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TRAINING THE TRAINER: DISABILITIES AND DENTAL HYGIENE

ELMER E. GONZALEZ

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TRAINING THE TRAINER: DISABILITIES AND DENTAL HYGIENE

BY

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B.A., Spanish, The University of New Mexico, 2005
B.S., Dental Hygiene, The University of New Mexico, 2008

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

**Master of Science
Dental Hygiene**

The University of New Mexico
Albuquerque, New Mexico

May, 2010

DEDICATION

The journey a student takes when pursuing graduate school takes dedication, hard work and most important the support from many people. In my case I've had numerous people support me since working on my undergraduate degree. I would like to thank God and Maria de Guadalupe for the gift of life and for the guidance I have received throughout the years, for the people they have placed in my path to support me and to guide me so that I could follow my dreams to an extent that I could have never imagined.

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ABSTRACT OF THESIS

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ABSTRACT

This study was intended to measure knowledge change of direct care staff upon administration of an oral health education completed by lecture materials and/or hands on training. The study was an experimental design which included 30 participants from a local agency dedicated to provide services to people with disabilities. The sample consisted originally of two groups of 15 participants each. However, the actual number of participating subjects was 14 in the experimental group and 10 in the control group. Each group was randomly assigned to either a control or an experimental group. No specific criterion was set as to which participant was assigned to each group. The experimental group received a lecture and hands on training for a total of one hour and forty five minutes. The control group received a discussion facilitated by one of the investigators. Both the experimental and control groups received a pre- test and a post test.

Considering all subjects together as a single group, $n=24$, the two sample t-test gave an estimated score difference of 0.05 which was significantly larger than zero (p -

value=0.005), $t= 2.168$, $df= 23$, $p\text{-value}= 0.005$. Overall learning increased between tests. Considering the two groups independently, using a paired t-test to examine the data, the experimental group, $n=14$ had an estimated score difference of 0.0607 ($p\text{-value}=0.01$), $t= 2.645$, $df= 13$, $p\text{-value}= 0.01$, which was a significant improvement. The control group $n=10$, had an estimated score difference of 0.035 ($p\text{-value}=0.14$), $t= 1.172$, $df= 9$, $p\text{-value}= 0.135$, which was not a significant improvement.

This study is beneficial in showing the influence of oral hygiene training for direct care staff who work with people with disabilities. Regardless of gender or education level, anyone providing services to people with disabilities can benefit from oral hygiene training.

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CHAPTER I

INTRODUCTION

Background

Research has shown a link between adequate oral hygiene and systemic health, therefore, the importance of adequate dental hygiene among all populations, including special populations is crucial to overall well being.¹ Because special populations tend to have many oral and systemic health problems, it is necessary to have well prepared and educated direct care staff to understand the oral-systemic link and address their client's oral health needs.¹ The purpose of this study is to ascertain whether oral health training for direct care staff can have an impact on their overall knowledge of oral hygiene for people with disabilities.

Purpose

The purpose of this investigation was important, not only to health professionals, but also to administrators of nursing homes, community based services and state funded facilities to explore the overall education level of direct care staff as well as their input and response to oral health care issues of the persons they care for. It was expected that after receiving training, direct care staff would respond more favorably to oral health concerns, and would have a better understanding of the oral-systemic link and the impact of good or bad oral health could have on special populations.

Statement of the Study

The significance of this study was to explore the knowledge and awareness of direct care staff on the oral-systemic connection and their perception of oral health among people with disabilities.^{7,16}

Significance of the Study

Individuals with developmental disabilities need to have proper care to achieve and maintain adequate oral health.¹⁻⁹ Special populations face many obstacles and limitations to accessing professional oral care.⁹⁻¹² These limitations may include the lack of Medicaid dental benefits, lack of specialized dental professionals and lack of transportation.^{9,12} Due to these limitations, it is extremely important for direct care staff to be well educated on the importance of dental care for the individuals they serve; so that major health complications such as periodontal diseases, dental caries, and complications related to the accumulation of bacterial plaque could be prevented.^{13,14,15,16} Although oral care may sometimes be very difficult or even impossible to perform on some challenging individuals¹, it remains to be the direct care staff's ultimate responsibility to ensure individuals with developmental disabilities are getting the appropriate care they need.² In order for staff to meet their responsibilities, effective training is required to increase their knowledge and skills so that they can deliver and/or assist people with disabilities with their oral hygiene to the appropriate level.¹⁻¹⁶

Research has shown that oral health and systemic health are associated.^{7,16} Providing oral care for special populations is a challenging task, and is one of the most important responsibilities a direct care staff faces on a daily basis.¹⁻¹⁶ In addition, some researchers have concluded that a healthy mouth is a mirror image of the person's general health.^{1,2,7} Persons with developmental disabilities who depend on their direct care staff's ability and knowledge on oral health can be either on advantage or disadvantage depending on the direct care staff's overall education.^{1,2,3,4,7}

The lack of Medicaid funds for dental care, lack of specialized dental providers, and lack of transportation, are among many issues persons with disabilities face when seeking dental treatment.^{9,10,12} In order to alleviate some of the problems special populations face, it

is crucial for direct care staff to be well prepared and aware that by providing meticulous oral care for the people they care for, some of these obstacles can be overcome.¹⁻¹⁶ Even with good oral home care, persons with disabilities may also require restorative dental treatment.¹⁵ Bi-annual dental appointments alone, are insufficient to achieve good oral health among people with disabilities.¹⁵ Perhaps it is thought that the increased educational level of direct care staff will serve as an instrument to provide quality of care to persons with disabilities; which then, will result in less disease and improved quality of life for these individuals.^{3,7} Therefore, direct care staff's understanding of the importance of oral health could be linked to their overall education and training.¹⁻¹⁶

Hypothesis

Is oral hygiene training an effective method to increase direct care staff's knowledge on oral hygiene topics?

Assumptions

- With oral health training, direct care staff will acquire better knowledge on oral health topics.
- Direct care staff receiving the training will be able to initiate oral health programs within their group home to provide better oral hygiene for people with disabilities.
- If training has a positive impact on the knowledge of direct care staff, administrators will hopefully be interested in the implementation of oral health training within their training curriculum to provide better oral hygiene services to the individuals they serve.

Limitations of the Study

- Only direct care staff from one agency were allowed to participate

- Human Research Review Committee (HRRC) limitations on having subjects participate in hands on training/ demonstrations of oral hygiene among themselves.
- The study only measured knowledge change of direct care staff before and after receiving training in oral health instead of measuring clinical ability to remove plaque and provide better oral hygiene to people with disabilities.
- Pre and post-test consisted of 20 basic questions regarding oral health.
- Entry level education of direct care staff of ARCA, in conjunction with number of college degrees acquired by direct care staff was not taken into consideration when designing measuring tools.
- Small sample size of participants taken from the population.
- The time allowed to provide oral hygiene lecture and training was limited to 1.5-2.0 hours.

Key Terms

Consumers, Clients, Individuals, People with disabilities, Persons with disabilities : Used interchangeably to describe people with disabilities living in group homes, nursing homes or the like.

Special Populations: Refers to persons with physical, developmental and intellectual disabilities.

ARCA (Association for Retarded Citizens of Albuquerque): Also referred to as the participating agency. ARCA is an agency that provides services to individuals with physical and developmental disabilities.

Oral Hygiene: The practice of keeping the mouth clean in order to prevent dental caries, gingivitis, periodontitis, halitosis, and other dental disorders.

Periodontal Diseases: Number of inflammatory diseases affecting the supporting structures of teeth. i.e, gingivitis and periodontitis.

Dental Caries: A process where bacterial toxins damage tooth structure.

Systemic health: Overall health of the human body.

Day Hab: Therapeutic centers where people with disabilities spend part of their day receiving therapy and building positive interactions.

Scope of the Study

The study was intended to measure knowledge change of direct care staff upon administration of lecture materials, hands on training, and completion of a pre and post-test. The study was designed to include 30 participants from a local agency dedicated to provide services to people with disabilities. The study followed an experimental design consisting of two groups of 15 participants each. Each group was randomly assigned to either a control or an experimental group. No specific criterion was set as to which participant was assigned to each group.

The study followed a simple format with a basic oral hygiene lecture and hands on training. Unlike other studies, this focused on providing the basic knowledge required to understand oral health without any clinical measurements.

CHAPTER II

LITERATURE REVIEW

Introduction

Several studies have shown that good oral health is important in order to maintain overall systemic health.^{4,7,16} The lack of oral health in persons with developmental disabilities is prevalent and a concern to health professionals.¹⁻¹⁹ The maintenance of oral health of people with developmental disabilities is many times the responsibility of their direct care staff, which in turn results in poor oral hygiene if the direct care staff is not well trained and has insufficient knowledge in oral care.^{1,15} The lack of information on the topic of oral health compromises the consumer's overall systemic health.^{7,16} In addition, it is important to ascertain if oral health knowledge plays a role in the direct care staff's delivery of oral care in regards to their overall educational level.

Studies have recently suggested that educated nurses lack the information and necessary skills to perform oral care duties and provide training to direct care staff and nurse assistants.^{3,6,14} Many nursing programs lack an adequate curricula that address appropriate oral health concerns and effective ways to recognize oral health complications.^{3,6} In group homes for example, nursing staff is overwhelmed with medication passes, physicals, and appointments; while dental examinations are not a priority, or taken care of only when the consumer complains of a specific oral/dental problem.³ Additionally, consumers usually do not express oral problems unless these are severe.^{2,3}

The low salaries of direct care staff leads to an increase in the turnover rate of staff, putting consumers at a higher risk of neglect due to difficulty of training new employees.⁶ Families of persons with disabilities, who choose to take their loved one to a group home or nursing home, expect to see the needs of their loved one to be met. This includes, but is not

limited to good nutrition, appropriate shelter, being treated with dignity, respect, and good dental hygiene.^{2,3,8}

Challenges for Persons with Disabilities to Receive Oral Care

Lack of dental providers

Persons with developmental disabilities face many obstacles when receiving dental services.^{2,9,18} The lack of dental providers is a common issue for the special needs population.^{2,9,10,14} Often times, consumers whose families are economically sound and those who do not require special accommodations, can afford to be seen at a private dental office, if the dentist is willing to accommodate them.^{9,10} However, there are not many private practice offices who work with state agencies, to provide services for special populations.^{9,10} The use of sedation, mechanical restraints and possible need for general anesthesia is another barrier to care for people with disabilities.²¹⁻³⁴

Public Coverage

Current Medicaid/Medicare benefits have limited access to dental services for many individuals.^{9,10} Medicaid usually provides more coverage for children with ages up to 21 years old. A patient 21 years or older may not receive dental coverage because they are usually covered by Medicare, which provides no dental benefits.^{9,10}

Private practice dentists have increased malpractice insurance premiums if they choose to provide continuous services for persons with disabilities.⁹ The reason behind it, is due to the fact that many of these individuals with special needs require sedation in order to keep them from harm to themselves or dental providers during treatment.^{9,21,24,25,33,34}

The use of sedation in dental offices is required sometimes due to maladaptive and disruptive behaviors of many patients with developmental disabilities, who require extensive

treatment or even full mouth rehabilitation. These problems discourage providers to care for people with disabilities due to the high premium increases in their insurance.^{9, 21, 24, 25, 33-39}

In addition, dental staff providing care to persons with disabilities must be well-trained and experienced on the appropriate use of restraints which may have to be used in order to deliver dental care to many of these patients.^{9, 20-28, 30}

Challenging behaviors

Many times, persons with disabilities are neglected from appropriate dental care because of their maladaptive behavior.^{3,9,33,34,36,40} Direct care staff are sometimes afraid to perform any type of oral care.¹ Adequate training is essential for direct care staff to feel confident when providing dental care for the person they care for.¹ Many persons with disabilities have challenging behaviors such as biting, tight muscles of mastication and difficult access to the oral cavity, which makes it difficult for direct care staff to perform any type of oral health care.^{1,33,34} When poor behaviors increase, oral health care becomes a lower priority.^{3,8} In addition, many direct care staff are reluctant to place their fingers in the individual's mouth.³ Others are skeptical to even brush a person's teeth when the consumer exhibits halitosis.^{1,2} Therefore, appropriate intervention and training is crucial in order for direct care staff to have a better understanding of oral health as well as techniques to help them feel more confident in delivery of suitable dental hygiene for people with developmental disabilities.

