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A CASE STUDY COMPARISON OF THE EFFECTS OF A RESISTANCE TRAINING AND NUTRITION INTERVENTION IN HEAD AND NECK CANCER SURVIVORS

Chelsea S. Bradley Ms.

Southern Illinois University Carbondale, chelsb@siu.edu

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A CASE STUDY COMPARISON OF THE EFFECTS OF A RESISTANCE TRAINING
AND NUTRITION INTERVENTION IN HEAD AND NECK CANCER SURVIVORS

by

Chelsea S. Bradley

B.S., Southern Illinois University, 2009

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the
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RESEARCH PAPER APPROVAL

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A Research Paper Submitted in Partial
Fulfillment of the Requirements
for the Degree of
Masters of Education in Science
in the field of Exercise Science

Approved by:

Joyce Fetro, Chair

Philip M. Anton

Tom E. Parry

Graduate School
Southern Illinois University Carbondale
November 1, 2010

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CHAPTER 1

INTRODUCTION

In the research literature pertaining to cancer rehabilitation, delineation is often made between “cancer patient” and “cancer survivor”. The term “cancer patient” typically refers to an individual undergoing treatment for active cancer, while “cancer survivor” refers to someone who has been through cancer treatment and is either in remission or is living with a reduced form of their original cancer. In recent years, there has been a concerted effort among cancer rehabilitation specialists to eliminate this delineation. For the purposes of this paper, a cancer survivor will be defined as “any individual that has been diagnosed with cancer, from the time of discovery and for the balance of life”, as suggested by the National Coalition for Cancer Survivorship (2004).

Cancer is a devastating disease that can often result in extreme reductions in body mass (Matthys & Billiau, 1997). This loss of body mass is typically termed “cancer cachexia” and is characterized by weight loss, muscle wasting, loss of appetite, and general debilitation. The scale of cachexia is especially dramatic in head and neck cancer survivors. Even before the onset of treatment, this population often experiences fatigue, anorexia, taste alterations, neurocognitive changes, deconditioning, mucositis, pain and difficulty swallowing due to the site of the cancer (Murphy, Gilbert, & Ridner, 2007). These effects are often intensified by surgery and radiation treatment.

Due to the typical location of the tumor and treatment, the head and neck cancer survivor’s diet often lacks the nutrition required for body mass maintenance, particularly skeletal muscle, and this typically evolves into cachexia. According to Silver, Dietrich

and Murphy (2007), a loss of lean body mass accounts for the majority of weight loss in head and neck cancer survivors (71.7%), and this weight loss often leads to poor survivor outcomes, such as quality of life decline and disruption of everyday function. Head and neck cancer survivors are significantly understudied, and exercise and nutrition interventions may have a greater impact on their lives than other cancer populations (Rogers, Courneya, Robbins, Malone, Seiz, & Koch, 2006). Proper guidance on nutritional intake as well as exercise designed to counter muscle loss is of great importance in this population.

The mission of exercise professionals in the area of cancer rehabilitation is to help treat the painful and often debilitating side effects of the disease and its treatment, and to help survivors live comfortable and functional lives (Rogers, 2008). The goal of exercise in apparently healthy individuals is typically centered on weight loss and strength gain; however, the objective of exercise in cancer survivors is oriented around returning them to their pre-diagnostic state of physical functioning or helping them to maintain their current level of strength and functioning (Schwartz, 2009). Important factors of physical functioning may include the ability to resist fatigue and effectively complete activities of daily living. Resistance training and proper diet support a healthy body composition, and can further improve the survivor's ability to complete basic functional tasks.

According to the American Cancer Society (2007), more than 40,000 Americans are diagnosed with cancer of the oral cavity, pharynx, or larynx annually. In 2006, a study conducted by Rogers et al. (2008), found that only 8.5% of this population were meeting current public health exercise guidelines. This finding is exacerbated by a decline in physical activity during treatment (Rogers, et al., 2006). While the importance

of exercise and nutrition is understood in most survivors, the reason for a decrease in physical activity in the head and neck population is still not fully understood.

