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Research Approaches in Prosthodontics

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Abstract - *Many current studies of prosthodontic treatment use patient-based outcomes. Traditionally, these outcomes are measured using quantitative methods. However, qualitative research methods can provide important information that cannot be found using quantitative techniques. In this article, the authors review quantitative and qualitative research studies. Differences, advantages and disadvantages of each method are highlighted. Prosthodontic researchers are encouraged to combine these methods to benefit from the potential of each of these approaches.*

KEY WORDS: Quantitative, Qualitative, Research approach, Prosthodontic research

INTRODUCTION

The impact of prosthodontic therapy on patients has generally been measured by three methods: quantitative, qualitative or a combination of the two [1]. A researcher's choice of measurement approach depends on several factors, including experience and personal training of the researcher, the audience, the type of outcome and, most importantly, the research question [1, 2].

The aim of this review is to provide an overview of common research methodologies and to highlight the main differences between these approaches. An appreciation of these differences is necessary not only to improve the understanding of different research strategies, but also to encourage the use of appropriate approaches to address different research questions, particularly in the field of Prosthodontics.

A search of publications indexed in MEDLINE (1966 to week 3, May 2007), EMBASE (1980 to week 3, May 2007) and CINAHL, plus a search by hand using the keywords "qualitative research and Prosthodontics" yielded 9 articles [3-11] in which qualitative approaches are used and seven articles with mixed approaches [12-18]. In contrast, more than 100 studies have used quantitative methods to measure the impact of prosthetic therapy on patient related factors like satisfaction and quality of life [19]. In order to delineate the methodological disparities in prosthodontic research and to highlight the advantages and disadvantages of each approach in this field, we need to briefly discuss the fundamental differences between qualitative and quantitative research (Table I).

DEFINITIONS

The term "quantitative" refers to a tradition of research, dominant in science since the 17th century, that emphasizes the measurement and quantification of phenomena[20]. The term "qualitative" research is concerned with the nature or quality of human experiences and what these phenomena mean to individuals [21]. According to Creswell [22], "Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem." "In qualitative approaches the researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants and conducts the study in a natural setting. Alternatively, quantitative research is an inquiry process based on testing a theory through chosen variables that are measured with numbers and analyzed with statistical procedures in order to determine whether the predictive generalization of the theory holds true[1]."

Qualitative research aims to understand the participant viewpoint, providing rich descriptive detail that sets quantitative results into the human context [23]. Results from qualitative studies can be published on their own. For example, Omar *et al* [24], used qualitative methods to study the emotional effects of tooth loss and the influence of religious beliefs in coping with the psychological impact of tooth loss. In addition, qualitative research can complement quantitative research by expanding the information gained through quantitative research, eg. by hypothesis generating [25].

DIFFERENCES BETWEEN QUALITATIVE AND QUANTITATIVE APPROACHES

The main difference between quantitative and qualitative approaches is the research question. Qualitative research allows the researcher to generate hypotheses and to define research questions throughout the research process, while quantitative research requires the hypotheses prior to the start of the study. Qualitative approaches document an individual's experiences and feelings in an attempt to characterize the complexity of human experience. In addition, one of the powerful tools of qualitative research is reflexivity, which permits researchers to develop ideas and negotiate relationships, thereby influencing the collection and analysis of data as the study progresses. This information could be very useful for other investigators, such as public health policy makers. For them, qualitative research is an important tool to study the "black box"

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Table 1. *A comparison of several key characteristics of qualitative and quantitative approaches. Adapted from Jack (2006)[26], Creswell (2003)[1, 22].*

	Qualitative	*Quantitative*
Philosophical Basis	Naturalism, interpretivism Acceptance of multiple realities Subjectivity	Materialism and positivism Acceptance that only one reality exist Objectivity
Aim	To search for understanding and meaning To define research question To generate new theories or hypotheses To explore contextual influences on phenomena To identify themes relevant to specific context that may be transferable to other settings	To test or verifies hypothesis and establish laws of cause and effect, association or correlation To generalize finding to a population
Methodological Underpinnings	Inductive processes Researcher is the primary instrument Flexible design Difficult to confirm sample size a priori Open ended questions Interpretation of phenomena emerge from participants' experience	Deductive processes Hypothesis testing Instrument based question Fixed design with predetermined simple size Close ended questions Statistical analysis
Research Designs [22]	Grounded theory Phenomenology Ethnography Case study Participatory action research , Narratives	Experimental, quasi-experimental and observational Ex: RCT, Cohort studies, case control

and to understand the factors that contribute to success or failure of health care policies [26].