Direct care staff's education

According to some researchers, direct care staff's overall experience is a predictor of their overall knowledge.¹ It is assumed that the older and more experienced a direct care staff is, the higher their knowledge about oral health.¹ In reality, an older direct care staff may not know more about oral health than a younger one; therefore, age of direct care staff has been

found to not be a predictor of oral health knowledge.³ Direct care staff need to be trained on appropriate techniques of oral hygiene, complications of oral diseases and their relationship to oral health.^{1,6} A study conducted by Frenkel, Harvey, and Needs in 2002, showed that direct care staffs' knowledge were deficient when speaking of denture wear and denture related complications. In addition, direct care staff would stop brushing their consumer's teeth if their gums started bleeding.³ After appropriate oral health training was provided by oral health professionals, direct care staff was more effective at cleaning the consumer's dentures and inserting their fingers inside their consumer's mouth to brush their teeth.^{2,3} However, direct care staff still kept the mentality that they had to stop brushing every time their consumer's gums would bleed.³ In addition, the use of appropriate oral health education was effective to increase the overall knowledge of direct care staff.⁸ According to Frenkel, Harvey, and Needs, knowledge and attitude changes are prerequisites to behavioral change³. It was necessary for the educators to not only increase the direct care staff's knowledge in oral health, but also to help change their attitudes regarding bleeding gums.³

A study conducted by Nicol, Sweeney, McHugh, and Bagg in 2005 regarding the effectiveness of health care worker training on the oral health of elderly residents of nursing homes, showed that oral health training is extremely important for nursing and auxiliary care staff who care for individuals in nursing homes. The investigators found that after training was performed, oral hygiene compliance increased among residents who brushed their own teeth, as well as compliance from care auxiliaries. In addition, since the training performed by the investigators was very comprehensive, encompassing education, hands on training, and most important clinical training directly related to the residents of the nursing facility; it is seen that this was one of the few studies with true positive clinical outcomes. This study is

beneficial to show that appropriate oral health training has positive outcomes among individuals who require special care as well as in nursing and auxiliary care takers.

Awareness of oral health and systemic disease

Overall oral health is crucial in order to achieve systemic health. Research has shown that a healthy mouth is a mirror of the body's health.⁷ Direct care staff should be able to define oral health as the standard which allows an individual to eat, speak or socialize without active disease, embarrassment, or discomfort and which contributes to overall well being.^{2,7} In addition, it is important for direct care staff to be educated and gain understanding that oral health is extremely important for persons with disabilities and the elderly in order to have a successful aging process.^{1,7}

Research has shown a positive link between periodontal diseases (poor oral hygiene) and the incidence of developing pneumonia, diabetes, heart disease, and many more systemic conditions.^{5,12,16} There is also a positive relationship between periodontal diseases and an increase in cholesterol, serum iron, hypertension, white blood cell count among others.^{12,16}

A study conducted in Singapore in 2007 to address the dental awareness of staff in nursing homes, concluded that direct care staff should be given appropriate training in oral health care issues in order to appropriately manage oral health needs of the consumers.^{1,7} In addition, appropriate training empowers direct care staff and improves the likelihood for the direct care staff to deliver quality of care to the consumer they provide services to.

Conclusion

It has been shown that people with disabilities face many challenges when receiving oral health care. However, knowledge and value modification of direct care staff through appropriate oral health training ensures quality of service to people with disabilities. It is in the hands of administrators of group homes, nursing homes, day hubs and other facilities to

increase compliance and knowledge among their direct care staff by including oral health information within their training for new hires in addition to the inclusion within the continuing education for existing employees. There are many aspects of this topic that need further investigation in order to evaluate if well trained direct care staff assimilate oral health as part of their duties and provide superior oral hygiene to persons with developmental disabilities.

CHAPTER III

METHODS AND MATERIALS

Research Design

An experimental design was used for this research project. Randomization was possible by opening enrollment to a sample of 30 employees based on voluntary participation and assigning participants randomly to either group A or group B. Out of the 30 enrolled participants, 4 were dropped from the study or data was not included in the results, and two participant did not show up to the study. After a pre-test and post test were given to both groups; the results of the data were evaluated and a statistical analysis performed.

Hypothesis

Is oral hygiene training an effective method to increase direct care staff's knowledge on oral hygiene topics?

Sample Description

Group A (Experimental): This group consisted originally of 15 direct care staff randomly selected from the 30 participant sample. However, 17 participants showed up to this location.

Group B (Control): This group originally consisted of 15 direct care staff randomly selected from the sample. However, only 11 participants showed up to the study location.

The entry level education for direct care staff of the organization is a minimum of high school diploma or GED; therefore, both group A and group B had a mixed numbers of educational levels among participants.

Procedures

The study was presented to ARCA for consideration three months before HRRC approval. Research investigators, research assistant, and research recruiter competed online

CITI training required by the HRRC office before any research was implemented. After completion of the online training, the research application was submitted for review by research committee then submitted for approval to HRRC. After approval was obtained from HRRC the investigator contacted the health coordinator of ARCA with recruitment materials for their use. The health care coordinator/ recruiter contacted house managers and social workers of ARCA Intercare by e-mail to announce at their weekly staff meetings an opportunity to participate in a research study for the direct care staff. Volunteer enrollment was then opened for those who wished to participate. 30 slots were available on a first come first serve basis. Once these slots were filled, enrollment was closed.

Random assignment of the research subjects to one of two sites was completed by the health coordinator/recruiter of ARCA. Randomization was achieved by open phone calls for enrollment. The first caller was assigned to either group A or group B; the second caller was assigned to the other group, opposite from caller number one. Equal opportunity was given to both, male and female direct care staff to participate. Participation was announced to be voluntary and participants were not penalized for withdrawing from the study. Exclusion criteria were set to only allow direct care staff from ARCA to participate in the study; a direct care staff from an agency other than ARCA was not considered for the study.

- Consent forms were distributed and read aloud to all participants at the beginning of the education seminar. Consent forms were available in both English and Spanish and both were approved by HRRC. The study was expected to cause no harm and was intended to educate and improve understanding of oral health among direct care staff.
- Participants were not identified by name. Participants were identified by ID number. The researcher assigned ID number to each participant after the consent forms were

collected in both group A and B. The participating agency did not receive details on how each participant performed on pre or post test. ARCA only received an overall result of the training without disclosing any ID numbers by the investigator so that no possible association could be made with any subjects.

Subjects

- Group A (Experimental): consisted originally of (n= 15) direct care staff randomly selected from the 30 participant's sample. However, 17 participants showed up to the study in this location. Out of the 17 participants, two showed up to the wrong site and data collected from them was thrown out. Another participant in this group left the study early before the post-test was given and was dropped from the study. The total number of participants in this group was 14 from which data was collected. This group met in location A to receive the seminar training and pre-post tests, which were given before and after the training. Pre and post-tests were administered and answered individually by direct care staff from this group. After the Pre- test was given, a 90 minute lecture training seminar was presented. The seminar entitled "Oral Hygiene Training for Direct Care Staff" covered basic topics in oral health for people with developmental disabilities including tooth brushing techniques, plaque removal, progression of periodontal disease, and proper positioning techniques to brush the teeth of people with disabilities. The purpose for the class was to enhance the knowledge of direct care staff in oral health and the importance of it in relation to overall systemic health. After completion of the course, a 15 minute hands on training on oral hygiene and positioning techniques was given. At the end of both trainings, a

post- test was given to assess any changes in understanding of basic oral health and knowledge acquisition.

- Group B (Control): This group originally consisted of (n=15) direct care staff randomly selected from the sample. Two participants showed up to location A and two participants withdrew from the study. 11 participants presented to this study location. Out of the 11 participants, data collected was not used from one participant due to the pre-post test not being filled out correctly. Therefore, total number of participants used in this group was 10. This group met in location B to receive pre-post test 40 minutes apart from each other. Group B did not receive either the lecture or the hands on training. Group B was allowed to discuss for 30 minutes any oral health subjects they had knowledge of. The discussion in group B was facilitated by one of the investigators, however, the investigator did not provide any dental knowledge. After the 30 minute discussion a post-test was administered to compare and assess any changes from the pre-test.
- The rationale for having the groups meet at two different locations at the same time was to avoid confounders of communication among the two groups that will bias the end result of the study.
- Dental Hygiene student(s) from the University of New Mexico were used to collaborate as research assistant(s). The role of the research assistant was to distribute and to read consent forms to group A. In addition, the assistant collaborated with researcher in the study group during the lecture and hands on training in location A. In location B, another researcher was the responsible of administering consent forms, the pre-post test, and facilitation of the discussion to Group B.

Outcome Measures/Instruments

- Pre-Post test design: The purpose of the pre-post tests was to assess the effectiveness of educational seminar and oral hygiene discussion and its impact on direct-care staff's overall oral health knowledge. Two different tests were created, A and B, and were administered at random to eliminate a "learning effect" from taking the same test twice. The pre-post tests consisted of 20 questions regarding oral hygiene, 15 true/false and 5 multiple choice. Although pre and post-test had same number of questions, the questions were not identical on questionnaire A and questionnaire B.
- Half of the participants received test A and half received test B at the beginning, following a sequence (ABABAB), then, the participants who received test A at the beginning received test B at the end following a sequence (BABABA). Tests were assigned ID numbers that corresponded to the ID number of the participant. Scores were recorded using a scantron machine and the score from the pre-test was subtracted from the score of the post- test. The rationale for subtracting the pre test from the post test score was to assess a difference between the two scores and show knowledge change, if any.
- The Pre-Post test also included a question in relation to the participant's educational level and gender.

Data Collection Procedures

An intervention was conducted to test the efficacy of oral hygiene training for direct care staff who work with people with disabilities on knowledge of oral health. A convenience sample of 30 direct care staff from the population of ARCA was randomly assigned to either the experimental group or the control group. The final sample consisted of

n=24 subjects, n=14 subjects for the experimental group and n=10 subjects for the control group. The overall sample consisted of 8 males and 16 females. The educational level ranged from high school graduates to college education. First, the subjects within both groups randomly received one of two tests to assess their knowledge about oral health topics. Then, the experimental group received a 90 minute lecture and 15 minute hands on training in relation to oral hygiene and simple positioning techniques to brush, floss, and the like. Alternatively, the control group had a 30 minute discussion facilitated by a researcher. Finally, each subject was given the alternate post-test to assess their knowledge. The range of the scores was from 0-20 depending on direct care staff's initial knowledge on pre-test and knowledge gained by the training or discussion on the post-test. The proportion of the scores was used to analyze the data collected.

Data Analysis

A two-sample t-test and regressions were used to test whether the educational seminar was responsible for more knowledge as assessed by the difference of the pre-test from the post-test. A one-sample t-test was used to test whether the mean for a normally distributed population is equal to zero or is different from zero. Specifically, it was looked to see whether the mean difference from the pre-test to post-test for the subjects tested (μ) is greater than zero, indicating an improvement. Formally, the null hypothesis is tested, $H_0: \mu = 0$, versus the alternative hypothesis, $H_1: \mu > 0$. It was assumed the null hypothesis was true unless sufficient evidence warrants rejection of the null in favor of the alternative, determined by the p-value of the test being less than chosen type-I error rate $\alpha=0.05$.

CHAPTER IV

RESULTS

Considering all subjects together as a single group, $n=24$, the two sample t-test gave an estimated score difference of 0.05 which is significantly larger than zero ($p\text{-value}=0.005$), $t= 2.168$, $df= 23$, $p\text{-value}= 0.005$. It was concluded that overall learning increased between tests. Considering the two groups independently, using a paired t-test to examine the data, the experimental group, $n=14$ had an estimated score difference of 0.0607 ($p\text{-value}=0.01$), $t= 2.645$, $df= 13$, $p\text{-value}= 0.01$, which is indicative of a significant improvement. The control group $n=10$, had an estimated score difference of 0.035 ($p\text{-value}=0.14$), $t= 1.172$, $df= 9$, $p\text{-value}= 0.135$, which is not a significant improvement. Note that both groups show an improvement based on their mean, but the sample sizes are small enough that there is simply not enough evidence to say whether the control group actually improved or not.

In addition, the multiple regression analysis yield no significant interactions between the variables (gender and education level) in comparison to oral hygiene knowledge, with $F\text{-statistic}= 1.002$ on 3 and 16 df , $p\text{-value}= 0.417$.

The data in Table 1 and

Table 2, shows the group assignment (experimental or control), randomly assigned ID number, gender, education level, pre-test results, post-test results, which test (A or B) was taken as the pre-test, and score difference between the two tests. A numerical summary of the score differences are also shown in Table 1 and

Table 2. A plot of the distributions of score differences for the two groups combined is shown in Figure 1 and groups separate in Figure 2.

Table 1. Control Group Results

NUMBER	GENDER	EDUCATIONAL LEVEL	PRE-TEST NUMBER	PRE- TEST RESULTS	POST - TEST NUMBER	POST -TEST RESULTS	SCORE DIFFERENCE
09-456- 1B	M	COLLEGE	A	18	B	18	0
09-456- 2B	M	HIGH SCHOOL	B	18	A	18	0
09-456- 3B	M		A	12	B	15	3
09-456- 4B	M	COLLEGE	B	18	A	17	-1
09-456- 5B	F	HIGH SCHOOL	A	16	B	19	3
09-456- 6B			B	17	A	17	0
09-456- 7B			A	18	B	19	1
09-456- 8B	F	COLLEGE	B	16	A	18	2
09-456- 9B	F	HIGH SCHOOL	A	18	B	20	2
09-456- 10B	F	HIGH SCHOOL	B	19	A	16	-3

* 09-456- 11B was not read by scantron; therefore results were not included.