With the standard of care for head and neck cancer survivors being nutritional counseling with supplementation, survivors undergoing this treatment have experienced improved nitrogen balance and weight gain; however, lean body mass has not been consistently improved (Bossola, Pacelli, & Doglietto, 2007). One method that has been shown to increase lean mass in healthy populations, as well as those suffering from disease or ailment, is resistance training. In addition to the many physical benefits that have been realized from a resistance training, the cost and side effects of using pharmacologic means to treat lean mass loss may be lessened with this type of exercise (Bossola, Pacelli, & Doglietto, 2007).

Prior research has determined that utilizing a progressive resistance training program (PRET) may significantly reduce shoulder pain and disability, as well as improve upper extremity muscular strength and endurance in head and neck cancer survivors (McNeely, Parliament, Keikaly, Jha, & Magee, 2008). According to Rogers et al. (2008), some studies support physical activity and diet interventions for improving head and neck cancer survivor quality of life, while other studies remain inconclusive. Further research in resistance training and nutritional guidance is needed to establish an appropriate prescription for maintaining muscle mass and improving body composition to a pre-diagnostic state in head and neck cancer survivors. The purpose of this investigation was twofold: 1) to determine the impact of dietary counseling and resistance training on muscle strength, lean mass, functional ability, and exercise adherence in two individuals with head and neck cancer, and 2) to investigate qualitative outcomes regarding the

attitude, condition and progress of the head and neck cancer survivors throughout a dietary and resistance training intervention, and its relation to program adherence.

CHAPTER 2

METHODS

Subjects

Two males were referred by their oncologist to participate in the RETAIN exercise and dietary intervention study. The first participant (C01) was a 43-year-old male diagnosed with tonsil carcinoma with lymph node involvement. His initial weight was 157lbs. and his height was 6'1". The second participant (C02) was a 70-year old male diagnosed with anaplastic large cell lymphoma of the right posterior scalp with lymph node involvement. His initial weight was 259lbs. and his height was 5'7 ½".

Procedures

Both participants underwent an identical exercise and nutrition protocol concurrent with radiation treatment. The protocol was 12 weeks long and the participants completed a physical assessment at week 0, week 6, and week 12. Throughout the 12 week program they participated in resistance exercise and nutrition sessions that are described in detail below. In addition, participants answered an eight question qualitative questionnaire during the third, sixth, ninth, and twelfth week of the study (described below).

Assessment

The physical performance assessment completed at Week 0, 6 and 12 included a bioelectrical impedance (BIA) test to assess body composition, several tests of functionality, and assessments of lower and upper body strength. The participants were

also asked to keep a food diary of the three days prior to the assessment for dietary record. The food diary was utilized to help the dietician understand the eating habits of the individual, and to assess change throughout the program.

Bioelectrical impedance (BIA).

The participants were asked to not eat or drink anything the morning before this test was completed to ensure both validity and reliability from test to test. Before the BIA test, the participant was asked if he had a pacemaker or an electronic device, if they ate or drank anything in the past four hours, and if they had participated in any strenuous exercise in the past 12 hours. After these questions were answered, BIA measurements were taken. The BIA test was conducted by placing two electrodes on the right foot as well as two electrodes on the right hand of the participant while in a supine position. After this test the participant was given the opportunity to eat a light carbohydrate snack before proceeding through the remaining assessment procedures.

Dynamometer testing.

Hand grip strength was assessed via a hand grip dynamometer. The participant was asked to squeeze the hand grip on a count of “3-2-1” as hard as they could for three seconds, and then the test was repeated on the opposite hand with a one minute rest between testing on a given hand. This test was repeated three times on each hand.

The hand grip test was followed by a back/leg strength dynamometer test. This test required the participant to remove their shoes and stand on a dynamometer scale, with their legs at a 130 degree angle. The participants were asked to pull up as hard as they could on the bar attached to the dynamometer on a count of “3-2-1 Pull Pull Pull”

for three seconds. This testing procedure was repeated for three trials. Throughout the test, instructions were given to keep the back as flat as possible, and to pull up through their legs to avoid injury.

Balance testing.

Balance was assessed using a semi-tandem standing test. Standing next to a table and with the exercise specialist on the other side of him to ensure that the participant did not fall, he was asked to place their left toe next to his right heel. When the participant was ready, he removed his hand from the table and the timer was started. If this pose was successfully completed for 10 seconds, the participant was then asked to move to the tandem pose with his toe directly behind his heel and the timer was started again to see if the participant could reach the 10 second goal.

