

Syllabus OS 512 2004 Research Design  
Synopsis of Course  
See Section 8 of this syllabus for more detail.  
Revised 08/20/04

Session and Date	Topic of Lecture	Assignments	
		Reading	Writing
1. 08/30/04	Summary of Course, Ethics	None	None
09/06/04	No class, Labor day		
2. 09/13/04	Vocabulary of Research Design	Belmont Report	Quiz on Belmont Report
3. 09/20/04	Reliability	Platt, 1964; Chapter on Semmelweis	Strong inference tree
4. 09/27/04	Threats to validity	Rohlin et al., 1991; Gerwin et al., 1997; van der Meij, 1999	Summary of article
5. 10/04/04	Philosophy of science	Roberts et al., 1984; Choksi et al., 1994; Mullaly et al., 1995	Summary of article Evaluation of article
6. 10/11/04	Evidence-Based Dentistry	Leverett et al., 1984; Wenzel et al., 1992; Kapur et al., 1997	Summary of article Evaluation of article
7. 10/18/04	Search skills. The HSL staff will present this session in Room B2C of the Health Sciences Library		
8. 10/25/04	Cross-over designs	Shanker et al., 1996; Braun et al., 1996; Schwartz, 1979	Evaluation of article Search results
9. 11/01/04		Cobb et al., 1959; Doerr et al., 1998; Lindquist, 1995	Evaluation of article Semmelweis #1
10. 11/08/04		Ramfjord, 1961; Rubinoff, 1987; Dao et al., 1994; Moore, 1999	Search result Short review #1
11. 11/15/04		Wright, 1981; Kratochvil, 1982; Meyerowitz, 1998	Evaluation of article Semmelweis #2
12. 11/22/04		Gaines et al., 1960; Duryea, 1983; Williamson, 1998	Evaluation of article Short review #2
13. 11/29/04			Evaluation of article Semmelweis #3
14. 12/06/04	Last class		
12/13/04	Final Exam		

# SYLLABUS

## 1. General information.

<b>Course:</b>	<b>Director:</b>
Oral Sciences 512 (2 credits)	W. D. McCall, Jr., Ph.D.
Research Design in the Oral Sciences	349 Squire Hall
Fall Semester, 2004	Office Phone: 829-3559
215 Foster Hall	Home Phone: 688-1535
Mondays 2 P.M. to 4 P.M.	Office Hours: By appointment
Look for handouts at: <a href="http://www.acsu.buffalo.edu/~wdmccall/">http://www.acsu.buffalo.edu/~wdmccall/</a>	E-Mail: <a href="mailto:wdmccall@buffalo.edu">wdmccall@buffalo.edu</a>
Look for articles and handouts at: <a href="http://ublib.buffalo.edu/libraries/catalog/">http://ublib.buffalo.edu/libraries/catalog/</a> then: search the catalog, course reserve, OS512 or McCall	Most of the readings for this course are on reserve at the library or on the blackboard site.
The Blackboard site is: <a href="http://ublearns.buffalo.edu/Blackboard">http://ublearns.buffalo.edu/Blackboard</a> >	

## 2. Purpose

New information enters a profession through publications and presentations, but some of these publications and presentations are mistaken, incomplete, biased, or fraudulent. Thus, one should learn to receive these sources of information critically and skeptically. The purpose of this course is to provide the broad principles of research design for that critical and skeptical reception. (The other essential ingredients for critical and skeptical reception of new information are mechanisms, that is, basic science, and statistics. Mechanisms and statistics are not part of this course.)

## 3. Goals.

Since this course comes early in graduate or postgraduate education, and since ethics are crucial to research on human subjects, the course will briefly discuss the ethics of human research. The main goals of this course are for the student to identify and describe in published articles the independent and dependent variables, the variables that need to be controlled to have valid results, the threats to valid conclusions, and the types of research design. This course will not focus on the content (e.g., biomaterials, microbiology, or endodontics) of the articles, nor will the course include statistics.

## 4. Outcomes.

At the completion of this course, each student should be able to do all of the following. (a) Explain the ethical principles underlying research on human subjects. (b) Explain independent and dependent variables and identify them in research publications. (c) Explain the several types of research design and identify them in research publications. (d) Explain the strengths and weaknesses of each type of design. (e) Use all the foregoing to analyze and evaluate published articles. And (f) synthesize these ideas by writing small reviews and small research proposals.