Table 2. Experimental Group Results

NUMBER	GENDER	EDUCATIONAL LEVEL	PRE-TEST NUMBER	PRE- TEST RESULTS	POST - TEST NUMBER	POST - TEST RESULTS	SCORE DIFFERENCE
09-456- 1A	M		B	19	A	20	1
09-456- 2A	F	HIGH SCHOOL	A	16	B	17	1
09-456- 3A	F	HIGH SCHOOL	B	9	A	12	3
09-456- 4A	F	COLLEGE	A	19	B	19	0
09-456- 7A	F	HIGH SCHOOL	B	20	A	19	-1
09-456- 8A	M	COLLEGE	A	18	B	19	1
09-456- 9A	M	HIGH SCHOOL	B	19	A	19	0
09-456- 10A	F	HIGH SCHOOL	A	13	B	19	6
09-456- 11A	F	HIGH SCHOOL	B	17	A	18	1
09-456- 12A	F	COLLEGE	A	18	B	19	1
09-456- 14A	F	HIGH SCHOOL	A	17	B	19	2
09-456- 15A	M	COLLEGE	B	18	A	18	0
09-456- 16A	F	HIGH SCHOOL	A	18	B	20	2
09-456- 17A	F	COLLEGE	A	18	B	18	0

* 09-456- 5A and 09-456- 13A were not from this sample, therefore data was not used. 09-456- 6A withdrew from the study before completion of post-test

The results of the study reject the null hypothesis $H_0: \mu = 0$, and favor the alternative hypothesis $H_1: \mu > 0$. We conclude that there is enough evidence to show that the significance level was reached when calculating the two groups together with a p-value=0.005 and when testing the experimental group alone with a p-value=0.01. Both groups show an increase in scores, while the experimental group shows almost twice the increase as the control group (0.061 vs 0.035). The standard deviation of both of these groups

is fairly large (around 0.09). This is shown in Figure 2 where the two distributions overlap substantially.

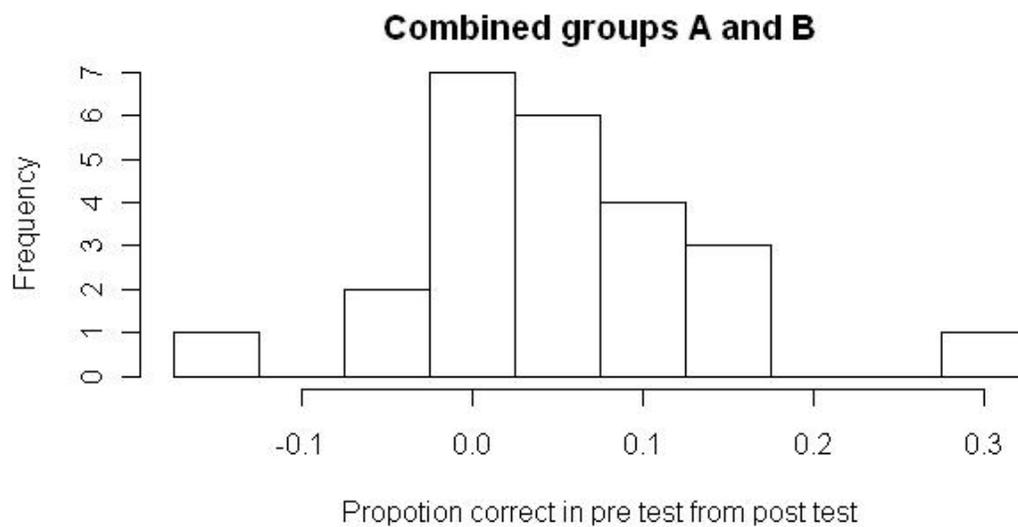


Figure 1. Plot of the Distribution of Score Differences of the Two Groups Combined

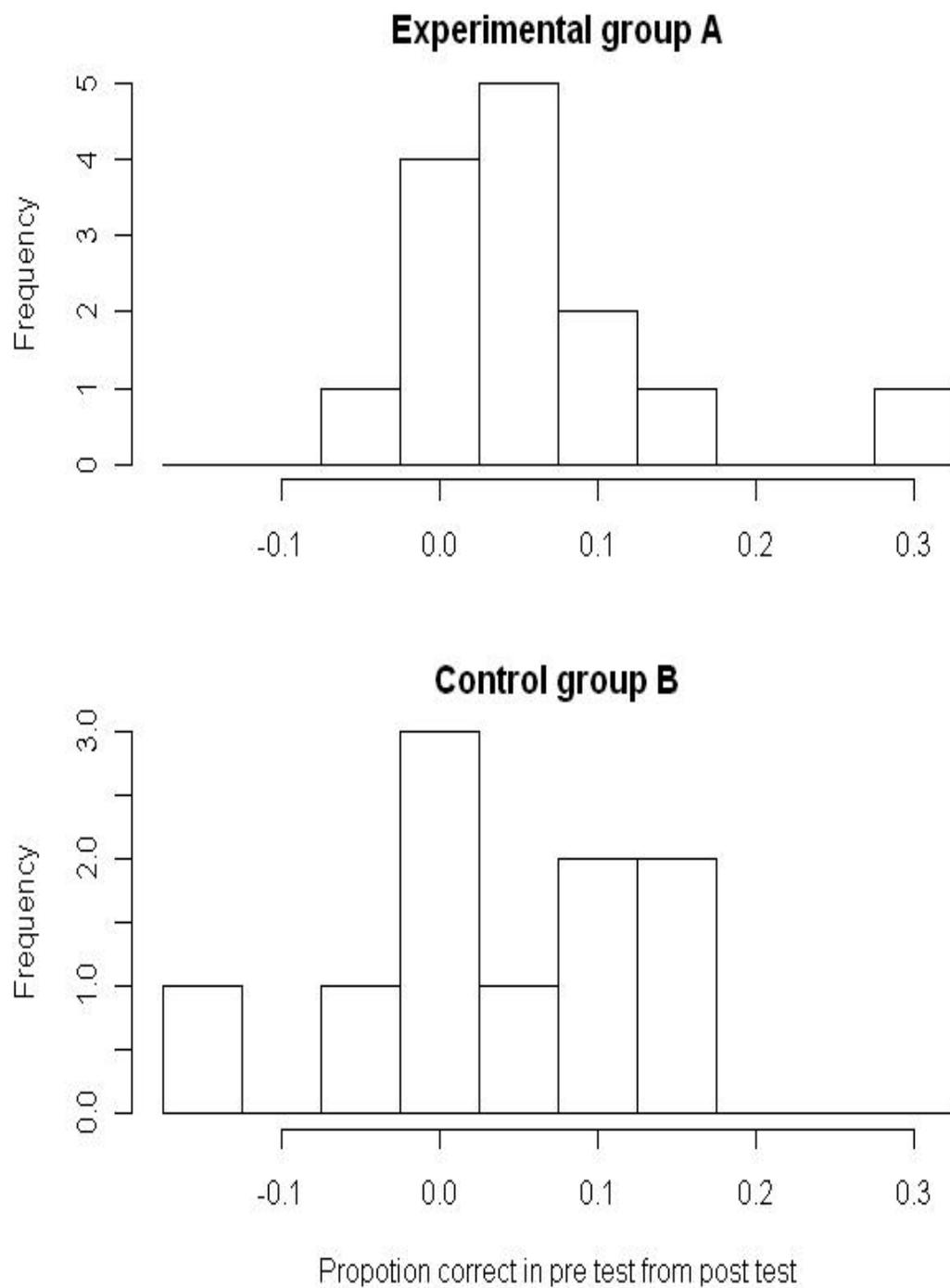


Figure 2. Plot of Score Differences of Each Group

Table 3 shows the statistics obtained for group A, B and the two groups combined in terms of sample size (n), mean (M), standard deviation (SD), median (MDN), minimum and maximum score obtained from the difference of pre and post- test, and p-value.

Table 3. Statistics for Groups A and B

GROUP	n	M	SD	MDN	MIN SCORE	MAX SCORE	P-value
Combined	24	0.050	0.088	0.050	-0.15	0.30	0.005**
Group A	14	0.061	0.086	0.050	-0.05	0.30	0.01**
Group B	10	0.035	0.094	0.025	-0.15	0.15	0.14

p-value significant at $\alpha= 0.05^*$, 0.01^{} , 0.001^{***}**

CHAPTER V

DISCUSSION

Principal Findings

The goal of the study was to assess if oral hygiene training for direct care staff was an effective method to improve knowledge in different oral health topics related to people with disabilities. The findings of the study support the research hypothesis by statistical significance at the type-I error rate $\alpha=0.05$ and contribute to the results of many studies indicating the need for better training for direct care staff who work with people with disabilities, as shown in Table 3. Resultant statistics for groups A and B clearly showed a significant improvement from pre-test to post-test in group A using a paired t-test with a mean of 0.061 and SD of 0.086 and p-value of 0.01 compared to group B which had a mean of 0.035 and SD of 0.094 and p-value of 0.14. These results showed that the lecture and hands on training were more effective than the discussion among direct care staff to teach oral hygiene and allow the acquisition of new concepts by direct care staff. Since both groups showed some improvement from pre and post test, a two sample t-test showed significant improvement from pre-test to post-test with a mean of 0.050 and SD of 0.088 and p-value of 0.005; indicating that both control and experimental group had gained some knowledge from the intervention and discussion.

It is probable that the results of the present study will help promote the initiation of oral health training by agencies that provide services to people with disabilities, geriatric patients, and other populations in need of well trained caregivers in the area of oral health to sustain adequate oral health practices within the agencies.

In addition, the study revealed that there was no significance by gender and education level of direct care staff. Both control and experimental groups performed equally well in the

pre-test regardless of gender and education level. This observation, served to take into consideration that, neither gender nor education level are good predictors of overall oral health knowledge among direct care staff who care for people with disabilities.

Limitations

There are some limitations of the present study that could have an impact in the findings, interpretation, and implications. The overall knowledge of direct care staff on oral health was found to be more advanced than it was anticipated by the investigator. Participants had at least a high school diploma and many of them had some type of college education. As it was explained before, education did not play a role in the overall result of the investigation. However, since the investigator was expecting some lack of oral health knowledge among direct care staff, the measuring tools were designed to assess very basic to no knowledge in oral health topics. It was expected to obtain low scores; however, on the pre-test both control and experimental groups scored quite high. Given that both groups scored high on the pre-test, there was not a lot of room for improvement on the post-test since both pre and post-tests were limited to twenty questions.

In addition, both the control group and experimental group were found to have some problems understanding the appropriate method to record their answers on the answer sheet. Furthermore, some participants were confused as to which location they were supposed to attend. The confusion ended up with a lack of participants on the control group and extra participants on the experimental group. Total sample size was thought to consist of $n=30$. At least two participants did not sign the consent forms and data collected were not used in the study. Two other participants did not show up to either location. One participant withdrew from the study because of time constraints ten minutes before the end of the study. Data collected from at least one participant were not used due to lack of understanding on how to

appropriately record answers; therefore, could not be evaluated. After all adjustments were made, participants samples consisted of n=14 for experimental group and n=10 for control group.

It is reported that participants in group B were expecting the facilitator to lead the discussion at all times. Some participants in control group were well educated on oral health; therefore, those who did not have much knowledge in oral health definitely gained and benefited from the discussion. It was also noted by the investigator that participants in this group were working together and sharing answers when they were taking the pre and post-test.

On the other hand, participants assigned to the experimental group received both the lecture and hands on training. The investigator in this group also noticed participants sitting in groups at the beginning of the study. Once the participants were assigned the ID number the investigator asked the participants to regroup according to their ID from number 1 to number 17.

By doing this random assignment of ID numbers to the experimental group, the investigator was able to break down the small groups of participants, thus gaining everyone's attention and preventing the problem noted in the control group. Participants answered pre and post- test individually and there were no problems with small group discussions and sharing of answers. It would have been beneficial to follow the same procedure for the participants in the control group.

This study was well received by ARCA. The willingness to participate and pay for their employees' time made this study a success. After the study was concluded, the agency expressed interest in continuing with a program similar like the one used by the investigator. The investigator was glad to assist the agency in developing a program that could be used as

an ongoing training for new employees and continuing training for current employees. The program consisted of a lecture and hands on training included within their training for new hires. The investigator trained one of the trainers to continue the program. In addition, collaboration between The University of New Mexico Division of Dental Hygiene and ARCA serve to utilize dental hygiene students to provide training in group homes in addition to the education given by the training department of ARCA.