Functional capacity.

Functional capacity was assessed utilizing an 8 foot walk test. An 8 foot course was laid out with two orange cones in a straight line. The participant was asked to stand with their toes even with the initial cone. The participant was then instructed to walk at a normal pace (like walking in the store) following the instructions “3-2-1 Go”. A timer was started as soon as the participant moved and was stopped when his front foot passed the second cone. Once at the opposite end the participant was asked to repeat the procedure heading back to the starting cone, again on a count of “3-2-1 Go”. The timer was again stopped when the participant’s front foot passed the cone. The faster of the 2 times was used in the data analysis.

Functional capacity was further assessed using a chair rise and sit test. The survivor was asked to stand in front of a chair with feet comfortably apart and arms crossed across the chest with hands on opposite shoulders. The participant was asked to sit and stand one time to ensure that they could safely complete this test. They were also instructed to be sure that their back touched the chair in the sitting position. The participant was asked to begin in the sitting position and then when instructed by “3-2-1 Go”, he would stand and sit five times as fast as he could without losing his balance. A timer was started when the individual was instructed by “go” and stopped when he sat for the fifth time. The total elapsed time was then recorded.

Resistance Training Sessions

When the 1st assessment was completed, the participants were then scheduled for a nutrition session once a week and two resistance exercise sessions per week with an exercise specialist for a period of six weeks. To keep these sessions convenient for the participant, they were completed at the oncology office, immediately following radiation treatment. The resistance exercise sessions began with a warm up. The warm up consisted of a 3-5 minute walk and was followed by a series of dynamic warm up activities designed to mimic the resistance exercise movements. The participant then completed a series of resistance exercises with resistance tubes designed to target all of the major muscle groups: chest press, leg extension, lateral row, reverse curl, triceps, heel raise, 2-arm front raise, hamstring curl and arm curl. These exercises were all performed with the choice of tubing resistance appropriate to perform 8-12 repetitions comfortably. The participant then continued to the cool down. The cool down consisted of a 3-5 minute walk followed by slow and static stretching for each major muscle group.

Following the first six weeks, each participant was then reassessed following the same protocol as the initial assessment. During the sessions that took place the first six weeks, the participant was instructed on how to complete the exercises properly. At the end of the first six weeks the participant was asked if he had any further questions about the exercises he was to complete at home and was instructed on how to keep record of his activity and progress. Phone sessions were conducted once per week during the second six weeks to ensure that the participant did not have any questions, was completing two sessions per week, and also was not confused about how to fill out his activity log. Phone based nutrition sessions were also conducted once per week. Following the completion of the second 6 week period, a final assessment was conducted (repeating the week 0 and week 6 assessment protocols).

Qualitative Questionnaire

At week 3, 6, 9 and 12 the participants were asked to answer a series of eight questions focused around their attitude, condition and progress in the program. *See Appendix A.*

CHAPTER 3

RESULTS

Table 1

Bioelectrical Impedance Results for C01

C01			
	Initial Assessment	Week 6 Assessment	Week 12 Assessment
Percent Fat	19.9%	20.1%	26.2%
Lean Weight	57.2kg	53.3kg	49.55kg
Total Weight	71.4kg	66.7kg	67.23kg

Table 2

Bioelectrical Impedance Results for C02

C02			
	Initial Assessment	Week 6 Assessment	Week 12 Assessment
Percent Fat	Equipment Malfunction	52.00%	51.90%
Lean Weight	Equipment Malfunction	55.20kg	56.70kg
Total Weight	117.70kg	115.00kg	117.77kg

Table 3

Physical Assessment Testing Results for C01

C01	Initial Assessment	Week 6 Assessment	Week 12 Assessment
Hand Grip Dynamometer (Avg. <i>right and left</i>)	47.75kg	44.5kg	42.85kg
Back/Leg Dynamometer	143kg	162kg	181kg
Standing Test	>10 s	>10s	>10s
8 Foot Walk Test	2.31s	1.60s	1.32s
Chair Rise and Sits	12.0s	9.7s	9.87s

Table 4

Physical Assessment Testing Results for C01

C02	Initial Assessment	Week 6 Assessment	Week 12 Assessment
Hand Grip Dynamometer (<i>Right / Left</i>)	41.15kg	45.7kg	45.5kg
Back/Leg Dynamometer	116kg	116kg	140kg
Standing Test	>10s	>10s	>10s
8 Foot Walk Test	2.21s	1.89s	2.30s
Chair Rise and Sits	13.69s	12.83s	13.20s

Adherence to these exercise session twice a week for 6 weeks was 100 percent. Two sessions for C01 were rescheduled and C02 did not have to reschedule any sessions. All twelve of the at home sessions were reported by the participants as complete.