## **5. Textbooks and readings.**

### **Bibliography**

There are no required textbooks. The following chapters and books give more detail for the student who feels the need to consult them. They are arranged roughly in the order of length.

S. Shott, *Statistics for Health Professionals*, Chapter 1, "Experimental Design," Saunders, Philadelphia, 1990.

J.A. Weintraub, C.W. Douglass, and D.B. Gillings, *Biostats Data Analysis for Dental Health Care Professionals*, Chapter 21, "Experimental Designs and Clinical Trials," CAVCO Inc, Research Triangle Park, 1985.

J.L. Spector, *Research Designs*, Sage, 1981.

M.L. Darby and D.M. Bowen, *Research Methods for Oral Health Professionals An Introduction*. Mosby, St. Louis, 1980.

F.J. Fowler, Jr., *Survey Research Methods*. Sage Publications, 1993.

D.M. Brunette, *Critical Thinking: Understanding and Evaluating Dental Research*, Quintessence, Chicago, 1996. (This book is also on the DVD used in the DDS program at UB.)

### **Recommended Reading**

N.D. Mohl. A case for clinical research. *J.Dent.Res.* 71: 1459-1460, 1992.

D.H. Blandford, G.B. Warren, and E.M. Campbell. Introduction to research planning. *J.Dent.Educ.* 48:246-250, 1984.

D.H. Blandford, G.B. Warren, and E.M. Campbell. Uses and content of a research protocol. *J.Dent.Educ.* 48:298-301, 1984.

### **Required Reading**

The handouts and the articles cited in Section 8 are required reading. These have been put on reserve at the Health Sciences Library, on the web, or on the Blackboard site.

## **6. Evaluation and grading.**

The focus of this course is on understanding and using the issues of research design. Each student will be required to read assigned journal articles, discuss them in class, write evaluations of their design, write reviews of sets of articles, write small research proposals, and take the final examination. Grades will be based on participation in class discussion (20%); the written evaluations, reviews, and research proposals (60%), and the final examination (20%). The quiz on the Belmont Report must be passed (70% or more) to complete OS 512.

*Class participation.* The instructor will make an effort to learn your name, and your responsibility is to make sure he succeeds. You should have an opinion, and state it, about the variables, the design, and the controls of each paper you read.

Your participation will contribute to your grade, your correctness will not. Questions admitting confusion and discussion following a wrong answer are more valuable to the educational process than the right answers.

### *General comments.*

A few different types of written documents will be required. The structure of each type is described below. The first will be graded and returned but not recorded. These summaries, evaluations, reviews, and proposals for research design should be typed double-spaced (a blank line between text lines). One page should suffice. If you do not have other access to a computer and a printer, the dental school has a computer lab in Room B35. You will need to use a word processor for your thesis, you may as well learn now. For my ease of reading please use a serif font (e.g., palatino, times), left justify (so the right edge is ragged), indent the first line of each paragraph, and use the spelling check feature.

### *Summary of article.*

Your written evaluation of an article should include the following. A header giving your name, the date, and the full reference of the article. Full reference means all the authors, the title, the journal, the volume, the first and last page numbers, and the year. The text should give, as one full sentence for each and not as a list of phrases, each of the following: the problem, purpose, method, result, significance, and critique. If you understand an article you can state the problem, purpose, method, result, significance, and critique in one sentence each. The "one sentence" is important because it forces you to decide on the heart of the matter and omit the irrelevant detail. The problem and the purpose should be found in the Introduction. Synonyms to look for are "hypothesis" and "question" and "aim." The method sentence may get a bit long, but try to capture the essential features of the research design. The main result should follow easily if the purpose and the method are clear. The significance and critique depend on your knowledge and experience and initially may be "not stated" or "none."

### *Evaluation of article.*

Your written evaluation of an article should include the following. A header giving your name, the date, and the full reference of the article. Full reference means all the authors, the title, the journal, the volume, the first and last page numbers, and the year. The text should give, as full sentences and not as a list of phrases, each of the following: (a) An introductory sentence or two giving the problem and the main finding, (b) the independence of the data, the independent variable or variables, the dependent variable or variables, the experimental unit, the type of design, and the timing of the data collection, (c) whether the variables included operational definitions, (d) the strengths and weaknesses of this design in this situation, including threats to the validity that were and were not controlled, and (e) suggestions of how the research might be improved. Could an alternative hypothesis explain the data? Can you propose an alternate design to answer the same research question? Please keep the evaluation to one page. (Also, please do not take the instructor's hurried and abbreviated scribblings on the board during class as an example of how you should write your evaluations.)