CHAPTER VI

CONCLUSION

It appears this study was beneficial to show the influence of oral hygiene training for direct care staff who work with people with disabilities. Regardless of gender and education level, anyone providing services to people with disabilities can benefit from oral hygiene training. The results of the study support the use of lecture and hands on training to teach oral hygiene to direct care staff as more effective than having a discussion on different oral health topics. The intention of the study was to measure oral health knowledge of direct care staff before and after receiving an intervention. A more robust study is needed to not only measure knowledge change before and after an intervention but also to measure the effectiveness of the training by assessing clinical findings on the residents served by the direct care staff who receive the training.

CHAPTER VII**APPENDICES****APPENDIX A- APPROVAL LETTER****APPENDIX B- TEST A****APPENDIX C- TEST B****APPENDIX D- LECTURE MATERIAL****APPENDIX E- LECTURE POWER POINT****APPENDIX F- HANDS-ON TRAINING POWER POINT****APPENDIX G- SUPPORT LETTER****APPENDIX H- RECRUITMENT E-MAIL****APPENDIX I- CONSENT FORM, ENGLISH VERSION****APPENDIX J- CONSENT FORM, SPANISH VERSION****APPENDIX K- TABLES, FIGURES, AND GRAPHS OF RAW SCORES****APPENDIX L- STATISTICAL ANALYSIS**

APPENDIX A
HRRC APPROVAL LETTER



THE UNIVERSITY OF NEW MEXICO
HEALTH SCIENCES CENTER

Human Research Review Committee
MSC 08 4560 BMSB Room B71
1 University of New Mexico~Albuquerque, NM 87131-0001
(505) 272-1129 Facsimile (505) 272-0803
<http://hsc.unm.edu/som/research/hrrc/>

02-Apr-2010

Sanchez-Dils, Elaine, RDH, MA
Surgery Dental Hygiene

SUBJECT: HRRC Approval of Research - Amendment
Project Title: Training the Trainer: Disabilities and Dental Hygiene
HRRC#: 09-456
Type of Review: Expedited Review
Approval Date: 02-Apr-2010
Expiration Date: 16-Oct-2010

Dear Dr. Sanchez-Dils:

The Human Research Review Committee (HRRC) has approved* the above mentioned research protocol action based on review of the following:

Request for Minor Changes form received 3/24/10
to change the the study title from "Oral Hygiene Training for Direct Care Staff who Work with People with Disabilities" to new title of "Training the Trainer: Disabilities and Dental Hygiene"

Protocol Received 3/24/10
UNM HSC Combined Consent/ HIPAA form version 3/24/10
UNM HSC Spanish Short form version 3/24/10
Recruitment Letter received 3/24/10

Consent Decision:
Amended consent(s) attached.

This study is approved to enroll only the number of subjects listed in the application, current protocol and consent form(s). If the PI wants to enroll additional subjects, it is the responsibility of the PI to submit an Amendment/Change to the HRRC before the approved number of enrolled subjects is exceeded. If increased enrollment is requested the application, protocol and/or consent form(s) must also be amended to include the new target.

When consent is required, it is the responsibility of the Principal Investigator (PI) to ensure that ethical and legal informed consent has been obtained from all research participants. A date stamped original of the HRRC approved consent form(s) is attached to this correspondence, and copies should be used for

consenting participants during the above noted approval period. If HIPAA Authorization is required, the HIPAA Authorization version noted above should be signed in conjunction with the consent form.

Sincerely,



Mark Holdsworth, PharmD
Executive Chair
Human Research Review Committee

* Under the provisions of this institution's Federal Wide Assurance (FWA00003255), the HRRC has determined that this proposal provides adequate safeguards for protecting the rights and welfare of the subjects involved in the study and is in compliance with HHS Regulations (45 CFR 46), FDA Regulations (21 CFR 50, 56).

APPENDIX B

TEST A

ORAL HIGIENE TRAINING FOR DIRECT CARE STAFF
QUESTIONNAIRE

A

ID# : _____

Sex: Male_____ Female_____

What is your highest level of education?

Elementary school_____ Middle school_____ High school or GED_____

College : Bachelors_____ Masters _____ Doctorate_____

PLEASE ANSWER THE FOLLOWING QUESTIONS. CHOOSE ONLY ONE ANSWER FOR EACH QUESTION.

1. Oral hygiene is very important for the overall well being of people with disabilities
 - a. True
 - b. false
2. A healthy mouth could reflect overall health.
 - a. True
 - b. False
3. An individual's self esteem may be improved by:
 - a. good oral hygiene
 - b. the ability to eat,
 - c. the ability to speak clearly and socialize
 - d. all of the above
4. What is the approximate amount of time it should take a caregiver to brush the teeth of a person with disabilities?
 - a. 1minute
 - b. 2 minutes
 - c. 5 minutes
 - d. None of the above
5. It is recommended by dental professionals to brush at least
 - a. 2 times per week
 - b. 2 times per day
 - c. Once a day
 - d. Once a week
6. The time recommended to brush the teeth of people with disabilities is before bedtime and in the morning.
 - a. True
 - b. False

7. It is not necessary to brush an individual's teeth after medication has been taken because medications cause no harm to teeth.
 - a. True
 - b. False
8. The place to brush someone's teeth is:
 - a. The living room
 - b. The bathroom
 - c. Where the individual feels more comfortable
 - d. All of the above
9. One should assure enough lighting is available to brush an individual's teeth effectively
 - a. True
 - b. False
10. Toothpaste is not necessary to brush someone's teeth?
 - a. True
 - b. False
11. Ensure and thick it could cause cavities because they
 - a. Stay in contact with the tooth for a long time
 - b. Are the best method to help a person stay healthy
 - c. Have a high sugar content
 - d. Both A and C
12. It is very important for a person with disabilities to have an individualized oral hygiene plan in their daily living.
 - a. True
 - b. False
13. Flossing is not necessary for a person with disabilities.
 - a. True
 - b. False
14. When gums bleed it is important to stop brushing
 - a. True
 - b. False
15. Bleeding gums could be a sign of inflammation, poor oral hygiene, and gingivitis.
 - a. True
 - b. False
16. The "tell-show-do" technique could be utilized to help an individual understand a procedure like tooth brushing.
 - a. True
 - b. False

17. Positive reinforcement should never be used to praise good behavior when performing oral hygiene.
- True
 - False
18. Giving candy is a good way to show an individual he/she is doing a good job.
- True
 - False
19. Smoking and high sugar consumption among people with disabilities deteriorates their oral and systemic health.
- True
 - False
20. Regular dental appointments are not necessary to maintain oral health among people with disabilities.
- True
 - False

APPENDIX C

TEST B

ORAL HIGIENE TRAINING FOR DIRECT CARE STAFF
QUESTIONNAIRE
B

ID# : _____

Sex: Male_____ Female_____

What is your highest level of education?

Elementary school_____ Middle school_____ High school or GED_____

College : Bachelors_____ Masters _____ Doctorate_____

PLEASE ANSWER THE FOLLOWING QUESTIONS. CHOOSE ONLY ONE ANSWER FOR EACH QUESTION.

1. Oral hygiene is a difficult task to perform on people with developmental disabilities, especially those with challenging behaviors.
 - a. True
 - b. false
2. Dentures need to be removed every night before bed.
 - a. True
 - b. False
3. It is recommended by dental professionals to use sponges to brush teeth instead of a toothbrush.
 - a. True
 - b. False
4. Dentures should not be brushed everyday because:
 - a. The toothbrush scratches the material
 - b. It is not necessary to clean dentures
 - c. Dentures are fake teeth and it is not important to clean them
 - d. None of the above
5. A soft bristled toothbrush is recommended to brush teeth.
 - a. True
 - b. False
6. Giving candy is not a good way to show an individual he/she is doing a good job.
 - a. True
 - b. False
7. It is very important to clean dentures on a daily basis to remove food and accumulated plaque.
 - a. True
 - b. False

8. It is very important to brush an individual's teeth after medication has been taken because medications could cause caries due to sugar content.
 - a. True
 - b. False
9. The place for caregivers to brush their client's dentures is:
 - a. The living room
 - b. The bathroom
 - c. The kitchen
 - d. All of the above
10. It is ok to use supportive techniques to aide a person with disabilities to brush their teeth appropriately
 - a. True
 - b. False
11. It is advised to brush someone's teeth after medications have been taken because:
 - a. Some medicine is rich in sugars
 - b. Sugar in medicine could cause cavities
 - c. Brushing removes the sugar contents in the teeth and decreases likelihood of developing cavities
 - d. All of the above
12. Ensure is loaded with sugars and it could cause cavities
 - a. True
 - b. False
13. Smoking and high sugar consumption among people with disabilities deteriorates their overall oral and systemic health.
 - a. True
 - b. False
14. The use of a soft foam mouth prop could be used to:
 - a. Support a person's mouth open
 - b. Effectively gain access to the mouth to brush better
 - c. Improve visibility of a caregiver when brushing an individual's teeth
 - d. All of the above
15. Bleeding gums are most of the time a sign of inflammation and poor oral hygiene. It is important to continue to brush even if the gums are bleeding for a few days
 - a. True
 - b. False
16. Dipping a toothbrush in plain water or in mouthwash is acceptable to brush someone's teeth.
 - a. True
 - b. False

17. If gum disease is not treated by improved oral hygiene in addition to regular dental appointments, a person could develop complications that could lead to bone and tooth loss.
- True
 - False
18. Positive reinforcement could be used to:
- Gain compliance
 - Show an individual he/she is doing a good job
 - Positive reinforcement is not good
 - Both A and B are correct
19. Regular dental appointments brushing twice a day and flossing once a day are necessary to maintain oral health among people with disabilities.
- True
 - False
20. The “tell-show-do” technique could be utilized to help an individual understand a procedure like flossing and tooth brushing.
- True
 - False

APPENDIX D
LECTURE MATERIAL

ORAL HYGIENE TRAINING FOR PEOPLE WITH DISABILITIES

LECTURE

INTRODUCTION

Considering the link between oral health and total health, optimum dental hygiene is crucial for people's well being; even more so among populations with systemic conditions and people with physical, mental and developmental disabilities.

Providing oral hygiene care for some individuals is a challenging task. However, it is important to understand that individuals with developmental disabilities deserve to not only be treated with **dignity and respect**, but also, to receive **appropriate health care** which includes oral hygiene. Adequate oral hygiene is important for people with disabilities due to the fact that a healthy mouth reflects the overall well being of the human body. A healthy mouth allows individuals to **eat, speak, socialize, and most important to feel good about themselves.**

HOW LONG DOES IT TAKE TO PERFORM ORAL HYGIENE?

It would only take about 6 minutes of your time to provide oral hygiene to the individuals you care for; **2-3 minutes for brushing and 2-3 minutes for flossing.** By performing these tasks consistently on a daily basis, you could be preventing many oral and systemic complications in addition to improving your client's overall health and self esteem.

WHERE AND WHEN SHOULD I BRUSH MY CLIENT'S TEETH?

It is important to brush your client's teeth at least **2 times per day for 2 minutes each time.** Dental professionals usually recommend to brush once in the morning and once before bed time, however, when working with a challenging individual it is very important to **assess the time of day** your client cooperates better in order to brush and floss effectively.

Another important aspect to keep in mind is to **brush after medications** have been given. There are many medications that have high contents of sugar which could be very damaging to your client's teeth. In addition, in group homes many times the use of sugary **dietary supplements** like **ensure and methods to thicken liquids** for people with swallowing deficit puts individual's teeth in danger of developing tooth decay if direct care staff fails to brush their teeth right after ensure or thick it have been consumed.

CAN I USE SPONGES TO BRUSH INSTEAD OF A TOOTHBRUSH

Even though sponges are sometimes used in hospitals, this are not recommended to be used instead of a toothbrush. Sponges don't really remove plaque effectively compared to the toothbrush. Sponges might be used to aid in the removal of food pouches from an individual's cheek; however, the most appropriate way to remove plaque from the teeth and gums is by brushing with a soft bristled toothbrush.

Place to brush teeth

The place to brush your client's teeth should be where your client feels **comfortable**. The bathroom is recommended, but not strictly necessary. If your client feels better by having his/her teeth brushed and flossed in the bedroom or living room then it is ok to brush teeth in the living room or the bedroom. There is not set place to perform oral hygiene and **privacy is not a concern** by brushing teeth in the living room. **Enough lighting** must be available to see well inside your client's mouth.

Each and every individual should have an **individualized oral hygiene** plan developed in conjunction with a dental professional.

DO I NEED TO FLOSS MY CLIENT'S TEETH?

Yes, teeth should be flossed **at least once a day**. The time of the day is not important as long as your client gets his teeth flossed. If behavior is a problem, it is important to note that on the client's notes so that the issue is addressed on your individual's next dental visit by your dental professional.

