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Laboratory Lore and Research Practices in the Experimental Analysis of Human Behavior: Subject Selection

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The selection of human subjects for behavioral research, and the subject characteristics those selection practices produce, have been the focus of considerable formal prescription within psychology as a whole (e.g., Schultz, 1969; White & Duker, 1973). In contrast, these concerns have received little attention within the experimental analysis of human behavior, in part due to differences in research strategies and tactics (cf. Johnston & Pennypacker, 1980; Sidman, 1960). These differences are central and important characteristics of the latter tradition (see Skinner, 1956), but they may also be a source of problems related to subject selection.

Within the experimental analysis of behavior, human subject-selection practices may be contrasted with those for nonhumans. In nonhuman research, subject selection is largely a matter of finding convenient, representative, and economically obtained and housed organisms about which much is known or controlled for (cf. Barnett, 1963). The concerns in nonhuman research are not so much about individual variability across subjects, but rather about generality across species (e.g., Grossett, Roy, Sharenow, & Poling, 1982; Seligman, 1970; cf. Beach, 1950).

Unlike research with nonhumans, that with humans does not have the luxury of selecting subjects in this fashion. First, humans have longer, more complex, and less controlled behavioral histories, thereby making the representativeness of individuals difficult to assume. Second, the uncontrolled activities of human subjects between sessions can have unknown effects on behavior during sessions. And third, human subjects are often harder to obtain and retain than is commonly assumed, thereby complicating the scheduling and completion of studies. These differences make the explicit consideration of human subject-selection practices an important concern, especially because those practices may also be influenced by unknown sources of laboratory lore, the idiosyncracies of which may inhibit (a) the discovery of reproducible behavioral processes, (b) the replicability of research findings, and (c) the eventual evolution of more effective experimental analyses of behavior (cf. Homer, Peterson, & Wonderlich, 1983).

Even if the sources of control over human subject-selection practices were made explicit, general recommendations for other researchers would be difficult to formulate because subject selection is still a function of individual research agendas, as well as institutional and economic constraints. These factors may affect the behavioral processes studied (e.g., reinforcement vs. aversive control), the experimental procedures employed (e.g., shaping vs. instructions), and the design elements implemented (e.g., extinction vs. DRO control procedures), to say nothing about the length and number of sessions that are conducted. In addition, the selection of human subjects can also be affected by more global variables such as meteorological conditions (e.g., rainy

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vs. sunny days) and the time of the year (e.g., school vs. vacation).

These limitations aside, important information may still be gleaned from current subject-selection practices, which we describe and discuss on the basis of a questionnaire survey on the topic, a search of the literature, and our own experience. As for the survey, in 1984 the 112 members of the Experimental Analysis of Human Behavior Special Interest Group of the Association for Behavior Analysis were sent questionnaires about their subject selection practices—52 (45%) of whom responded in full. Self-report data such as these are not unambiguous, of course, because the controlling variables over the reports are private to current readers. Thus, our analysis is "interpretive" not only of the actual subject selection practices, but also of the reports of those practices. With respect to the literature survey, we coded all articles on the experimental analysis of human behavior in the *Journal of the Experimental Analysis of Behavior* (1958–1984) and *The Psychological Record* (1959–1984) for pertinent information. These data were recoded and checked by two independent coders, and corrected if discrepancies were found. Overall interrater agreement was 96.5%.

In what follows, we present information obtained from these sources under the topics of (a) subject samples, and issues related to marker variables (i.e., age, gender, and diagnostic category) and subject characteristics; (b) subject selection and recruitment procedures, which includes discussions of subject sources, recruitment procedures, random selection, restrictions on generality, and informed consent; and (c) subject completion.

SUBJECT SAMPLES

Marker Variables

Age. Although age is often inappropriately taken to be a cause of behavior (Baer, 1970; see, e.g., Ilg & Ames, 1955, pp. 3–65), age is not an irrelevant consideration, for it represents a marker variable for important biological and environmental events that may influence behavior. Age differences may thus be useful correlates of individual differences in research on basic behavioral processes (e.g., schedule performance, stimulus equivalence), and even more so in research related to particular content areas of behavior-environment relations (e.g., *social* reinforcement; see Schultz, 1969). In some cases, age may provide suggestions about how individual differences develop and how they might be altered (see e.g., Weiner, 1970, 1981).

One important consideration is that subject selection within narrowly defined age limits may produce a spurious sense of generality when outcomes might otherwise differ across wider age ranges (cf. Verplanck, 1955). This may indeed be a problem within the experimental analysis of human behavior because the most common subjects are, by far, college students. Over 67% of the questionnaire respondents and 45% of the 1979–1984 research studies reported using such subjects—almost twice that of any other age category (cf. Buskist & Miller, 1982, p. 140). In turn, just as the preponderance of college students presents a problem, so too does the paucity of infants and toddlers, who represent only about 4.0% of the research subjects.