### *Short reviews.*

You will combine your skills in analyzing papers with your skills in searching the medical literature by writing two brief reviews. The criteria cited near the end of the review paper by R.A. Moore (1999) should provide a basis for understanding and

writing a review. For *Short Review #1* the topic is amalgam versus composite resin for restorations. For *Short Review #2* use a treatment of your choice. Do a search. Try to summarize the evidence in a table and try to keep your entire review to two or three pages.

### *The Semmelweis Proposals.*

Dr. Semmelweis believes that if doctors wash their hands between leaving the cadaver lab and entering the maternity ward there will be fewer cases of childbed fever among the mothers. He has asked you, as a member of his staff in Vienna in 1860, to design a series of research projects to test his belief. The first study will be pre-experimental, the second quasi-experimental, and the third true experimental. Keep the date in mind when you select your variables: microbiology, immunology, and most other "-ologies" were unknown.

## **7. Policies and procedures.**

Participation implies attendance. There will be no make-up sessions. Written work is to be the product of only the student.

"The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect for others' academic endeavors. By placing their name on academic work, students certify the originality of all work not otherwise identified by appropriate acknowledgments."

---UB policy on academic honesty

"If you have a diagnosed disability (physical, learning, or psychological) which will make it difficult for you to carry out the course work as outlined or requires accommodations such as recruiting note takers or readers, or providing extended time for examinations or assignments, please advise the course director during the first two weeks of the course so we may review possible arrangements for reasonable accommodations."

---UB policy on disabilities

Plagiarize is defined in my Webster's dictionary as "to take and pass off as one's own the ideas, writings, etc. of another" or to "take ideas, writings, etc. from and pass them off as one's own." In simpler words, plagiarizing is copying. And thus it is a form of cheating. If you want to use the author's words, put them in quotation marks and cite the source. For example you could write the following: Ramfjord (1961) stated that "The purpose of this study was to investigate, clinically and electromyographically, the relationship between occlusal disharmony and pain in the temporomandibular joint and adjacent structures and to search for rational therapy for these disorders." A much better way,

however, is to put the idea into your own words: Ramfjord's purpose was to see if pain was reduced by occlusal adjustment."

## **8. Session titles, required reading, and assignments.**

1. 08/30/2004

- (a) Introduction. Knowledge survey. Handout syllabus and Belmont Report. Go through the syllabus.
- (b) Lecture: Summary of whole course. Lecture and discussion of ethics in research.

09/06/2004 No class. Labor Day

2. 09/13/2004

- (a) Quiz on Belmont Report.
- (b) Lecture: vocabulary of research design.

Read the Belmont Report before class. There will be a quiz at the start of class. (A requirement of the course is to pass the quiz with 70% or more. The quiz will be repeated if necessary.)

3. 09/20/2004

- (a) Discussion of strong inference tree.
- (b) Lecture: reliability.

Before class read both Platt, JR (1964): Strong inference, *Science* 146, 347-353, and the chapter on Semmelweis. Use the idea of the "Strong Inference Tree" from Platt to make a strong inference tree for the Semmelweis problem of childbed fever. Several hypotheses were considered by Semmelweis, his colleagues, and his opponents. Include each and see if you can devise an experiment to disprove it. For this homework I will accept handwritten, pencil documents. I will collect homework at the beginning of class, so you may want to make a photocopy.

4. 09/27/2003

- (a) Discussion of assigned articles.
- (b) Lecture: threats to validity

Gerwin, RD; Shannon, S; Hong, C-Z; Hubbard, DR, Jr; Gevirtz, RN (1997): Interrater reliability in myofascial trigger point examination. *Pain* 69, 65-73.

Rohlin, M; Kullendorff, B; Ahlqvist, M; Stenstrom, B (1991): Observer performance in the assessment of periapical pathology: a comparison of panoramic with periapical radiography. *Dentomaxillofacial Radiology* 20, 127-131.

van der Meij, EH; Reibel, J; Slootweg, PJ; van der Wal, JE; de Jong, WFB; van der Waal, I (1999): Interobserver and intraobserver variability in the histologic assessment of oral lichen planus. *Journal of Oral Pathology and Medicine* 28, 274-277.