MY CLIENTS GUMS BLEED WHEN I BRUSH OR FLOSS... SHOULD I STOP BRUSHING IF BLEEDING OCCURS?

NOT AT ALL, when there is inflammation and infection in someone's gums, bleeding is likely to occur upon any stimulus, especially brushing and flossing. If bleeding is noted while you are brushing your client's teeth, continue to brush gently as recommended. Bleeding should stop after a week or two if you are consistent with your client's oral hygiene. As your client's gums start to heal and inflammation decreases, bleeding will decrease and/or stop.

Bleeding gums are **usually a sign of gingivitis** and it only requires **improved oral hygiene** to heal. Gingivitis is inflammation of the gums due to increase amounts of undisturbed plaque buildup and poor oral hygiene. Brushing and flossing alone are the best method to care for the problem.

If you are brushing and flossing your client's teeth as recommended and bleeding persists for more than 7-10 days contact your dental professional for advice and a dental

consultation. In addition, if your client is experiencing oral pain please contact your dental professional as soon as possible.

WHAT CAN I DO IF MY CLIENT IS DIFFICULT TO BRUSH AND FLOSS

First of all, make sure you and your client will be safe if you are going to perform any type of oral hygiene on him/her. Dealing with an individual with challenging behaviors is the greatest concern especially if you are not very familiar with your client. If you are new working with the individual make sure another caregiver helps you to brush your client's teeth until your client has become familiar with you and the oral hygiene procedures.

Many times it is very helpful to utilize techniques like the “**tell-show-do**” approach in order for your client to understand and see what it is going to be done. It is important to start slow and be patient with your client. Introduce the toothbrush, explain what it does and show how to do it, then it may be helpful to hand it in to your client and ask him/her to show you how to do it. Continue with the floss and follow the same technique. As the procedure becomes familiar it is expected that more cooperation will be gained from your client. The key words are to be consistent over and over again. If behavior is a problem, it may be necessary to ask a co-worker for assistance.

It is always good to give **positive reinforcement** to your client for the procedures he/she is doing well. In addition, many individuals with disabilities like to follow **routines**, especially children and adults with Autism; therefore, setting a routine and place where your client is relaxed could be very comforting and help to decrease behavioral concerns.

DO I NEED TO TAKE MY CLIENT TO DENTAL APPOINTMENTS REGULARLY?

ABSOLUTELY; you should make sure your client visits his/her dental hygienist at least 2 times per year. Often visits to your client's dental professional along with optimum oral hygiene at home help your client have a healthy life. Every six month visits to the dental hygienist are recommended; however, many times your client's dental professional may recommend a tighter recall in order to ensure your client's oral hygiene is under control. It is also important to have a yearly dental exam by your dentist and dental hygienist.

WHAT DO I DO IF MY CLIENT HAS FALSE TEETH

It is important to teach you client to **remove the dentures every night** before bedtime. If the client is capable of brushing his own dentures then guide him/her through the process. If the client is unable, it is important that you brush your client's dentures every night. You can use regular toothpaste or no toothpaste at all to brush them. It is important to note that **no bleach** or other cleaning solution should be used to clean dentures since the material is delicate and may be damaged easily.

It is also important to note that to **prevent damage**; you should always **line up the sink with towels** to protect the dentures in case you drop them on the sink. After the dentures have been brushed, make sure you put them in denture solution or in water to soak overnight.

MY CLIENT'S JAW GETS TIRED EASILY WHEN I AM BRUSHING HIS/HER TEETH

Many people have jaw problems or it is difficult for them to hold their mouth open for a long period of time. In order to effectively brush your client's teeth you need to clearly see into the mouth which is hard if the individual cannot hold his/her mouth open. To better assist your client with his oral hygiene, it is recommended that you use a soft mouth prop approved by the organization where you work. A soft mouth prop serves as a supportive device to help your client stay open and to assist you to provide appropriate oral hygiene.

SHOULD I PRAISE MY CLIENT WITH SWEETS WHEN HE/SHE DOES WELL

NO. Praising your client with sweets, cokes or cigarettes is not recommended. You may be getting compliance but you are not helping improve your client's oral and systemic health by praising good behavior with unhealthy habits like candy, cokes and cigarettes. These not only deteriorate your client's oral health by increasing the likelihood of developing caries and gum disease, but also deteriorate your client's overall systemic health by increasing the likelihood of developing diabetes and heart disease.

Healthy Rewards:

If you really need to offer candy, choose sugar free gum or candy.

Sodas have a high content of acid and are not recommended even if they are sugar free or ZERO.

Healthy snacks like vegetables and fresh fruit are always a nice treat.

A nice reward to reinforce positive behavior is taking your client for a ride or a walk. Many individuals enjoy going out and usually will cooperate with oral hygiene if you take them out afterwards.

There are many other things you could try, just be creative and always look to your client's well being; after all you are the best advocate and friend they could ever have to care for their overall health.

APPENDIX E
LECTURE POWER POINT

ORAL HYGIENE TRAINING FOR DIRECT CARE STAFF

PRESENTED BY: ELMER E. GONZALEZ, RDH, BS, BA.
UNIVERSITY OF NEW MEXICO
SCHOOL OF MEDICINE
DIVISION OF DENTAL HYGIENE

BACKGROUND

- Optimum oral hygiene is crucial for people's well being
- Oral hygiene could be challenging on some individuals
- A healthy mouth reflects the overall well being of the human body

HOW LONG DOES IT TAKE TO PERFORM ORAL HYGIENE?

- In general, it takes approximately 6 minutes for a direct care staff to provide oral hygiene.



TOOLS....



WHERE AND WHEN SHOULD I BRUSH MY CLIENT'S TEETH

- Very important to brush at least two times a day for two minutes each time.
- It is recommended to brush once in the morning and once before bedtime.

- FOR AN INDIVIDUAL WITH DISABILITIES, MANY TIMES IT IS RECOMMENDED TO BRUSH MORE THAN TWICE A DAY.
- IT IS IMPORTANT TO RECOGNIZE THE TIME OF DAY TO GAIN BETTER COMPLIANCE.

- BRUSH AFTER MEDICATIONS HAVE BEEN GIVEN.



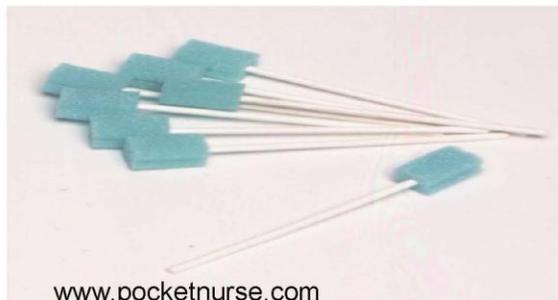
- Brush after Thick it, Ensure or other sugary liquids that stay in contact with teeth have been consumed.



- The consequence of not brushing and flossing is poor oral hygiene.
- Gum diseases
- Cavities
- Bone loss
- Tooth loss

COULD I USE A SPONGE TO BRUSH

- Many hospitals use sponges to clean their patient's gums
- Some therapists recommend the use of sponges



- Sponges **are not** recommended by most dental professionals.

LOCATION TO BRUSH TEETH...

IS THE BATHROOM THE
ONLY PLACE
RECOMMENDED TO
BRUSH SOMEONE'S
TEETH?



- THE BEST PLACE TO BRUSH TEETH IS WHERE THE INDIVIDUAL FEELS MORE COMFORTABLE. (COMFORT ZONE)
- IT COULD BE:
 - BATHROOM
 - LIVINGROOM
 - BEDROOM
 - ETC...



- Would I be violating an individual's privacy if I brush and floss his/her teeth in the living room?
 - Privacy is not a concern when performing oral hygiene in a common area such as the living room, as long as this is documented in the individual's dental hygiene plan.



- How do I brush if there is not enough lighting in the living room or the bedroom?
 - Anywhere you perform oral hygiene, make sure there is ENOUGH LIGHTING.
 - Could use flashlight



<http://scratch.mit.edu/galleries/View/9466/creator/asc>

IS FLOSSING NECESSARY?

- YES, It is recommended to floss at least once a day.
- Time is not important
- Not every individual with disabilities will be able to floss.
- Individualized Dental Hygiene Plan



SHOULD I STOP BRUSHING IF BLEEDING OCCURS?

- Many times bleeding is noticed after brushing or flossing...
- Bleeding could be a sign of:
 - Gingivitis

What is Gingivitis?

- Is considered to be inflammation of the gums due to increased amounts of undisturbed bacterial plaque.



- POOR ORAL HYGIENE

How do I get rid of Gingivitis

- Brushing and Flossing alone are the best method.
- DO NOT STOP BRUSHING IF BLEEDING OCCURS.



- 
- IF BLEEDING PERSISTS FOR MORE THAN 7-10 DAYS
 - IF THERE IS ORAL PAIN ASSOCIATED WITH THE BLEEDING
 - CONTACT YOUR DENTAL PROFESSIONAL FOR CONSULTATION AND ADVICE...



WHAT CAN I DO IF MY CLIENT IS DIFFICULT TO BRUSH AND FLOSS

- GET TO KNOW YOUR CLIENT
- LEARN YOUR CLIENT'S BEHAVIOR

TELL-SHOW-DO

- Use techniques like the Tell-Show-Do approach to gain compliance and cooperation
- ALWAYS praise/reinforce positive behavior (POSITIVE REINFORCEMENT)

POSITIVE REINFORCERS

- AVOID SWEETS, SODAS, CIGARRETES. EVEN THOUGH THESE MAY HELP GAIN COMPLIANCE, THEY ARE NOT GOOD REINFORCERS AND MAY DETERIORATE AN INDIVIDUAL'S OVERALL ORAL AND SYSTEMIC HEALTH.

www.usna.edu/USNABand/news/2009/09990804.htm

- IMPORTANT TO USE HEALTHY REINFORCERS LIKE

- Veggies
- Fresh fruits
- Sugar free gum/candy
- Walks
- Rides
- Movies



www.joyvitality.com



www.usna.edu/USNABand/news/2009/09990804.htm

- When using rewards, it is important to not use the same reward over and over again.
- Offer rewards in a consistent way and only reinforce desired behavior.

- There is a great variety of rewards to offer an individual.
- Be creative
- Keep health in mind

WHAT IF MY CLIENT HAS FALSE TEETH?

- Teach you client to remove dentures every night and to clean them.
- Assist with cleaning if client is unable to do so.
- Important to prevent denture damage while cleaning them



MY CLIENT HAS A HARD TIME STAYING OPEN; WHAT CAN I DO?

- Many people has difficulty keeping their mouth open
- Jaw problems
- Fatigue
- Very difficult to perform oral hygiene
- Almost impossible to see inside the mouth

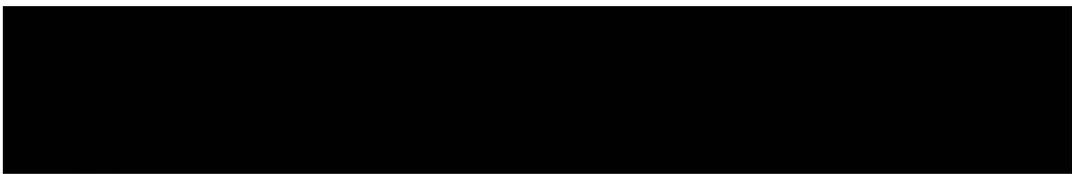
- **SOFT MOUTH PROP**
 - Assits to perform oral hygiene
 - Allows visibility
 - Is used as a supportive device
 - Very easy to use



DO I NEED TO TAKE MY CLIENT TO DENTAL APPOINTMENTS REGULARLY

- Absolutely, you should make sure your client visits the Dental Hygienist at least 2 times a year.
- Regular dental cleanings and good home care are necessary.

Dental visits alone are not enough to help your client achieve and maintain optimum oral/syatemic health



QUESTIONS?