Current research on human behavior illustrates the possible importance of age to the apparent generality of behavior principles. For instance, young, preverbal human subjects appear to display patterns of responding on fixed-interval schedules of reinforcement that are similar to those produced by nonhumans, whereas verbal children respond more like adults, that is, with either very low or very high response rates (e.g., Bentall, Lowe, & Beasty, 1984; Lowe, Beasty, & Bentall, 1983). Other age-related differences have also been found in the traditional discrimination learning research (cf. Kendler & Kendler, 1962; Reese, 1970), as well as more recently in research on stimulus equivalence (e.g., Sidman, Rauzin, Lazar, Cunningham, Tailby, & Carrigan, 1982).

Not only should such concerns be raised about cross-sectional age samples within individual studies, but also about

comparisons of same-age samples used in research conducted at different times. For example, 5-year-olds in 1953 may have behaved differently on certain tasks (e.g., matching-to-sample) and with respect to certain procedures (e.g., those involving instructions) than might 5-year-olds in 1988 because of cultural differences in technological experience (e.g., the ascendence of television and interactive computer games) and in child-rearing practices (e.g., parental permissiveness). Developmental research with cross-sequential research designs makes this point clear and compelling (see Baltes, Reese, & Nesselroade, 1977, pp. 118–138).

Thus, age differences may not only interact with the analysis of behavioral processes under study, but also with experimental procedures and tasks, and the content of particular behavioral consequences, antecedents (e.g., instructions), and demand characteristics (Baron & Perone, 1982; Lowenkron, 1983). Overall, age-related differences may be an important source of variability to be controlled for, as well as a subject matter to be studied in its own right (e.g., Baron & Menich, 1985).

Gender. The issues surrounding subject gender are similar to those with respect to age: Gender is a marker variable for historical differences that may interact with tasks, apparatus, and procedures. The questionnaire survey, however, showed that 76% of the respondents considered their subjects' gender to be irrelevant—males and females were usually intermixed and were used exclusively only 12% and 2% of the time, respectively. Ten percent of the respondents reported that gender selection might be relevant, but that this depended on the research question being asked.

Diagnostic category. Our comments on age and gender hold as well for subject diagnostic categories (e.g., normal vs. delayed development) in that diagnostic category may interact with the behavioral processes and content under study, the experimental procedures employed, and the generality of all three. What a diagnostic category actually indicates, of course, is not always clear, and inferences based on such category membership must be made cautiously.

On the questionnaire survey, 96% of the respondents included normal humans among their subjects, 31% included delayed/retarded subjects, 17% included autistic/psychotic subjects, and 10% included samples from other subject populations (e.g., those with criminal records).[2] The 1979–1984 data from the literature survey provide a similar picture: Normal, delayed/retarded, and autistic/psychotic subjects comprised 89.6%, 16.7%, and 4.2% of the population samples, respectively.

For researchers interested in reproducible behavioral processes alone, the nonhuman model for selecting subjects seems fitting—select healthy, normal individuals. For researchers interested in extending the generality of the behavioral processes to socially significant problems, then the problem (e.g., aggression) might arguably be related to the type of subjects selected. When generality of process is found in the latter, so much the better for the robustness of the process; where it is not found, so much the better for discovering differences that have applied implications.

Subject Characteristics

When asked what subject characteristics were important to their research, 79% of the questionnaire respondents mentioned some combination of subject history and its outcome (e.g., personality traits). More specifically, 52% of the respondents mentioned (a) motor abilities, such as sitting still, pointing, and button pressing; (b) intellectual abilities, for instance, those related to verbal behavior, reading, and problem-solving; and (c) more general characteristics, such as developmental level, maturity, motivation, temperament, and mental and physical health. Although these characteristics (e.g., motor abilities) simply represent prerequisite behavior for engaging in the experimental tasks, some investigators

[2] These percentages, and those reported later, add up to more than 100% when respondents could check more than one answer.

think these characteristics are necessary for successful completion of their research projects, and that some subject characteristics affect the questions researchers ask about behavior, and the experimental procedures they employ (e.g., instructions, see Baron & Galizio, 1983). As for our own practices, we screen our preschool subjects for prerequisite motor abilities. In addition, we have found teachers' opinions about the likelihood a child will enjoy and complete the project to have predictive value.

The importance of these characteristics aside, many questionnaire respondents reported that they select subjects largely on pragmatic grounds. When asked what factors were important, 42% cited the availability and convenience of a subject pool. Related factors such as geographic proximity, vacation schedules, daily scheduling constraints, and health were also reported to be important influences on subject selection practices. These pragmatic concerns are obviously important to the conduct of research, but the subject samples they produce may yield subject characteristics (e.g., family stability) that might confound research findings.