Differences between qualitative and quantitative approaches are also reflected in each step of the research process as described by Creswell[1, 2] and summarise below. Knowledge of these differences provides valuable information for understanding the aims of each approach.

Step 1: Identifying a Research Problem

Quantitative Research: The research problem requires a description of trends or an explanation of a relationship amongst variables [1, 2].

Qualitative Research: The research problem requires an exploration and understanding of a central phenomenon because of a lack or inaccuracy of theory. The researcher needs to learn more from participants [27]. The nature of the phenomenon may also not be suited to quantitative measures [28].

Step 2: Reviewing the Literature

Quantitative research: The literature review has an essential role to justify the need for research and to provide direction for the research question or hypothesis. Based on the literature, the researcher identifies important variables and potential relationships that need to be examined [1].

Qualitative Research: As in quantitative research, the literature review justifies the need for research on the topic. However, as opposed to quantitative research, the review does not provide direction. The direction of the research is provided by the information supplied by the study participants [2].

Step 3: Specifying a Research Question

Quantitative Research: In order to obtain measurable and observable data on variables of interest, the research questions and hypotheses are specific and narrow [2]. Quantitative questions ask about frequency, performance, time, location, intensity, strength and sequence, and groups are compared or a relationship between variables are established through association or cause-effect [29].

Qualitative Research: The research question often starts with how or what, so that it forays into the topic and describes what is going on. Research questions and hypotheses are general and broad, thus evoking needed information to synthesize and prioritize observations about behaviours [20].

Step 4: Choice of outcomes and instruments; Data collection

Quantitative Research: An enormous array of instruments, either ad hoc or standardized, are used to measure the impact of prosthetic therapy, including the Oral Health Impact Profile (OHIP) [30], the SF-36 [31], and others [32]. These instruments differ in their primary intended purpose and in their content. The rationale for using a measure should be clear and justified according to the target population and the context in which it is used. It should be appropriate, reliable, valid, responsive, precise, interpretable, acceptable and feasible. These instruments permit the collection of numerical data, which, in turn, permits quantitative statistical analyses. The aim of this process is to generalize information from a small number of people to a larger population. Thus, the sample should be representative and large enough to show differences between the variables.

Choice of outcomes

Patient-based versus clinician-based outcomes

The literature confirms that there is a discrepancy between clinical findings or the perceptions of clinicians and patients' perceptions of pain or treatment satisfaction [33]. Thus, in order to evaluate interventions and to identify more appropriate forms of health care, particularly for chronic conditions, it is necessary to take into account patients' judgments and preferences.

A number of roles have been suggested for patient-based outcome measures including: their use as screening tools, as methods to identify patient preferences, to help clinicians make informed decisions, and as a means to improve patient–provider communication [34]. Patient-reported outcome measures aim to capture the patients' perspective of health, illness, and the effects of health care interventions in a reliable, valid, acceptable and feasible way.

Alternatively, clinical scales are the perceptual judgement of health professionals. Some researchers prefer clinical and laboratory based data and argue that they are more "objective", easier to quantify, easily reproducible and clinically relevant for determining treatment effectiveness. However, these are measurements of technical issues that could be independent of patient judgment. Therefore, their use should be to understand more about technical issues and not used to substitute for indicators of treatment success.

Qualitative Research: Qualitative data typically consist of text or image data. The researcher does not start data collection with a set of tools to measure different variables. Instead, the researcher learns from the participants in the study and develops a form for data recording as the study proceeds [35]. There are wide arrays of data collection techniques and most fall into three categories that include in-depth interviews, observation or existing documents [2]. The objective of the interview is to explore the ideas of the interviewees about the phenomenon of interest. In observational protocols, the behaviour of participants is also noted. The data can be collected from the existing documents like newspapers and websites, audio, video or pictures. From audio-recordings, transcripts of text are typed to form a database. In this approach, the investigator does not use instruments constructed by other researchers. Instead they develop their own form of interview protocol [2].

Step 5: Analyzing and Interpreting the Data

Quantitative Research: Data are analyzed by statistical procedures and interpreted according to initial predictions or prior studies.