APPENDIX F
HANDS-ON TRAINING POWER POINT

ORAL HYGIENE TRAINING FOR DIRECT CARE STAFF HANDS ON

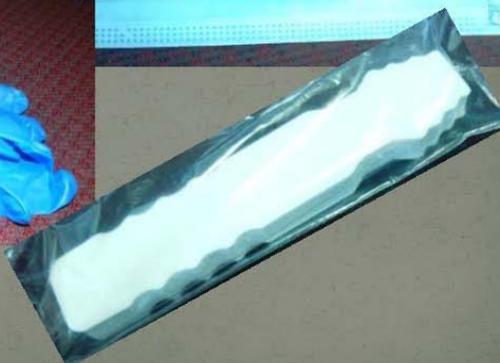
ELMER E GONZALEZ, RDH, BS,BA
GRADUATE STUDENT
UNIVERSITY OF NEW MEXICO SCHOOL OF MEDICINE
DIVISION OF DENTAL HYGIENE

BRUSHING

- TOOTHBRUSH
- TOOTHPASTE (Not always Needed)
- CUP WITH WATER
- FLOSS



- A PAIR OF GLOVES
- MASK
- MOUTH PROP (If needed)



BRUSH TECHNIQUE

- Stand behind or besides the individual
- place toothbrush at an angle while retracting cheek with opposite hand
- Hold toothbrush lightly
- 3 fingers
- Brush teeth
- Brush along gumline
- Brush for 2 minutes



- Standing behind:
- Support head with your opposite arm and body
- Retract cheek
- Have client turn to the Right
- Excellent for Wheel Chair



USING THE MOUTH PROP TO ASSIST YOU DURING BRUSHING

- Improved visibility
- Great to access the inside
- Prevents injury

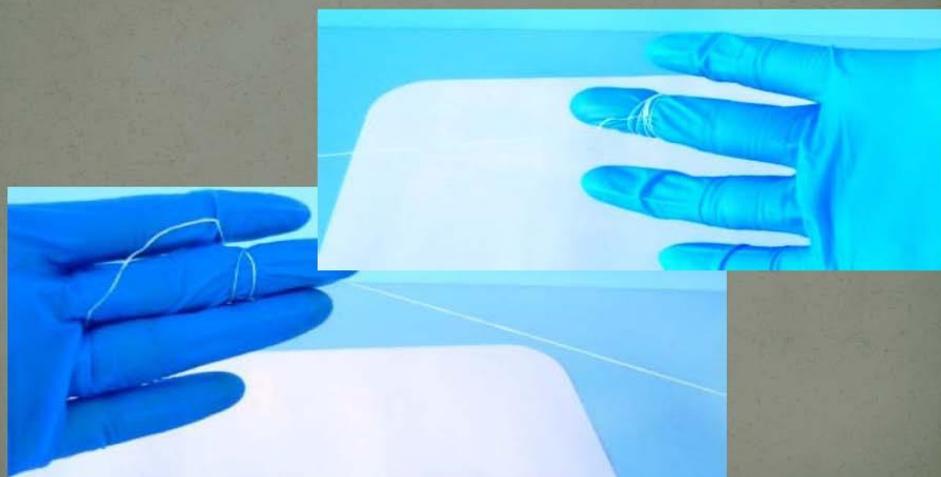


FLOSSING

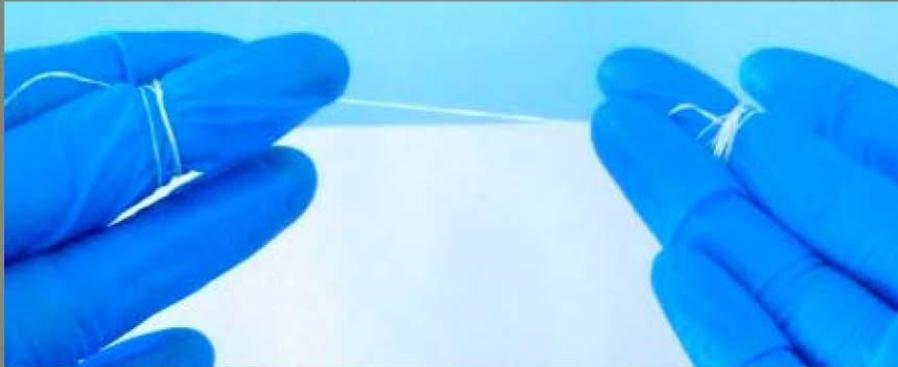
- Cut about 16 inches of floss
- Arm length



- Wrap the ends to both, right and left middle finger



- If right handed, wrap most of the floss on right middle finger



- Grasp floss with both hands using index and thumb so that a small piece of floss is available to use
- $\frac{1}{2}$ to 1 inch
- Floss only one or two teeth, then rotate floss from right middle finger to left middle finger.



- Standing behind individual; floss 1 or two teeth with same piece of floss then rotate



- Do the same for the back teeth
- You may need a longer piece of floss to reach the very back molars



- You may be able to use flossers instead of regular floss.
- Reach Access is a good one.
- Easy to use

BRUSHING DENTURES

- Dentures must be removed before bed every night
- To care for dentures:
- Line up the bathroom sink with towels
- Use gloves and mask
- Use denture brush
- Cup w/ Denture cleaner



- Use regular toothpaste or denture cleaner
- DO NOT USE any abrasive cleaners like Bleach or any household cleaners



- Hold denture firmly from top and bottom with non-dominant hand
- Hold denture brush with dominant hand
- Check denture for any cracks or scrapes



- Brush denture until food debris and plaque are removed
- Turn denture to opposite side and brush the inside
- Also brush denture gums
- These are acrylics and must be cleaned every day



- When finished,
- Place denture in soaking solution to preserve shape and remove stains.
- Make sure denture is given to right individual
- Engrave name on dentures to prevent misplacing



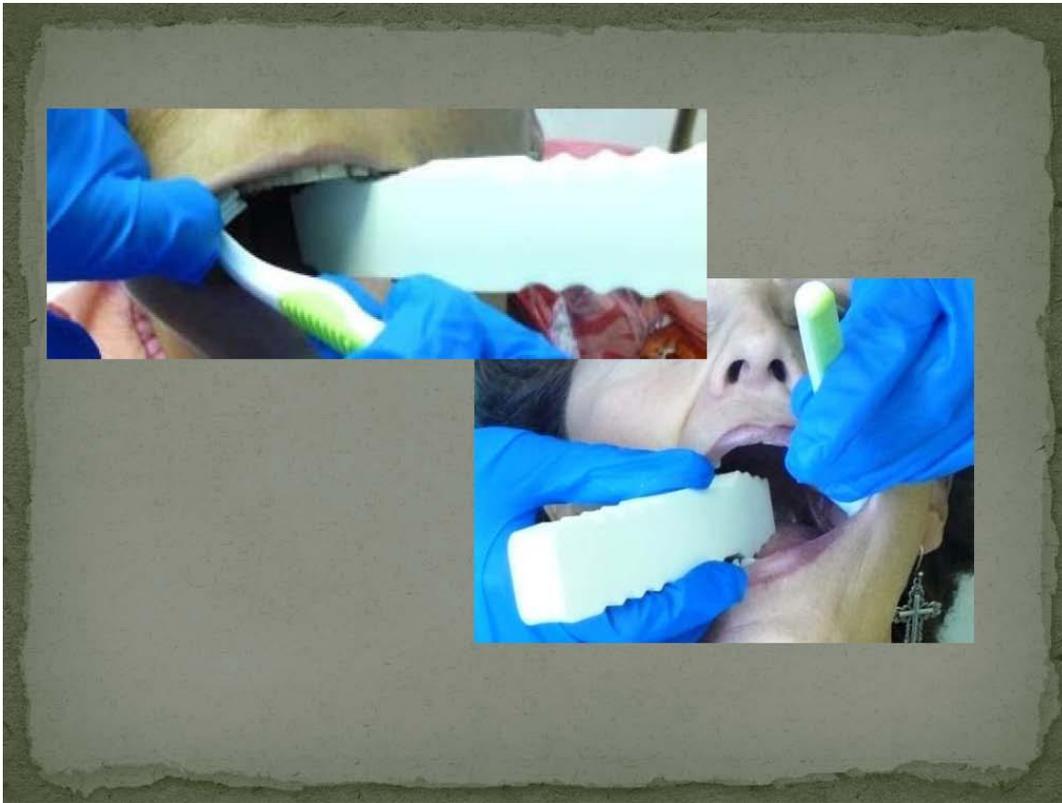
USING THE MOUTH PROP

- The mouth prop is to be used as a supportive device
- Not intended to be a restraint
- Improves visibility and access
- Use only when necessary
- Use only if allowed by you agencies' human rights committee.



- Have individual open
- Step like side goes in the mouth
- Place on back teeth if possible
- Retract opposite side to brush/floss
- Occasionally 2 staff are needed





TELL-SHOW-DO TECHNIQUE

- Tell what you will be doing
- Demonstrate what you will be doing
- Speak slowly and clearly
- Face the individual
- Helps individuals to understand what you will be doing, i.e. brushing and flossing.

APPENDIX G
ARCA SUPPORT LETTER

**OAK LEVEL**

Clear Channel Outdoor
Comcast Corporation
Daniels Fund
Mid-Region Council
of Governments
New Mexico Advertising
Federation
New Mexico Department
of Transportation
Rick Johnson and Company
United Way of
Central New Mexico
Anonymous

ASPEN LEVEL

Albuquerque Community
Foundation
Central New Mexico Housing
Corporation
Clear Channel Radio
Con Alma Health Foundation
KOAT-TV

BIRCH LEVEL

Citadel Radio
New Mexico Commission
on Community Volunteerism
Hugh and Helen Woodward
Fund of the ACF
Qwest Foundation
Scalo Northern Italian Grill

PINON LEVEL

Bank of America, N.A.
Bank of the West
Discount Tire Driven to Care
Program
Ethicon Endo-Surgery, Inc.
First Community Bank, Inc.
KOB TV
Manuel Lujan Insurance
Agency
Molina Healthcare, Inc.
New Mexico Educators
Federal Credit Union
Rodgers & Company, Inc.

List Current as of 6/30/08.

*This list recognizes our corporate
partners who support ARCA with
a minimum annual gift of \$5,000.*

August 10, 2009

To Whom It May Concern:

ARCA is willingly providing the participation of our direct support employees to participate in a research study regarding *Oral Hygiene Training for Direct Care Staff Who Work with People with Disabilities*.

We will be working with Elmer Gonzalez, RDH, BS, BA who is conducting this research. We are very happy to be participating and, in fact, are anxious to see the results.

Sincerely,

Judi Murphy, RN, CDDN

Judi Murphy, RN, CDDN
Health Care Director

Opening Doors for individuals with developmental disabilities since 1957.

11300 Lomas Blvd. NE Albuquerque, New Mexico 87112 • www.ARCAOpeningDoors.org • (505) 332-6700

APPENDIX H
RECRUITMENT E-MAIL

RECRUITMENT E-MAIL

To: ARCA's Direct Care Staff

This letter is to announce an opportunity available for 30 Direct Care Staff from all Intercare group homes to participate in a research project. Elmer E. Gonzalez, RDH, BS, BA graduate student at the University of New Mexico School of Medicine, Division of Dental Hygiene and his professor Elaine Sanchez-Dils, RDH, MA would like to invite you to participate in a 1- 2 hour research project titled "**TRAINING THE TRAINER: DISABILITIES AND DENTAL HYGIENE.**" Different topics directed to oral health of people with disabilities will be discussed. Your participation is 100% voluntary and you are not obligated to participate.

If you are interested in participating in this research project, please contact Ms. Judith Murphy at 505-332-6820 to sign up. Spaces are limited to only 30 participants on a first come first served basis. In addition, if you have any further questions regarding the research project please contact Judith Murphy or any of the investigators.

We greatly appreciate your participation.

Sincerely yours,

Research Investigators

Elmer E. Gonzalez, RDH, BS,BA

Graduate Student

505-272-5326

EGonzalez@salud.unm.edu

Elaine Sanchez-Dils, RDH, MA

Associate Professor

505-272-4513

EDils@salud.unm.edu

APPENDIX I
CONSENT FORM, ENGLISH VERSION

**The University of New Mexico Health Sciences Center
Consent to Participate in Research**

Training the Trainer: Disabilities and Dental Hygiene

Purpose and General Information

You are being asked to participate in a research study that is being done by ELAINE SANCHEZ-DILS, RDH,MA, who is the Principal Investigator, and ELMER E GONZALEZ, RDH, BS,BA. This research is being done to evaluate OVERALL KNOWLEDGE OF DIRECT CARE STAFF IN ORAL HEALTH TOPICS RELATED TO PEOPLE WITH DISABILITIES. You are being asked to participate because YOU WERE IDENTIFIED AS A DIRECT CARE STAFF BY ARCA. Approximately 30 people will take part in this study at THE ARCA TRAINING ROOM IN THE MAIN OFFICE AND THE 4TH STREET OFFICE.

This form will explain the study to you, including the possible risks as well as the possible benefits of participating. This is so you can make an informed choice about whether or not to participate in this study. Please read this Consent Form carefully. Ask the investigators or study staff to explain any words or information that you do not clearly understand.

What will happen if I participate?

If you agree to be in this study, you will be asked to read and sign this Consent Form. After you sign the Consent Form, the following things will happen: YOU WILL BE RANDOMLY ASSIGNED TO EITHER A STUDY GROUP OR A CONTROL GROUP. THEN, YOU WILL BE CONTACTED BY JUDY MURPHY WITH DETAILED TIME AND DATE TO PARTICIPATE IN THE STUDY. THE STUDY WILL ONLY ASSESS YOUR OVERALL KNOWLEDGE IN ORAL HEALTH TOPICS BEFORE AND AFTER IMPLEMENTATION OF EDUCATIONAL MATERIALS BY A PRE AND POST TEST CONSISTING OF 20 QUESTIONS EACH.