Read all three of the above articles and write a summary of one of them. An effort will be made to grade and return papers to your mailbox or department before the next class.

5. 10/04/2004

- (a) Discussion of assigned articles.
- (b) Lecture: philosophy of science.

Roberts, AM; Person, P; Chandran, NB; Hori, JM (1984): Further observations on dental parameters of trigeminal and atypical facial neuralgias. *Oral Surgery, Oral Medicine, Oral Pathology* 58, 121-129.

Choksi, SK; Brady, JM; Dang, DH; Rao, MS (1994): Detecting approximal dental caries with transillumination: a clinical evaluation. *Journal of the American Dental Association* 125, 1098-1101.

Mullaly, BH; James, JA; Coulter, WA; Linden, GJ (1995): The efficacy of a herbal-based toothpaste on the control of plaque and gingivitis. *Journal of Clinical Periodontology* 22, 686-689.

Read all three of the above articles. Write a summary of one of them and an evaluation of a different one.

6. 10/11/2004

- (a) Discussion of assigned articles
- (b) Lecture: Evidence-based Dentistry

Leverett, DH; McHugh, WD; Jensen, OE (1984): Effect of daily rinsing with stannous fluoride on plaque and gingivitis: final report. *Journal of Dental Research* 63, 1083-1086.

Wenzel, A; Verdonshot, EH; Truin, GJ; Konig, KG (1992): Accuracy of visual inspection, fiber-optic transillumination, and various radiographic image modalities for the detection of occlusal caries in extracted non-cavitated teeth. *Journal of Dental Research* 71, 1934-1937.

Kapur, KK; Garrett, NR; Dent, RJ; Hasse, AL (1997): A randomized clinical trial of two basic removable partial denture designs. Part II: Comparisons of masticatory scores. *Journal of Prosthetic Dentistry* 78, 15-21.

Read all three of the above articles. Write a summary of one of them and an evaluation of a different one.

7. 10/18/2004

Search skills. This session will meet in Room B2C of the Health Sciences Library. A homework based on the topic will be distributed prior to the session.

8. 10/25/2004

- (a) Discussion of assigned articles.
- (b) Lecture: Cross-over designs.

Schwartz, RA; Greene, CS; Laskin, DM (1979): Personality characteristics of patients with myofascial pain-dysfunction (MPD) syndrome unresponsive to conventional therapy. *Journal of Dental Research* 58, 1435-1439.

Braun, S; Hnat, WP; Freudenthaler, JW; Marcotte, MR; Honigle, K; Johnson, BE (1996): A study of maximum bite force during growth and development. *Angle Orthodontist* 66, 261-264.

Shanker, S; Ngan, P; Wade, D; Beck, M; Yiu, C; Hogg, U; Wei, SHY (1996): Cephalometric A point changes during and after maxillary protraction and expansion. *American Journal of Orthodontics and Dentofacial Orthopedics* 110, 423-430.

Search and find an article which experimentally evaluates the reliability of a clinical measurement in your specialty or a clinical area that interests you. Make a copy of the article for the instructor and be prepared to discuss it. Turn in the computer printout of your search effort. Read all three of the above articles and write an evaluation of one of them.

9. 11/01/2004 Discussion of assigned articles.

Cobb, LA; Thomas, GI; Dillard, DH; Merendino, KA; Bruce, RA (1959): An evaluation of internal-mammary-artery ligation by a double-blind technique. *New England Journal of Medicine* 260, 1115-1118.

Doerr, PA; Lang, WP; Nyquist, LV; Ronis, DL (1998): Factors associated with dental anxiety. *Journal of the American Dental Association* 129, 1111-1119.

Lindquist, TJ; Ogle, RE; Davis, EL (1995): Twelve-month results of a clinical wear study of three artificial tooth materials. *Journal of Prosthetic Dentistry* 74, 156-161.

Read all three of the above articles and write an evaluation of one of them. Write a research proposal using a pre-experimental design to test the hand-washing hypothesis of Semmelweis. Be sure to read the earlier paragraph in this syllabus about the Semmelweis proposals.

10. 11/08/2004 Discussion of assigned articles.