Qualitative Research: A text database is analyzed by being divided into groups of sentences. The analysis procedure consists of determining the meaning of the text segments and description of the central phenomenon under investigation. This description includes contextual information about the people or idea being studied. The data analysis reflects the description and thematic development as well as interrelation of themes. The researchers reflect on their own bias, values and assumptions and discuss their role, their experiences, and their cultural backgrounds [2, 36]**.** The interpretation is an explanation of how the findings relate to the research and a personal reflection about the significance of what has been learned during the study [2].

MIXED APPROACHES

Although a long-standing debate has existed between qualitative and quantitative methodologists about which of these methods are most valid, health researchers recently have begun to understand the benefits of booth tools and are now combining the two methods [12, 37]. This mixed approach allows confirmation of findings from different data sources [1]. For example, exploration of potential outliers with in-depth interviews can provide insight about their divergence [1, 25, 38]. Sondell *et al.* [17] has carried out mixed approach studies to evaluate the influence of verbal communication on patient satisfaction with prosthodontic treatment. They showed that giving the patients an opportunity to discuss their dental health improved their satisfaction with the treatment outcome. Finally, mixed methods permit researchers to both generalize findings to a population and to develop a detailed view of the concept on an individual basis.

RESEARCH APPROACHES USED IN PROSTHODONTICS

Incorporating a device into the oral cavity is a complex process. A variety of factors contribute to how much each patient benefits and how s/he adapts to the prosthesis. Physical and physiological factors include chewing ability, oral heath status, and diet and nutrition [39-43]. Psychological and behavioural factors include patient expectations, self-esteem, quality of life and social relationships [44-46]. Investigators have measured these various factors using patient-based [47-51], clinician-based and laboratory-based instruments [43, 52, 53]. In Prosthodontics, the discrepancy between professionally- expressed and patient-expressed needs has forced clinicians to accept that, although Prosthodontics is a technical science, technical skills alone are not good predictor of patient satisfaction with treatment. Therefore, the use of patient-based outcomes to measure the impact of prostheses on well-being have increased over the last decade [47], especially in the field of removable Prosthodontics, which essentially involves social, psychological and physical impacts of edentulism. Even when using patient-based measures, prosthodontic research involves primarily quantitative approaches because of the following issues:

When used appropriately, the internal and external validity of both qualitative and quantitative methods has never been in doubt, but the credibility and respectability of these methods vary across disciplines, professions, time periods and countries [54]. The credibility of the researcher depends on several factors such as training, experience and philosophical beliefs of the value of the qualitative inquiry [54]. As a consequence, qualitative research is either absent or poorly ranked in methodological hierarchies of scientific evidence [55]. Furthermore, fundability of qualitative research in the prosthetic field is challenging because approaches that produce analytical data tend to be favoured by policymakers and those who fund research. This is because findings that are easily generalizable appear to be more suitable for

practical application and justification of difficult clinical and political decisions. In addition, a rigorous qualitative research that provides in-depth descriptions and observations usually requires greater amounts of time, labour and cost than similar quantitative investigations [17, 56].

Quantitative research can be replicated with ease and confirmed or refined in follow-up studies. The data obtained from quantitative research has the advantage of being amenable to highly sophisticated statistical analyses and modeling procedures. Moreover, systematic reviews of quantitative data appear to be less susceptible to bias from external influences than reviews of qualitative data. Systematic reviews of quantitative data do not involve personal feelings, and researcher objectivity is assumed [57]. On the other hand, qualitative analysis depends on the insights and conceptual capabilities of the analyst.

However, qualitative research can provide insight into phenomena that have not been previously studied. Qualitative research defines and answers questions that quantitative methods cannot address [58]. For example, would a soldier who has lost part of his body during combat value a dental prosthesis more than a Hollywood star? Answering this question requires an understanding of the social environment, thoughts, feelings and experiences of the people involved. The effects of intangibles such as beliefs, the complexity of human interaction and understanding how the social, political and economic context influences human experiences and behaviours can provide clinicians with a better understanding of the impact of their prosthetic therapies.

CONCLUSION

Qualitative and quantitative research studies follow completely different strategies and design elements. The crux of good research is the appropriate use of different methodologies. To truly assess the range of prosthodontic outcomes, one must consider the physiologic, psychologic and social implications. Thus, creative study designs that adopt methodological pluralism are encouraged.

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