Participation in this study will take a total of 1.5- 2.0 HOURS REQUIRED FOR PARTICIPATION hours over a period of 1 DAY.

What are the possible risks or discomforts of being in this study?

Every effort will be made to protect the information you give us. However, there is a small risk of loss of confidentiality WE WILL NOT USE NAMES, SS#, OR ANY IDENTIFIABLE INFORMATION, AN ID NUMBER WILL BE ASSIGNED BY THE INVESTIGATOR AT THE TIME OF THE STUDY. NO IDENTIFIABLE INFORMATION WILL BE SHARED WITH THE AGENCY(ARCA) TO PREVENT PRESSURE AND/OR COERCION SOME OF THE PHOTOGRAPHS SHOWN IN THE PRESENTATION COULD CAUSE DISCOMFORT, HOWEVER, THIS IS NOT EXPECTED.

How will my information be kept confidential?

Your name and other identifying information will be maintained in locked files, available only to authorized members of the research team, for the duration of the study. FOR ANY INFORMATION ENTERED INTO A COMPUTER, THE ONLY IDENTIFIER WILL BE A UNIQUE STUDY IDENTIFICATION (ID) NUMBER ASSIGNED THE DAY OF THE STUDY. Any personal identifying information and any record linking that information to study ID numbers will be destroyed when the study is completed. Information resulting from this study will be used for research purposes and may be published; however, you will not be identified by name in any publications.

Page 1 of 3

HRRC#: 09-456
Version: 3/24/10

APPROVED	04/02/2010	 UNM <small>The University of New Mexico</small>	OFFICIAL USE ONLY <small>Human Research Protection Office</small>	EXPIRES	10/16/2010
The University of New Mexico Human Research Review Committee					

Information from your participation in this study may be reviewed by federal and state regulatory agencies, and by the UNM Human Research Review Committee (HRRC) which provides regulatory and ethical oversight of human research.

What are the benefits to being in this study?

There may or may not be direct benefit to you from being in this study. However, your participation may help find out IF ORAL HYGIENE TRAINING IS A HELPFUL TOOL TO BE IMPLEMENTED FOR DIRECT CARE STAFF WHO PROVIDE SERVICES FOR PEOPLE WITH DISABILITIES..

What other choices do I have if I don't participate?

Taking part in this study is voluntary so you can choose not to participate.

Will I be paid for taking part in this study?

YOU WILL NOT RECEIVE PAYMENT OR COMPENSATION BY THE INVESTIGATOR(S) FOR PARTICIPATING IN THE STUDY, HOWEVER, ARCA HAS CHOSEN TO PAY REGULAR HOURLY SALARY FOR THE TIME 1-2HRS YOU ARE IN THE STUDY WHETHER YOU ARE IN GROUP A OR GROUP B.

Can I stop being in the study once I begin?

Yes. You can withdraw from this study at any time without affecting your EMPLOYMENT, PARTICIPATION IN THE PROGRAM OR ACCESS TO CARE, EDUCATION, ETC. AS APPROPRIATE.

The investigators have the right to end your participation in this study if they determine that you no longer qualify to take part, if you do not follow study procedures, or if it is in your best interest or the study's best interest to stop your participation.

Refusal to Sign

If you choose not to sign this consent form you will not be allowed to take part in the research study.

What if I have questions or complaints about this study?

If you have any questions, concerns or complaints at any time about the research study, ELAINE SANCHEZ-DILS, RDH, MA , or ELMER E GONZALEZ, RDH, BS,BA, will be glad to answer them at 505-272-4513 OR 505- 272-5326 MONDAY-THURSDAY 8AM-4PM . If you would like to speak with someone other than the research team, you may call the Human Research Review Committee (HRRC) at (505) 272-1129. The HRRC is a group of people from UNM and the community who provide independent oversight of safety and ethical issues related to research involving human subjects.

What are my rights as a research subject?

If you have questions regarding your rights as a research subject, you may call the HRRC at (505) 272-1129 or visit the HRRC website at <http://hsc.unm.edu/som/research/hrrc/>.

Consent and Authorization

You are making a decision whether to participate in this study. Your signature below indicates that you read the information provided (or the information was read to you). By signing this Consent Form, you are not waiving any of your legal rights as a research subject.

I have had an opportunity to ask questions and all questions have been answered to my satisfaction. By signing this Consent Form, I agree to participate in this study and give permission for my health information to be used or disclosed as described in this Consent Form. A copy of this Consent Form will be provided to me.

Name of Adult Participant (print)

_____/_____
Signature of Adult Participant / Date

I have explained the research to the subject and answered all of his/her questions. I believe that he/she understands the information in this consent form and freely consents to participate.

Name of Research Team Member

_____/_____
Signature of Research Team Member/Date

APPENDIX J
CONSENT FORM, SPANISH VERSION

**CENTRO DE CIENCIAS DE LA SALUD
DE LA UNIVERSIDAD DE NUEVO MÉXICO**

CONSENTIMIENTO PARA PARTICIPAR EN UN ESTUDIO

FORMULARIO CORTO

Training the Trainer: Disabilities and Dental Hygiene

Estamos solicitando su participación en un estudio de investigación.

Antes de dar su aprobación, el investigador debe informarle sobre (i) el propósito, el procedimiento y la duración de la investigación; (ii) cualquier tipo de procedimiento de naturaleza experimental; (iii) cualquier tipo de riesgo, incomodidad y beneficio que razonablemente se pueda esperar; (iv) cualquier tipo de procedimiento o tratamiento alternativo potencialmente beneficioso; y (v) como se mantendrá la confidencialidad.

Donde corresponda, el investigador debe también informarle sobre (i) cualquier tipo de compensación o tratamiento médico, si ocurriera algún daño; (ii) la posibilidad de riesgos inesperados; (iii) circunstancias por las cuales el investigador pudiera suspender su participación; (iv) cualquier costo adicional para usted; (v) qué pasa si decide suspender su participación; (vi) cuándo le informarán sobre nuevos descubrimientos que puedan afectar su deseo de participar; y (vii) cuántas personas participarán en el estudio.

Si usted está de acuerdo en participar, le deben dar una copia firmada de este documento y un resumen escrito del estudio.

Si necesita hablar con ELAINE SANCHEZ-DILS, RDH,MA o ELMER E. GONZALEZ, RDH,BS,BA, puede llamar en cualquier momento al 505-272-4513 o al 505-272-5326 si es fuera de horas de atención al público o feriado.

Si tiene alguna pregunta sobre sus derechos como sujeto de la investigación, o de lo que debe hacer si recibe algún daño, usted puede ponerse en contacto con la Oficina de la Protección de Investigaciones Humanas, llamando al (505) 272-1129.

Su participación en este estudio de investigación es completamente voluntaria, y no recibirá ninguna sanción ni pérdida de beneficios si no quiere participar o decide retirarse.

Al firmar este documento, usted indica que ha recibido una explicación oral del estudio, incluyendo la información antes mencionada, y que acepta participar voluntariamente en esta investigación.

Firma del participante _____ Fecha _____

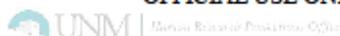
Firma del testigo _____ Fecha _____

Version Date: 3/24/10
HRRC No.: 09-456

Page 1 of 1

OFFICIAL USE ONLY

Approved: 04/02/2010



Expires: 10/16/2010

The University of New Mexico Human Research Review Committee

APPENDIX K
STATISTICAL TABLES

CONTROL GROUP B

ID NUMBER	GENDER	EDUCATION LEVEL	TEST NUMBER	PRE TEST RESULTS	TEST NUMBER	POST TEST RESULTS	CHANGE
09-456-1B	M	BACHELORS	A	18 B	18	0	
09-456-2B	M	HS/GED	B	18 A	18	0	
09-456-3B	M		A	12 B	15	3	
09-456-4B	M	BACHELORS	B	18 A	17	-1	
09-456-5B	F	ELEMENTARY	A	16 B	19	3	
09-456-6B			B	17 A	17	0	
09-456-7B			A	18 B	19	1	
09-456-8B	F	ASSOCIATES	B	16 A	18	2	
09-456-9B	F	HS/GED	A	18 B	20	2	
09-456-10B	F	HS/GED	B	19 A	16	-3	
09-456-12B				17	17.7	0.7	

12,13,14,15 B DID NOT SHOW UP TO THE STUDY, HOWEVER, 2 OF THOSE 3 SHOWED UP TO THE OTHER LOCATION.

11B DATA WAS NOT ANALYZED DUE TO SCANTRON NOT MARKED PROPERLY; THEREFORE NOT READ BY MACHINE

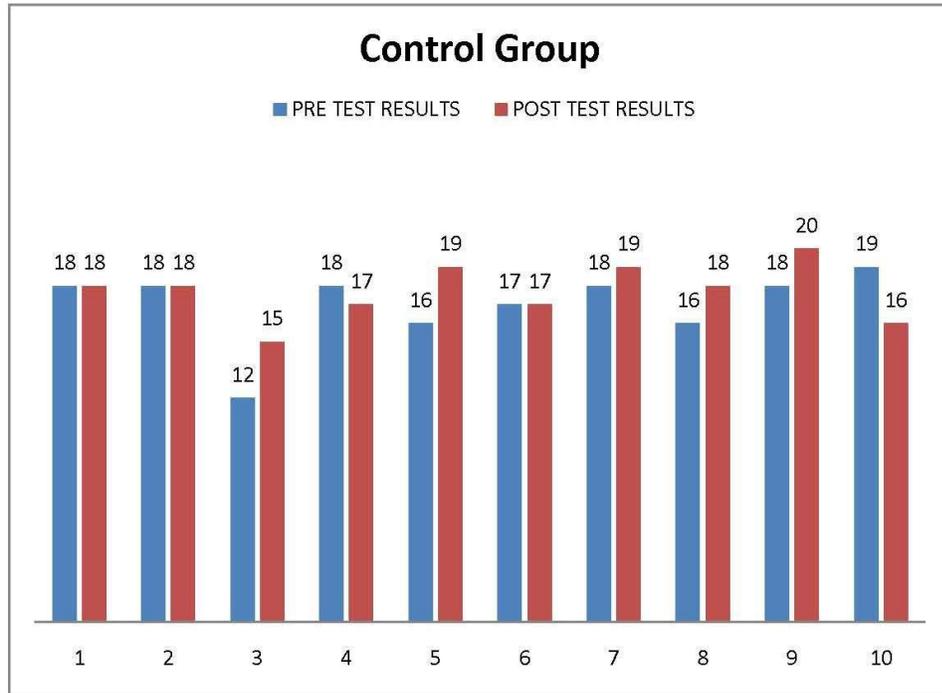
EXPERIMENTAL GROUP A

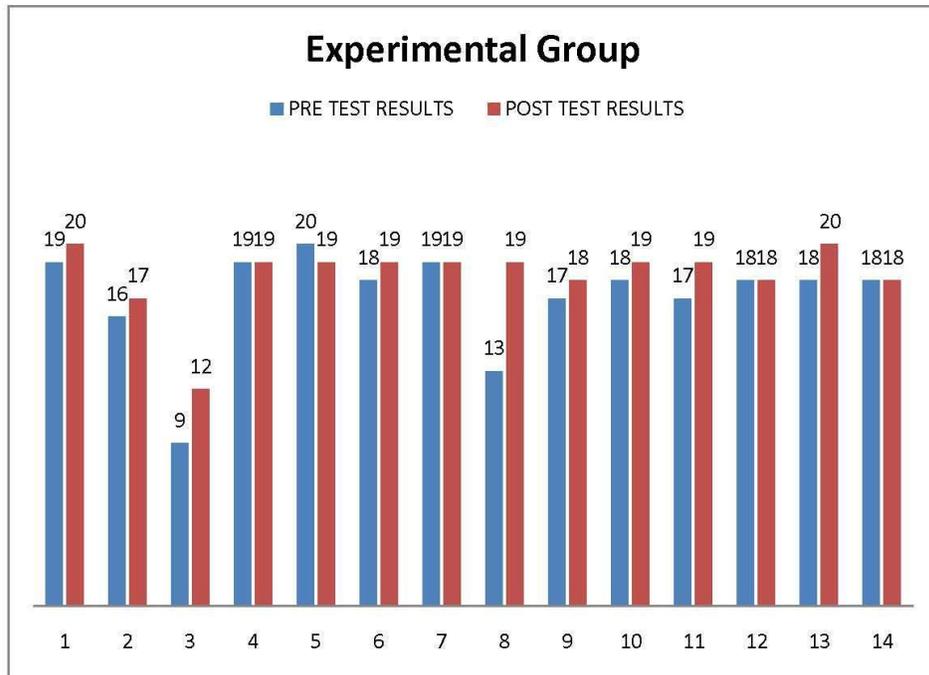
ID NUMBER	GENDER	EDUCATION LEVEL	TEST NUMBER	PRE TEST RESULTS	TEST NUMBER	POST TEST RESULTS	CHANGE
09-456-1A	M		B		19 A	20	1
09-456-2A	F	HS/GED	A		16 B	17	1
09-456-3A	F	HS/GED	B		9 A	12	3
09-456-4A	F	BACHELORS	A		19 B	19	0
09-456-7A	F	HS/GED	B		20 A	19	-1
09-456-8A	M	BACHELORS	A		18 B	19	1
09-456-9A	M	HS/GED	B		19 A	19	0
09-456-10A	F	HS/GED	A		13 B	19	6
09-456-11A	F	HS/GED	B		17 A	18	1
09-456-12A	F	BACHELORS	A		18 B	19	1
09-456-14A	F	HS/GED	A		17 B	19	2
09-456-15A	M	BACHELORS	B		18 A	18	0
09-456-16A	F	HS/GED	A		18 B	20	2
09-456-17A	F	BACHELORS	A		18 B	18	0
				17.07142857		18.28571429	1.214286