Questionnaire Responses

While the responses to the questionnaires were all very unique and important, four questions from each three week time period were chosen based on the importance and relevance to the study purpose. The questions chosen also illustrate the participants' possible reasons for adherence versus drop out.

In week three, self report questions 4, 5, 6 & 7 were chosen for their relevance to the study.

4) Has exercise been an outlet for you in the past (stress relief or enjoyment)?

C01: The participant strictly lifted weights when he was younger to stay tough and look good. Exercise was not done for any type stress relief or enjoyment.

C02: The participant never saw it as something he needed as long as he could get around. He was in the Navy, so exercise was something that was forced on him. Exercise has not been done for stress relief or enjoyment in the past.

5) Do you consider exercise to be an outlet for you now (do you look forward to your exercise sessions)?

C01: The participant is only participating as a favor to us and the doctor.

C02: The participant does enjoy our sessions now. His mind has changed about what exercise means for him.

6) Do you have any worries about completing the entire 12 weeks of exercise?

C01: The participant is concerned because he says that they are going to perform 39 radiation treatments. He is not sure he will make it through.

C02: The participant does not have worries about completing as long as he does not experience any other health complications.

7) Have you begun to notice physical effects of your treatment?

C01: The participant has experienced a loss of taste, dry mouth, burnt skin, peeling of skin, physical and mental fatigue, weakness of muscle (states that our sessions are helping him to still “feel strong”).

C02: The participant has experienced a stiff neck, sore throat, but no fatigue yet.

In week six, self report questions 1, 2, 3, & 6 were chosen for their relevance to the study.

1) In your opinion has exercise, in addition to nutritional counseling, improved your overall quality of life?

C01: Nutritional counseling has kept the participant active during the sessions and also at home apart from the times we meet. He doesn't feel like sleeping all the time anymore.

C02: The participant feels as though he is keeping his strength, he is not sure what it would have been like without exercise.

2) Are there any positive outcomes that you are seeking from this exercise regimen?

C01: The participant wishes to continue to gain strength and muscle mass and seeks to continue exercising when our study is complete.

C02: The participant wants to keep his strength and being able to continue working on his farm.

3) In what ways have the physical effects of your treatment been problematic for exercising?

C01: The participant states that fatigue, weight loss (lost 9 lbs. in week four of the study), swallowing, dry mouth, fever, simply not feeling well have been problematic for his exercise.

C02: Fatigue keeps the participant from giving 100% all the time. Neck sores and bleeding keeps him from doing neck exercises. Knee pain makes some of the stretches difficult for him to do.

6) Do you feel more or less confident in your ability to complete the 12 week program?

C01: The participant feels confident and says that he will finish. He is more confident now that he understands all exercises and his capabilities.

C02: The participant is confident he can do it.

In week nine, self report questions 3, 5, 6, & 8 were chosen for their relevance to the study.

3) Do the weekly calls I am making have an effect on your decision to follow through with the workouts?

C01: The participant stated that the calls help with his accountability.

C02: The calls help the participant in case something is wrong. For example he was struggling with the reverse curl, so we had to change this exercise to do one leg at a time.

Weekly calls help for accountability and for question purposes.

5) Are you more/less concerned about completing the 12 weeks at home?

C01: The participant is more confident to complete he feels better every day.

C02: Week 1 and 2 the participant was unsure if he could complete, but now that he is finished w/ radiation and his neck is healed he feels better able to complete the twelve weeks.

6) Is this exercise program something that you would encourage other cancer survivors to do?

C01: Yes, the participant suggests this depending on the age of the client. He thinks someone over 75 would have a hard time completing these workouts.