Dao, TTT; Lavigne, GJ; Charbonneau, A; Feine, JS; Lund, JP (1994): The efficacy of oral splints in the treatment of myofascial pain of the jaw muscles: a controlled clinical trial. *Pain* 56, 85-94.

Moore, RA (1999): New developments in evidence-based decision-making: relevance to pain treatment and research In: *Pain 1999 - An updated review*. IASP Press, Seattle, pp. 423-430.

Ramfjord, SP (1961): Dysfunctional temporomandibular joint and muscle pain. *Journal of Prosthetic Dentistry* 11, 353-374.

Rubinoff, M; Gross, AJ; McCall, WD, Jr. (1987): Conventional and nonoccluding splint compared for patients with myofascial pain dysfunction syndrome. *General Dentistry* 35, 502-506.



Read the cited articles. Search to find two more articles in which splints were used to treat TMD pain. The articles you find must be newer than those assigned. Turn in your search result. Write one review encompassing both the articles assigned and the articles you found.

11. 11/15/2004 Discussion of assigned articles.

Kratochvil, FJ; Davidson, PN; Guijt, J (1982): Five-year survey of treatment with removable partial dentures. Part I. *Journal of Prosthetic Dentistry* 48, 237-244.

Meyerowitz, C; Watson, GE, II (1998): The efficacy of an intraoral fluoride-releasing system in irradiated head and neck cancer patients: a preliminary study. *Journal of the American Dental Association* 129, 1252-1259.

Wright, SM (1981): The radiologic anatomy of patients who gag with dentures. *Journal of Prosthetic Dentistry* 45, 127-133.

Read all three of the above articles and write an evaluation of one of them.

Write a research proposal using a quasi-experimental design to test the hand-washing hypothesis of Semmelweis.

12. 11/22/2004

Duryea, EJ (1983): Utilizing tenets of inoculation theory to develop and evaluate a preventive alcohol education intervention. *Journal of School Health* 53, 250-256.

Gaines, WJ; Langford, HG (1960): Research on the effect of blood-letting in several inflammatory maladies. (Translation of an article by Pierre-Charles-Alexander Louis, *Arch. Gen. Med.* 321-336, 1835, with introduction.). *Archives of Internal Medicine* 106, 571-579.

Williamson, EH; Rosenzweig, BJ (1998): The treatment of temporomandibular disorders through repositioning splint therapy: a follow-up study. *Journal of Craniomandibular Practice* 16, 222-225.

Read all three of the above articles and write an evaluation of one of them. Find some articles that present the experimental evidence supporting a treatment of your choice. Write a short review of that evidence.

13. 11/29/2004

Writing Group for the Women's Health Initiative Investigators (2002): Risks and benefits of estrogen plus progestin in healthy postmenopausal women. *Journal of the American Medical Association* 288, 321-333.

Write a research proposal using a true experimental design to test the hand-washing hypothesis of Semmelweis.

14. 12/08/2003 Last class. Course evaluation. Knowledge survey.

*Final examination.* Three or four articles will be handed out a week or so before the exam. You may write anything you like on your copies of the articles, and bring them to the exam. The exam itself will be a series of multiple choice questions based on the articles.

## **9. Changes this year.**

Two modest changes for 2004. The writing of the "summary" has been added. This was motivated by a former student telling me how useful the practice had been. The second change was to move the segment on reliability earlier in the semester.

There are two changes of note for 2003. One is the inclusion of a session on reliability. In the past it had been included as a part of the "threats to validity" and then ignored. Reliability of clinical data is sufficiently important to warrant a session of its own. The second change is a migration from the ~wdmccall website toward the "Blackboard" website.

The changes for 2002 have been modest. The session on search skills has been moved later in the semester so the course can end with a series on evidence-based decision-making. A series of articles recently published on national health issues has been added. The due dates of the research proposals involving the Semmelweis hand-washing hypothesis have been staggered to allow for instructor feedback.

The most significant change for 2001 is the deletion of the Research Proposal. The main problem was that students received no feedback on what was a substantial part of the grade, and thus students who did not see the differences among the types of research design got low grades and were surprised. The series of homeworks on the handwashing hypothesis is intended to replace it. A second change for 2001 is the formal inclusion of Medline searching. This course is evolving towards teaching evidence-based decision-making, and searching is a crucial part of that process. A third change is that what were called "mini-meta-analyses" are now called "reviews" since a meta-analysis implies doing statistics on the articles being analyzed.