09-456-6A DROPPED FROM THE STUDY DUE TO TIME CONSTRAINTS

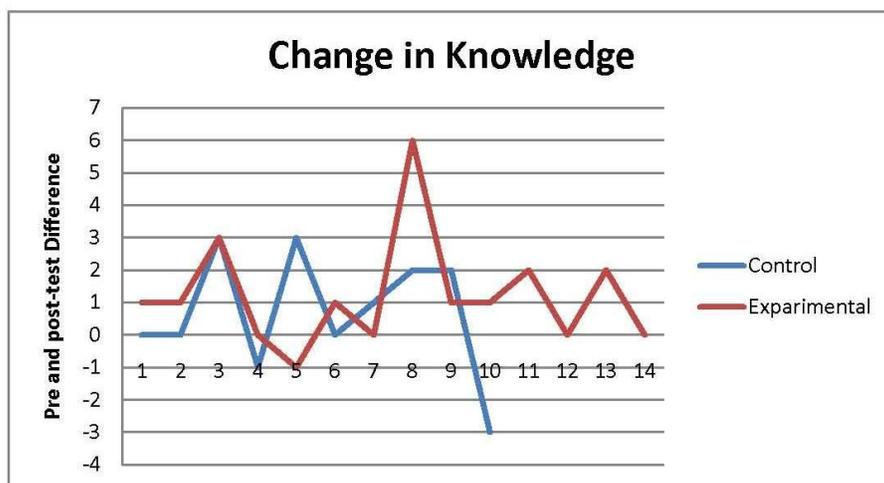
09-456-5A

06-456-13A THESE SUBJECTS DID NOT SIGN CONSENT FORM AND SHOWED UP TO DIFFERENT LOCATION; THEREFORE, DATA WAS NOT USED





Control	Exparimental
0	1
0	1
3	3
-1	0
3	-1
0	1
1	0
2	6
2	1
-3	1
	2
	0
	2
	0



APPENDIX L
STATISTICAL ANALYSIS

```

ElmerAnalysis.R
# Analysis of intervention survey
# for Elmer Gonzales, UNM Dental Hygiene
# by Erik Erhardt (erik@statacumen.com)
# 11/25/2009

# time 11/25/2009 7:00PM - 8:25PM
#      11/25/2009 10:08PM - 10:31PM
# 2 hours

# Using statistical software R

rm(list=ls()); # reset variables
# set path and set working directory
path <-
"F:\\\\USERS\\Erik\\StatAcumen\\consult\\AdvisingStudents\\2009_ElmerGonzale
s_intervention_survey"; setwd(path);

# read data
data <- read.csv("ElmerGonzales_intervention_survey.csv");
data[(data[]=="")]=NA; # correctly assign missing values

total.q <- 20; # there were total questions

# assign variables
group <- data[,"group"];
id <- data[,"id"];
gender <- data[,"gender"];
educ <- data[,"educ"];
test1num <- data[,"test1num"];
pretest <- data[,"pretest"];
posttest <- data[,"posttest"];

# construct proportion correct for each test
p1 <- pretest / total.q;
p2 <- posttest / total.q;

# difference in proportion correct, pre test from post test
d <- p2-p1;

summary(d)
summary(d[group=="A_exp"] )
summary(d[group=="B_cont"])
sd(d)
sd(d[group=="A_exp"] )
sd(d[group=="B_cont"])

```

	Mean	SD	Min.	1st Qu.	Median	3rd Qu.	Max.
All	0.050	0.088	-0.15	0.00	0.050	0.10	0.30
A	0.061	0.086	-0.05	0.00	0.050	0.09	0.30
B	0.035	0.094	-0.15	0.00	0.025	0.10	0.15

```

par(mfrow=c(2,1), mar=c(4,4,2,2), oma=c(1,1,1,1)); # mar allows the
histograms to touch top-bottom c(bot,lef,top,rig)
xlim <- c(min(d)-1/(2*total.q),max(d)+1/(2*total.q));
breaks <- seq(xlim[1],xlim[2],1/total.q);
hist(d[group=="A_exp"],breaks=breaks,xlim=xlim, main="Experimental group
A", xlab=""); # , xlab="Propotion correct in pre test from post test"
hist(d[group=="B_cont"],breaks=breaks,xlim=xlim, main="Control group
B" , xlab="Propotion correct in pre test from post test");

```

```

##### XXXX this is not good because some people score full marks so
logit(20/20) is Inf.
## on logit scale
#logit <- function (x) { y <- log(x/(1-x)); }
#inv.logit <- function (y) { x <- exp(y)/(1+exp(y)); }
#
#lp1 <- logit(pretest / (total.q+0.0001));
#lp2 <- logit(posttest / (total.q+0.0001));
#ld <- lp2-lp1;
#
#par(mfrow=c(2,1), mar=c(4,4,2,2), oma=c(1,1,1,1)); # mar allows the
histograms to touch top-bottom c(bot,lef,top,rig)
#xlim <- c(min(ld)-1/(2*total.q),max(ld)+1/(2*total.q));
#breaks <- seq(xlim[1],xlim[2],1/total.q);
#hist(ld[group=="A_exp"],breaks=breaks,xlim=xlim, main="Experimental
group A", xlab=""); # , xlab="Propotion correct in pre test from post
test"
#hist(ld[group=="B_cont"],breaks=breaks,xlim=xlim, main="Control group
B" , xlab="Propotion correct in pre test from post test");

```

```

par(mfrow=c(1,1), mar=c(4,4,2,2), oma=c(1,1,1,1)); # mar allows the
histograms to touch top-bottom c(bot,lef,top,rig)
xlim <- c(min(d)-1/(2*total.q),max(d)+1/(2*total.q));
breaks <- seq(xlim[1],xlim[2],1/total.q);
hist(d,breaks=breaks,xlim=xlim, main="Combined groups A and B",
xlab="Propotion correct in pre test from post test");

```

```

#####
# perform a simple one-sample paired t-test as a quick check about the
group differences
t.test(d,alternative="greater");
t.test(d[group=="A_exp"],alternative="greater");
t.test(d[group=="B_cont"],alternative="greater");

> t.test(d,alternative="greater");

```

One Sample t-test

```

data: d
t = 2.7689, df = 23, p-value = 0.005461
alternative hypothesis: true mean is greater than 0
95 percent confidence interval:
 0.01905112      Inf
sample estimates:

```

```
mean of x
  0.05
```

```
> t.test(d[group=="A_exp"],alternative="greater");
```

```
One Sample t-test
```

```
data: d[group == "A_exp"]
t = 2.645, df = 13, p-value = 0.0101
alternative hypothesis: true mean is greater than 0
95 percent confidence interval:
 0.02006437      Inf
sample estimates:
mean of x
0.06071429
```

```
> t.test(d[group=="B_cont"],alternative="greater");
```

```
One Sample t-test
```

```
data: d[group == "B_cont"]
t = 1.1721, df = 9, p-value = 0.1356
alternative hypothesis: true mean is greater than 0
95 percent confidence interval:
-0.01973820      Inf
sample estimates:
mean of x
  0.035
```

```
#####
# perform a simple two-sample paired t-test as a quick check about the
group differences
t.test(d[group=="A_exp"],d[group=="B_cont"],alternative="greater");
```

```
#####
# Results
      Welch Two Sample t-test
```

```
data: d[group == "A_exp"] and d[group == "B_cont"]
t = 0.6827, df = 18.344, p-value = 0.2517
alternative hypothesis: true difference in means is greater than 0
95 percent confidence interval:
-0.03953053      Inf
sample estimates:
mean of x mean of y
0.06071429 0.03500000
```

```
#####
# perform a simple linear model on the differences with covariates
# start with full model (all covariates) and work backwards
summary(lm( d ~ group + test1num + gender + educ));
```

```
summary(lm( d ~ group + gender + educ));
```

```
summary(lm( d ~ group + gender));
```

```

summary(lm( d ~ group));

summary(lm( d ~ gender));

#####
# Results
> summary(lm( d ~ group + test1num + gender + educ));

Call:
lm(formula = d ~ group + test1num + gender + educ)

Residuals:
    Min       1Q   Median       3Q      Max
-0.203644 -0.036087 -0.003135  0.043067  0.217480

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.058894   0.060915   0.967   0.349
groupB_cont -0.028876   0.046441  -0.622   0.543
test1numB   -0.004725   0.047123  -0.100   0.921
genderM     -0.051544   0.053246  -0.968   0.348
educhs      0.028351   0.050003   0.567   0.579

Residual standard error: 0.09688 on 15 degrees of freedom
(4 observations deleted due to missingness)
Multiple R-squared: 0.1588,    Adjusted R-squared: -0.06555
F-statistic: 0.7078 on 4 and 15 DF,  p-value: 0.599

>
> summary(lm( d ~ group + gender + educ));

Call:
lm(formula = d ~ group + gender + educ)

Residuals:
    Min       1Q   Median       3Q      Max
-0.205809 -0.034661 -0.004569  0.044533  0.215339

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.05470    0.04289   1.275   0.220
groupB_cont -0.02885    0.04498  -0.641   0.530
genderM     -0.05026    0.05006  -1.004   0.330
educhs      0.02996    0.04587   0.653   0.523

Residual standard error: 0.09384 on 16 degrees of freedom
(4 observations deleted due to missingness)
Multiple R-squared: 0.1582,    Adjusted R-squared: 0.0003768
F-statistic: 1.002 on 3 and 16 DF,  p-value: 0.4172

>
> summary(lm( d ~ group + gender));

Call:
lm(formula = d ~ group + gender)

Residuals:

```

	Min	1Q	Median	3Q	Max
	-0.20735	-0.03235	-0.01765	0.03897	0.22794

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.07206	0.02785	2.588	0.0181 *
groupB_cont	-0.01471	0.04254	-0.346	0.7334
genderM	-0.03971	0.04254	-0.933	0.3623

Signif. codes: 0 "****" 0.001 "***" 0.01 "**" 0.05 "." 0.1 " " 1

Residual standard error: 0.09375 on 19 degrees of freedom

(2 observations deleted due to missingness)

Multiple R-squared: 0.05864, Adjusted R-squared: -0.04046

F-statistic: 0.5917 on 2 and 19 DF, p-value: 0.5632

>

> summary(lm(d ~ group));

Call:

lm(formula = d ~ group)

Residuals:

	Min	1Q	Median	3Q	Max
	-0.18500	-0.06071	-0.01071	0.04571	0.23929

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.06071	0.02391	2.539	0.0187 *
groupB_cont	-0.02571	0.03705	-0.694	0.4949

Signif. codes: 0 "****" 0.001 "***" 0.01 "**" 0.05 "." 0.1 " " 1

Residual standard error: 0.08948 on 22 degrees of freedom

Multiple R-squared: 0.02143, Adjusted R-squared: -0.02305

F-statistic: 0.4818 on 1 and 22 DF, p-value: 0.4949

>

> summary(lm(d ~ gender));

Call:

lm(formula = d ~ gender)

Residuals:

	Min	1Q	Median	3Q	Max
	-0.21786	-0.02500	-0.01786	0.03214	0.23214

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.06786	0.02450	2.770	0.0118 *
genderM	-0.04286	0.04062	-1.055	0.3040

Signif. codes: 0 "****" 0.001 "***" 0.01 "**" 0.05 "." 0.1 " " 1

Residual standard error: 0.09166 on 20 degrees of freedom

(2 observations deleted due to missingness)

Multiple R-squared: 0.05271, Adjusted R-squared: 0.005349

F-statistic: 1.113 on 1 and 20 DF, p-value: 0.304

>

CHAPTER VIII**REFERENCES**

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