C02: Yes, the participant would encourage others to try the program. No more distress than not doing it. Tell others to slow down but keep with it. Every little bit helped him.

8) Do you feel that the exercises you are completing are improving your quality of life as a cancer survivor?

C01: The exercises helped keep the participants mind off treatment. They also helped to loosen his neck and keep it less sore.

C02: The participants QOL improved throughout the study from week 1-week 12, it was stated that his QOL; however, at week 12 his QOL was not better than his prediagnostic state. He stated, "If he had not done the program he would not have recovered as fast." The exercises kept him moving which in turn kept him mentally intact because he thought less about the diagnosis. Exercises also kept him moving.

In week twelve, self report questions 1, 2, 3, & 4 were chosen for their relevance to the study.

1) Do you feel that you successfully completed all 12 weeks of this study?

C01: Yes, the participant feels like he was very successful for the entire 12 weeks. He did not want to give up his resistance bands; his mom was beginning to use them as well.

C02: Yes, the participant has been doing an extra session most weeks.

2) What were factors that helped you achieve/hindered the completion of the program?

C01: The participant wanted to stay true to promising Dr. Robbins he would participate. He stated that the program gave him energy, and this encouraged him to continue.

C02: The participant enjoys doing exercise once he gets started. This is the first time he has ever done this so it is hard to get started, but from then on he enjoys it, especially on days he is feeling good.

3) What were the most physical/mental limitations that made completing workouts in these last three weeks difficult?

C01: According to the participant, week 4 was very difficult to get through due to the radiation really causing him to experience fatigue. He stated that it only got easier after Week 9. The participant was more and more motivated knowing he was completing something that would be beneficial for others in the future.

C02: The participant reported no physical limitations. He stated that being able to remember the benefits caused him to be less motivated to start and finish the exercises.

4) Did some of the positive outcomes that you were hoping for from this study come true?

C01: The participant stated that he “Didn’t become a muscle man, but he feels better. It helped him keep his strength up.”

C02: The participant isn’t sure what he would have gotten through without it. He did notice strength gain and flexibility gains coming true.

Nutritional Results

While C01 noted that food tasted bad, he continued to eat as much as he could. Often his diet consisted of macaroni and cheese, cream of wheat, ensure, ramen noodles, hamburger, corn beef and cabbage. Despite pain in his throat and food tasting poorly,

C01 did not experience a lot of difficulty eating most soft foods; however, due to his area of treatment and removal of his teeth, he did have to avoid acidic and hard foods. C01 also supplemented with three cans of Ensure® a day, and drank large quantities of water.

Participant C02 kept his appetite throughout treatment, continuing to eat foods and portions that were similar to his pre-diagnosis diet. Participant C02 ate a high fat diet consisting of bacon and eggs on most mornings, ham and cheese sandwiches with potato chips in the afternoon, and fried chicken or pork in the evenings. The dietary maintenance of C02 was likely enhanced by the location of his radiation being on the posterior portion of his skull, as opposed to on the anterior portion of his neck. C02 also seemed to have high energy levels, and a positive outlook on his progress through the study and this may have been due, in part, to his ability to maintain his diet.

CHAPTER 4

DISCUSSION

Quantitative

In participant C01, BIA tests showed an increase in body fat percentage concurrent with a decrease in lean weight and an overall total weight loss. According to Halpern-Silveira et al. (2009), individuals participating in exercise and nutrition interventions on average experience less weight loss than head and neck cancer survivors not receiving exercise or nutrition care. On a percentage basis, it has been found that with exercise and nutritional guidance, head and neck cancer survivors may be able to maintain 10% more body weight than those without guidance (Silver, Dietrick, & Murphy, 2007).

C01 lost 4.17 kilograms of body weight from week 1 to week 12 of exercise. Beginning at 71.4 kilograms, he lost 4.3 kilograms by week 6, and was back up to 67.23 kilograms by week 12, a total weight loss of 4.17kg (5.8% of his body weight). According to a study completed by Munshi, Pandey, Durga, Pandey, Bahadur, & Mohanti (2003), 74.3% of head and neck cancer survivors lose greater than 10% of their body weight. With C01 losing only 5.8%, this result puts him in the upper 25.8 percentile of this population and indicates that his body weight outcome may have been enhanced by study participation. Beginning with a lean weight of 57.2 and ending the program with 49.55 kilograms of lean weight, C01 lost 7.7 kilograms of lean weight. This was a total lean weight loss of 13.46%. Participant C01 also gained 6.3% body fat from the beginning to the end of the study.

