

Single subject research designs

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There are a number of research options for treatment-oriented chiropractors who wish to examine and publish important clinical observations. These options include the case study and the single case experiment.

The case study is flexible. This in-depth strategy can investigate unusual conditions, innovative treatments or theoretically-derived hypotheses. Case study procedures include a selection of variables on which to focus, a data collection procedure, and a method of analysis of the observations and impressions.

The single case experiment is narrower in scope than the case study. Only a few variables are examined. Typically, a time-series design is used to determine change before and after treatment. The reversal (A-B-A) design is commonly used enabling the researcher to assess a patient before treatment, after introducing the treatment, and after the treatment has been withdrawn.

In order to systematically determine what is already known and what questions still need to be researched, it is important to replicate findings, evaluate change, and communicate findings to other chiropractors in order to build a robust body of knowledge based on clinical findings. Single subject research designs provide a viable means for doing this.

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KEY WORDS: practice-based research, case study, single case experiment, chiropractic, manipulation.

Il existe plusieurs options de recherche pour les chiropraticiens qui, tout en poursuivant leur pratique privée, désirent vérifier ou publier des observations. Ces options incluent l'étude de cas et l'étude mono-occasionnelle.

L'étude de cas a un champ assez large. Cette approche globale peut servir à étudier des conditions inhabituelles, des traitements innovateurs ou des hypothèses aux origines théoriques. L'approche d'étude de cas inclut un choix de variables sur lesquelles se concentrer, une procédure pour la collecte de l'information et une méthode d'analyse des observations et impressions.

L'étude mono-occasionnelle a un champ plus restreint que l'étude de cas car seulement quelques paramètres sont examinés. Généralement, on évaluera les changements dans le temps, soit entre le début et la fin des traitements. L'approche dite réversible (A-B-A) est couramment utilisée. Elle permet l'évaluation d'un patient en trois phases, soit : avant le traitement, pendant le traitement et une fois le traitement terminé.

Afin de différencier ce qu'on sait de ce qui demande plus de recherche, il est important de pouvoir reproduire nos résultats, d'évaluer les changements et de communiquer nos résultats aux autres chiropraticiens. Tout ceci afin de bâtir une solide banque d'informations. L'étude à un thème est une bonne façon d'atteindre ce but.

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MOTS-CLÉS : recherche en pratique privée, étude de cas, étude mono-occasionnelle, chiropratique, manipulation.

Introduction

Few chiropractors and other health professionals conduct controlled experiments in their clinical practice. This is because chiropractors function primarily as treatment-oriented professionals rather than as researchers. Further, many clinicians

argue that multisubject research methods used by social scientists are inappropriate or unethical for the clinical situation. Yet, important chiropractic phenomena often go unrecorded and, ultimately, unpublished. In this first in a series of articles on practice-based research, the general principles involved in single subject research designs will be discussed.

Research designs for clinicians

Interestingly, some of the most reliable laws have been established using simple but elegant single subject research designs developed by B.F. Skinner¹ and his colleagues.² Evans³ suggests that their work provides practical research options for treatment-oriented health professionals.

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These options fall into two related approaches: the case study and the single case experiment. Case studies provide an in-depth description of an individual, whereas single subject designs experimentally investigate a treatment effect.⁴ Both approaches provide alternatives to, but not replacements for, conventional research designs which require random allocation of a relatively large pool of subjects to experimental and control groups. These research options also provide opportunities for practice-based research to flourish.

The case study

The case study is an in-depth investigation of one or a few subjects. Its major advantage is the breadth and depth of information that can be gathered and analyzed. Frequently, the case study is exploratory in nature when the phenomenon or process is not clearly understood.⁵ Other uses of the case study include the presentation of unique or unusual findings,⁶ the generation of new hypotheses or theories,⁷ or the disconfirmation of generalities.⁸

The research questions are broad (e.g., How does chronic low back pain affect life style?), focusing on how and why circumstances occur. Benner⁹ believes that a wealth of knowledge is contained in clinical practice. Thus, case studies provide a way to formalize experiential knowledge so that it can be communicated and used to advance quality health care.¹⁰

Procedures for the case study

As Evans³ has written, a case study requires expertise and planning. Initially, one must decide on the purpose of the study. This decision will suggest a set of variables on which to focus.

If two chiropractors jointly develop a research project, using the case study approach, each could benefit from the ideas and skills of the other in planning what sources and types of information will be gathered. For example, the data of case studies are often written summations of important observations, relationships and inferences. Interviews, observations, test results and patient journals or diaries may also serve as data-generating devices.³

It is also essential to plan a data-recording procedure in order to avoid the loss of important information. As information is being collected, it is important to document records as to time, date, and place.