In summary, research findings may be importantly influenced by subject characteristics produced by idiosyncratic subject selection practices across laboratories. Any differences in results, though, should not be lamented or simply taken as the cost of pragmatic concerns. Instead, they should be analyzed for correlations with possible subject characteristics, which may in turn suggest how certain historical and current factors may be responsible for those differences (cf. Baron & Perone, 1982; Harzem, 1984) and about how those factors might be altered to reduce intersubject variability in the future (Weiner, 1970, 1981).

SUBJECT SELECTION AND RECRUITMENT PROCEDURES

Subject Source

In large part, the inclusion or exclusion of the marker variables discussed above, as well as other subject characteristics, are determined by (or determine) the sources from which subjects are selected, and hence the same caveats and recommendations about subject selection apply here as well. As might be expected, both the questionnaire survey and the literature show that extensive use is made of schools as sources for subject recruitment (cf. Buskist & Miller, 1982, p. 140). The percentage of subjects reportedly recruited from schools, institutions, and the community at large were 86.5%, 15.4%, and 13.5%, respectively. The comparable figures for the 1979–1984 research literature are 64.6%, 16.7%, and 16.7%, with the difference between schools and other sources becoming greater over time.

Recruitment Procedures

Subjects can be recruited through a variety of means, many of which are determined by the types of subjects required and their availability. We know of no laboratory lore about successful recruitment beyond common courtesy and politeness towards prospective subjects, their guardians, or others who look after their welfare. When recruiting from schools, though, we have found that research proposals that do not provide rationales for the practical importance of the research are at a competitive disadvantage. Moreover, some pressure exists to select subjects already at risk or in need of special services, for they are the ones most likely to benefit from the social contact associated with human research.

As for technical procedures involved in recruiting subjects, 65% of the questionnaire respondents either posted or made classroom announcements, 27% used advertisements, and 28% obtained subjects from educational, clinical, and personal referrals. No comparable data could be obtained from the literature survey. Although the effectiveness of recruitment procedures for obtaining subjects would seem an obvious area for empirical investigation, especially as the procedures might interact with subject characteristics, almost no research has addressed this issue (but see Eufemia, Wesolowski, & Dowdy, 1985).

Random Selection

As mentioned earlier, the strategies and tactics involved in the experimental analysis of human behavior have led investigators to adopt subject selection procedures different from those in psychology as a whole. Within the former tradition, researchers are typically interested in selecting subjects representative of the species, and then engaging in rigorous within-subject analyses that render individual differences moot. Given the relatively broad range of acceptable subjects, selection procedures are thus more a function of pragmatic considerations (e.g., subject availability) than of concerns about statistically pure random sampling. This point is supported by results from the questionnaire survey: 69% of the respondents said that they did not use random sampling, 23% said that they did, and 8% said both "yes" and "no," depending on the research area and experimental designs employed. In addition, 31% of the respondents noted that they (as we) screen subjects for particular characteristics, such as age, gender, motor and intellectual ability, and emotional stability. Finally, 27% of the respondents remarked that their subject samples were not unbiased in the sense that, for instance, college students and volunteers are probably not representative of the population of adults at large.

Restrictions on Generality

As for whether subject selection procedures restrict the generality of research findings, 47% of the questionnaire respondents answered "no" and 41% answered "yes"; of the remaining, one-third said that generality depended on the particular research topic, and two-thirds said the issue was an empirical one. Given the strong possibility that subject selection procedures may restrict generality, either within or across studies, then those characteristics should be presented for possible future evaluation. Reports of those characteristics may also serve as an important source of control over how researchers evaluate a particular study (cf. Johnston & Pennypacker, 1980, pp. 375–393) because, as Homer, Peterson, and Wonderlich (1983) have argued, the evaluation of generality via systematic replication "is in part dependent upon the reader's ability to determine the important similarities and differences in the subjects treated" (p. 39).

Informed Consent

Current ethical standards require researchers to obtain informed consent as a safeguard for their human subjects (American Psychological Association, 1983a; Department of Health, Education, and Welfare, 1981; National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1977). Although such consent is presumably uniformly obtained, the literature survey showed that less than two percent of the post-1978 studies have actually reported doing so.

