely painful procedures as burning by blow torch, submersion in scalding water, and extreme unavoidable electric shock," (b) **BENEFIT**, which began with "We would still be in the

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dark ages without the benefits which we have received through research conducted with animals," or (c) **INFORMATION**, which began by requesting information about the subject's academic major, sex, and college class.

All forms contained the following:

We are conducting a series of surveys to determine people's reactions to animal research.

Suppose that you volunteered to assist in the psychological laboratory. When you arrived, you were instructed by the professor who was conducting the research that your task was to administer shock to an animal in a learning situation. You were to operate a switch which turned on the shock whenever you received a signal to do so.

Your reaction would be:

A. I would comply because I feel that there is nothing wrong with inflicting pain on animals when it is done for research purposes. (**COMPLY**)

B. When I discovered that shocking an animal was involved, I would ask for more information about the purpose and usefulness of the research and would participate only if the information I received satisfied me. (**MEANS-ENDS**)

C. Since I had already volunteered, I would go along with it, but I would find it upsetting that I had to shock an animal. (**GO ALONG**)

D. When I discovered that shocking an animal was involved, I would refuse to participate. (**REFUSE**)

Would your reaction have been the same no matter what animal species was involved? If your reaction would be different depending on the species, write the letter of the above alternatives for each of the following: frog, pigeon, rat, hamster, cat, dog, monkey.

Space was left for comments. Twenty-four **TORCH** and **BENEFIT** forms were used for complete counterbalancing of the order in which the alternatives were presented, and the species were listed in phyletic order beginning with "frog" on half the forms and with "monkey" on the other half. All **INFORMATION** forms used the same phyletic order beginning with "frog." All forms were returned anonymously.

Approval of the use of animals in painful research—explicit in the case of **COMPLY**, and implicit in **MEANS ENDS** and **GO ALONG**—was expressed by over 95% of the 688 subjects (Table 1). Of the less than 10% (66 subjects) who selected **REFUSE** as their basic response, 55% (36 subjects) qualified that response in a statement to the effect that they did not actually *disapprove* of research in which pain is inflicted on animals but felt that they, themselves, would personally find it difficult to engage in.

Approval was most frequent for the rat (95%). This was even more than for the frog or pigeon, and it was higher for the monkey (82%) than for the dog (75%).

TABLE 1: Proportion of Ss selecting each category in the three major conditions

	N	COMPLY	GO ALONG	MEANS-ENDS	REFUSE
BENEFIT	117	.231	.060	.632	.077
TORCH	133	.134	.098	.683	.084
INFORMATION	438	.119	.148	.625	.107

That differentiation among human groups with respect to willingness to inflict pain occurs is well known (Johnson, 1972). Military training consists partly of categorization and dehumanization of the group designated "enemy." The animal species of the present study represented levels of "dehumanization" in terms of phyletic level, and they were listed in phyletic order on the questionnaires. Despite this, subjects differentiated on other bases. They were more willing to inflict pain on the phyletically more similar monkey than on the more familiar and "friendly" dog.

The **TORCH** statement, designed to remind subjects of possible horrors of animal research, did not produce an increase in **REFUSE** responses, but the **BENEFIT** statement, which stressed the usefulness of animal research, increased **COMPLY** to almost twice the percentage of the other conditions (Table 1). The most popular response was **MEANS ENDS**, selected by about two-thirds of all subjects.

Sex differences were statistically significant ($X^2 = 32.6$, $df = 3$, $p < .01$). Only 6.3% of females selected **COMPLY** as compared with 17.3% of the males; and 17.5% of the females selected **REFUSE** as compared with only 4.4% of the males (Table 2). A curious additional sex difference occurred in the case of the cat. More male students expressed willingness to inflict electric shock pain on cats than did females. A colleague, speaking from his personal experiences, has suggested that the male's view of the cat stems from male-culture abuse commonly inflicted on cats by boys. The male's responses on the questionnaire, then, can be considered another expression of negative reactions toward a victim (Lerner and Simmons, 1966).