Analyzing the case study

Analysis of the case study includes content analysis in a search for patterns and theories. This is often done with at least two researchers evaluating the material independently and then discussing their individual impressions in order to reach consensus. It is also possible to organize the qualitative information into quantitative form.³ Techniques provided by Lofland and Lofland¹¹ include organizing data into thinking units, categorical matrices, flow charts, and frequency tables. These and other established data organizing techniques will form the basis of future articles.

The case study may take a variety of forms, but generally a portion of the study is devoted to an account of the research process itself. One purpose served by such an account is that the case can be compared to other similarly conducted studies. Over time, individual case studies can be analyzed collectively.¹⁰

The single case experiment

The single case experiment is narrower in focus than the case study, concentrating on a few variables. The patient serves in both the experimental and control conditions. The typical single subject experiment involves some form of time-series design⁴ and a stable baseline measure to determine if the patient's behaviour on the dependent measure occurs at a constant rate.¹² If a stable baseline cannot be achieved, single subject research is an inappropriate choice.

Procedures for the single case experiment

Hansen and Barlow¹³ recommend a number of procedures to enhance the soundness (internal validity) of single case experiments. They suggest that the practitioner use several different measures of the phenomenon being studied. Further, it is important to measure this phenomenon (the dependent variable) using a standardized routine, thereby avoiding the use of retrospective information to determine treatment effectiveness. In order to rule out extraneous factors, concentrate on examining one independent variable (e.g., a specific treatment) at a time.

Single subject research designs

One research strategy designed to minimize testing effects and unrelated change in the patient's condition is the reversal (A-B-A) design. The patient's condition is measured before the treatment is introduced (A), after introducing the treatment (B), and after withdrawing the treatment (A). As long as one finds substantially different levels of the dependent variable during treatment than those in the pretreatment and posttreatment baselines, it is possible to infer causality provided no effects are cyclical. Vernon¹⁴ presents an illustrative example of this type of research using a case of chronic unilateral sciatica. To rule out potential cyclical effects, one might expand the reversal (A-B-A) design to an A-B-A-B design.

Some situations suit neither a reversal design nor a multiple baseline design. A chiropractor, for example, may see a patient for the first time in an acute condition. It is not ethical to treat the patient and, once the patient is improved, reverse the procedure. However, it may be possible to use a random time-series design. The key to this design is that the choice of the time at which the specific treatment being studied is applied is introduced entirely at random. If the dependent variable changes immediately after the experimental treatment, the hypothesis is supported.³

Criteria for evaluating results

The designs mentioned above are the basic and commonly used ones, although other types can be employed. However, regardless of which design is used, there are two issues that must be

considered when engaging in single subject research: replication and evaluating change.

If one tests a patient and finds a specific pattern, it is desirable to determine if the same pattern emerges in another subject. This second examination is an independent replication of the experiment. If the same pattern emerges, then further subjects can be used. If one fails to replicate the findings on one or more patients, this is an invitation to track down factors contributing to the inconsistent findings (e.g., faulty design).¹⁵ Single subject research attempts to rule out extraneous variables by strategies such as replicating the intervention over time. Similarly, these designs use a therapeutic criterion to evaluate change.^{16,21}

The therapeutic criterion refers to the clinical significance or value of the treatment for the patient. This criterion is more difficult to determine than the replication criterion but researchers have included a procedure known as social validation in some single-case experiments. Essentially this method involves systematically comparing the functioning of the patient with condition-free patients. If the patient's condition is no longer distinguishable from a condition-free group, then the therapeutic criterion has been satisfied.⁴

The subjective evaluation method may also be used. The patient is routinely asked to evaluate qualitative differences in functioning on an assessment instrument. If the results are substantially different from the pretreatment scores, the therapeutic criterion is considered to have been satisfied.

As Mook¹⁴ points out, the single case experiment controls both the variability in the data produced by variations in the controlled condition and, if one manipulates that condition, making its effect on each subject visible, one gains control over individual differences. Both sources of variability are under control. Single subject research prevents treatment factors from varying.

Conclusion

Whether one designs a case study or a single case experiment, single subject research is flexible. Unlike multisubject experiments, single subject research enables one to track down unexpected findings as they emerge. Carefully designed single subject research studies also avoid the problems associated with averaging data.¹⁸ After all, only individuals behave, not experimental and control groups.¹⁴ More importantly, single subject research activities provide an avenue for communicating em-

pirical findings of clinical significance to other chiropractors as well as a means of establishing fruitful collaboration between senior students and/or recent graduates and their field professional counterparts.¹⁹

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