One problem raised by this requirement is its effect on subject selection and recruitment, and hence on the composition of subject samples. On the questionnaire survey, 86% of the respondents indicated that informed consent did not restrict their samples. Of the 14% who answered that it did, two respondents mentioned that they lost 5–25% of their potential subjects due to the requirement. This latter finding is borne out in the developmental psychology literature in which parental refusal to provide informed consent, and hence allow child participation, has been shown to range from 10% to 35% in cross-sectional studies (e.g., Beck, Collins, Overholser, & Terry, 1984; Ford, 1982), and to be as high as 70% in longitudinal studies (e.g., McCarthy & Hoge, 1982).

That subject participation can be influenced by the informed consent requirement should not be taken lightly, especially where subject loss might produce biased samples. Beck, Collins, Overholser, and Terry (1984), for instance, found that the children of parents who did not consent to research participation had more unsatisfactory peer interactions (e.g., were aggressive or withdrawn) than those whose parents did

consent. These results raise important questions for experimental analyses of human behavior, especially when informed consent or the content of statements of informed consent (Lowenkron, 1983) differentially affect the inclusion of certain subject populations. If researchers would report the proportion of their subjects who do not participate for lack of informed consent, as well as why, then some sources of bias or of subject self-selection characteristics might be elucidated.

SUBJECT COMPLETION

Not only may the characteristics of subjects who participate in research affect research outcome, but the characteristics of the subjects who begin but do not complete research studies presumably shape and direct future subject-selection practices, as well as become grist for laboratory lore. Moreover, these characteristics may affect the generalizations that can be made from research studies because the subjects who complete research studies may differ from those who do not (see Bathurst & Gottfried, 1987; Fagan, Ohr, Singer, & Fleckenstein, 1987).

In the questionnaire survey, 59% of the respondents reported that no differences existed between subjects who did and did not complete their studies, or that most of their subjects completed the studies anyway. Twenty-eight percent of the respondents, however, mentioned some differences, the most common and obvious being unreliable attendance, scheduling inconvenience, geographical relocation, and ill health. Also included were descriptions of the subjects who completed research projects as being calmer; more mature, normal, compliant, and patient; better motivated; and under stronger instructional control—just the characteristics we, ourselves, have been led to select for in our research.

Admittedly, these general descriptions of subject behavior are inadequate for precise behavior analyses, but they might usefully be reported as a basis for informal assessments of their relationship to the marker variables described previously, as well as to various research questions, apparatus, methods, and designs. For instance, researchers investigating the parameters of free-operant avoidance conditioning in nonhumans often discard a fair proportion of their subjects—those who are not proficient avoiders (cf. Hineline, 1978). Although the characteristics of nonhuman subjects may not be important, the characteristics of nonproficient human avoiders may play a critical role in evaluations of generality in the experimental analysis of human behavior, both within and across species (see Higgins & Morris, 1984). Moreover, with respect to methodology, subject characteristics (e.g., age and irritability) may interact with experimental designs that call for extensive individual analysis across sessions, in comparison to analyses that can be completed in a single session. In any event, information on subjects who complete studies, and their subject characteristics, might make subject selection more efficient, as well as increase our understanding of human behavior.

CONCLUSION

In conclusion, we would like to emphasize three points. First, in order to make the laboratory lore of subject selection more explicit, researchers should provide more detailed information about their subject selection and recruitment procedures. Adhering to the standards of the American Psychological Association (APA), as described in the APA Publication Manual (APA, 1983b, p. 26), would seem sufficient for many of these needs (see also White & Duker, 1973).

Second, a descriptive and experimental attack might be made on subject characteristics as they affect research outcome, either (a) to control unwanted sources of variability or (b) to study them, and the variables of which they are a function, in their own right. Such a move might not only provide information that could increase the effectiveness of research on human behavior by affirming or disconfirming extant laboratory lore, but may also have important implica-

tions for extensions of basic research into applied behavior analysis (cf. Hake, 1982; Poling, Picker, Grossett, Hall-Johnson, & Holbrook, 1981), as well as into such areas as social and developmental psychology, personality and individual differences, and aging (cf. Baron & Perone, 1982, pp. 149–154; Harzem, 1984). The more that is known about individual differences across subjects and about how those differences correlate with research outcome, the more the relationships between basic and applied research literatures, and between those in the experimental analysis of behavior research and in the rest of experimental psychology, may be strengthened.

Third, researchers should not forget that their behavior is a function of the same principles as that of their subjects. If one of a researcher's tasks is to select subjects, then to understand how subject selection affects research outcome, an analysis should be made of the variables that control subject-selection practices. When viewed from this perspective, subject selection is the result of the differential instruction, shaping, and maintenance of the behavior of scientists. Moreover, no matter what the current subject selection practices may be, they are not the final "truth" of how subject selection practices should be conducted. In sum the evolution of improved research practices can only be hastened by bringing the behavior of scientists under clearer control of the consequences of scientific practice, even in the seemingly uninteresting area of subject selection.

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