Comparing college classes, **MEANS ENDS** rose from 56% of the Freshmen steadily upward to 73.0% of Sophomores, 77.8% of Juniors, and 82.0% of Seniors, with other responses, especially **GO ALONG**, consistently declining as a function of college class (4.6% of Seniors).

A questionnaire is essentially a kind of opinion poll. It measures less what individual respondents do than what they approve and disapprove of in the abstract. When, in earlier research (Hoffman and Costantini, 1967) 60 college students were faced with the situation described in the questionnaire, actual behavior was not consistent with the responses of at least 70% of the subjects of the present study. As might be predicted from the original Milgram (1963) experiments, all obeyed without protest. No one refused to participate and no one questioned the value of the research. The college students of these studies, representatives of the population from which animal researchers are ultimately drawn, clearly approve of inflicting pain on animal subjects "for research purposes." Furthermore, the disclaimers of many of the subjects who selected **REFUSE** as their overall response reveals *cultural disapproval of expression of concern for the animal subject*.

Some years ago, working in a laboratory using acute animal preparations, I ob-

TABLE 2: Proportion of Ss in INFORMATION condition broken down by subject characteristics of sex, field of study, and college class

SEX	N	COMPLY	GO ALONG	MEANS-ENDS	REFUSE
Females	212	.063	.142	.623	.175
Males	226	.173	.155	.629	.044
FIELD OF STUDY					
Education	118	.042	.051	.737	.170
Science/Nursing/ Psychology	57	.246	.088	.562	.105
Other Fields	256	.101	.210	.607	.082
CLASS					
Freshmen	226	.109	.219	.560	.124
Sophomores	78	.141	.051	.730	.077
Juniors	58	.086	.034	.778	.103
Seniors	22	.046	.046	.820	.091

served that the animals (mostly dogs) sometimes underwent unnecessary stress and pain as the result of carelessness, hurry and the unpleasant social consequences which followed expression of "overconcern" for the subject. These observations have been confirmed by seven research workers whom I have more recently consulted.

There are at least three separable sources of pain and stress to laboratory animals: (1) pain which is an essential aspect of the independent variable, e.g. an experiment on the effect of punishment on maze performance; (2) pain which is incidental to the independent variable, e.g. post-operative pain in brain lesion research; and (3) pain and discomfort which results from inadequate living and handling conditions, e.g. crowded cages, inadequate diet, and inhumane euthanizing. All research animals may be subjected to the third type of discomfort. Existing ethical codes (e.g., American Psychological Association, Board of Scientific Affairs, 1971) and instructions for laboratory workers (Hergenhahn, 1970; Plutchik, 1968; Matheson *et al.*, 1970; and Silvan, 1966) caution against inadequate maintenance procedures. Medical and physiological research—including psychophysiological research—typically involves secondary discomfort due to surgery or other physical procedures. Ethical codes address themselves primarily to possible abuses arising from secondary and maintenance conditions. However, intrinsic sources of reinforcement in the form of less work and money expended when care is poor, and social punishment of demonstration of concern, puts animals at risk despite verbal codes.

When pain is an independent variable, as it so often is in psychological research (Campbell and Church, 1969), the risks increase. The animals resist removal from the cages, they may suffer the dangers of escape and recapture, they may bite and anger their caretakers leading to further mistreatment. It has been noted that research using

aversive stimulation necessarily differs from research in which only neutral and positive stimulation is used in many ways other than the stimulation received during experimental "trials" (W. Kornsey, personal communication). Recently, researchers in social psychology have suggested that the fact that a person is in pain can lead, in itself, to poorer treatment from others (Lerner and Simmons, 1966), a phenomenon which has also been observed in medical situations where patients who are in pain and where ability of the medical personnel to relieve pain is limited, have been observed to receive poorer and more callous treatment than other patients (A. Rogers, personal communication).

Although ethical regulations limiting and restricting research are an incumbrance to any scientist, they afford some protection to research subjects. Over nine years of teaching courses in Experimental Psychology, I have noted the regularity with which college students, when asked to design an independent project, think first of a procedure in which laboratory rats are submitted to electric shock or human beings are made to feel anxious and tense. The students seem less to be sadistic than fearful themselves. They want something which will "work." There is some reinforcement in the very process of initiating a reaction. Turn on the grid and the rat leaps into the air! This is more immediately reinforcing than administering a food pellet.

Because of (1) the cultural acceptance of research involving aversive stimulation to animals ("antivivisectionists" are a tiny minority), (2) the reinforcement that results from the immediacy and visibility of the effect of aversive stimulation for the experimenter, and (3) the social punishment that one may be subjected to for expressing concern for the animal in many laboratory situations, it is recommended that:

A. Mature and experienced psychologists act as role models by making great distinction between animal research that involves pain and discomfort, and research that does not. There should be nothing casual about the decision to use shock or to use positive reinforcement. The latter should always be preferred unless compelling circumstances demand the use of aversive stimulation.

B. The use of electric shock or other aversive techniques should not be permitted to students whose research projects are conducted merely for training in research methodology, to inexperienced investigators, or as classroom demonstrations, unless, again, there is compelling justification.

C. All researchers using aversive procedures should be registered with the American Psychological Association National Headquarters. For almost 100 years, the British have required experimenters using painful procedures to obtain permission. Registering will help to avoid duplication. It will also attest to the seriousness of such research and dispel the notion that inflicting pain on a research animal is acceptable in any research context.

D. Better training and more stringent licensing of animal researchers would help to ensure that animal care is generally improved. There now exist laboratories which have adopted excellent procedures for the protection of animal subjects, but abuses exist in many others. Although most of the abuse is not the result of deliberate mistreatment in research laboratories, fun-and-games cruelties are sometimes indulged in by persons assigned the tedium of animal care. Laboratory animals may also be neglected during university vacation periods.

E. Finally, I urge that our ultimate authorities, the editors of journals and those responsible for the selection of papers to be read at scientific meetings adopt *more stringent criteria for acceptance* of research reports in which aversive stimulation has been utilized or in which animals suffered secondary sources of pain and discomfort. Was the particular procedure used essential in terms of the research question the experiment was designed to answer? Did, in other words, the ends justify the means? A full explanation justifying the procedures should be part of the published research report.

References

- American Psychological Association, Board of Scientific Affairs (1971) *Principles for the Care and Use of Animals*, December 3.
- Berkowitz, L. (1964) *The Development of Motives and Values in the Child*, Basic Books, New York, NY.
- Bernard, V.W., Ottenberg, P. and Redl, F. (1971) Dehumanization. In *Sanctions for Evil*, N. Sanford and C. Comstock, eds., Jossey-Bass, San Francisco, CA.
- Campbell, B.A., and Church, R.M. (1969) *Punishment and Aversive Behavior*, Appleton-Century-Crofts, New York, NY.
- Hergenhahn, B.R. (1970) *A Self-Directing Introduction to Psychological Experimentation*. Brooks/Cole Publishing Co., Belmont, CA.
- Hoffman, D.T. and Costantini, A. (1967) *The Incidental Infliction of Pain: An Extension of the Work of Stanley Milgram*. Paper presented at the Eastern Psychological Association meetings, April, 1967, Boston, MA.
- Johnson, Roger N. (1972) *Aggression in Man and Animals*, W.B. Saunders Co., Philadelphia, PA.
- Lerner, M.J. and Simmons, H. (1966) Observers reactions to the "innocent victim": compassion or rejection. *J. Pers. Soc. Psychol.* 4:203-210.
- Matheson, D.W., Bruce, R.L. and Beauchamp, K.L. (1970) *Introduction to Experimental Psychology*, Holt, Rinehart & Winston, Inc., New York, NY.
- Milgram, S. (1963) Behavioral study of obedience. *J. Abnorm. Soc. Psychol.* 67:371-378.
- Milgram, S. (1965) Some conditions of obedience and disobedience to authority. *Human Relations* 18:57-75.
- Plutchik, R. (1968) *Foundations of Experimental Research*, Harper & Row, New York, NY.
- Silvan, J. (1966) *Raising Laboratory Animals: A Handbook for Biological and Behavioral Research*, Natural History Press, Garden City, New York, NY.

SESSION II

The Use of Vertebrates in Biology Classes

CHAIRMAN: MICHAEL W. FOX