As stated in the paragraph above, the loss of 5.8% total weight that C01 experienced may be partially attributable to nutritional support in addition to resistance exercise. As noted in the results, despite pain in his throat and a loss of appetite, C01 continued to eat many foods typical of his normal diet throughout his treatment. C01's minimal loss of weight may have contributed to his ability to sustain his energy level and maintain a better quality of life throughout the study. In anticipation of the severe weight loss that often takes place in head and throat cancer survivors, C01 may have changed increased his caloric intake prior to and in the first stages of treatment and this could have contributed to his 6.3% gain in body fat, as well as his ability to reduce his overall loss of body weight.

A possible contributor to the continuous loss of weight in C01 from week 0 to week 12 could have been his tobacco and alcohol use prior to and during his initial diagnosis. Smoking tobacco and drinking alcohol can cause side effects such as loss of taste and sore throat to occur earlier in radiation treatment. Earlier onset of these side effects may have contributed to increased loss of weight at an earlier stage.

Participant C02 maintained his weight throughout the 12-week program. C02 had lost only two kilograms (4.4 lbs) by week 6, and was slightly above his original weight of 117 kilograms in week 12 at 117.7 kilograms. This weight maintenance puts participant C02 in the upper 25.8 percentile for weight loss as well (Munshi et al., 2003). Body fat percentage and lean weight changes from the week 0 assessment could not be calculated due to equipment malfunction; however, these measurements were maintained from week 6 to 12 (body fat %: W6: 52.0%, W12: 51.9%; lean weight: W6: 55.2 kg, 56.7 kg). C02 reported eating well, and did not experience a loss of appetite, especially in comparison

to C01. C02 was able to maintain his overall weight had a positive impact on his ability to continue to participate in the program.

Another factor that may have contributed to weight loss and the inability to maintain lean mass in C01 may be the location of his cancer and the area that was radiated. C02 was radiated on the head and did not have the common side effects of sore throat, tenderness to the area being radiated, nausea, loss of taste, or a metallic taste that C01 experienced and that are typical with cancer located in this area of the body (Duffy, Scheumann, Fowler, Fisher, & Terrell, 2009). These side effects were felt acutely by C01 and could have contributed to a lessened desire and inability to consume most meats and other solid foods that are high in protein. These nutritional deficits make it even more difficult for the body to build muscle and this could have contributed to the negative body composition results for C01.

When measuring functionality and strength, it was found that C01 experienced a decrease in right and left hand grip strength, an increase in leg strength, an increase in self-selected walking speed, a decrease in time to complete sit to stand, and no difference in balance performance. C02 experienced strength gains in hand grip and leg strength, a decrease in self-selected walking speed, a decrease in time to complete sit to stand, and no differences in balance performance. While changes in strength and functionality are mostly positive overall, the loss of average hand grip strength in C01 may be attributed to general fatigue, loss of upper body muscle mass, and the site of surgery/radiation. Specifically, C01 had surgery and radiation in the neck area. This could have affected his ability to squeeze the dynamometer due to the involvement of the muscles of the neck in this activity. The loss of musculature in this area may have had an impact, but there may

also have been pain in this area during this activity that restricted his ability to produce force. C02 experienced surgery/radiation on the back portion of his head and thus he may not have felt these effects.

While lower body strength appeared to be unaffected in both subjects, a slight decrease in self-selected walking speed in C02 was indicated while C01 took a full second off his walking time. The age of participants may have contributed to their potential for improvement in walking speed. While C01 was 43 years old, C02 was 70 years old and improvements in walking speed may have been easier to establish for C01. At age 70, C02 had been sedentary for a number of years and this pattern may have had a cumulative negative impact on his walking speed that would be hard to overcome. C01 is considerably younger, and despite the fact that he was relatively sedentary prior to study participation, his relative youth and fewer cumulative years of sedentary lifestyle would likely provide him with a greater ability to improve. Also, due to his young age, C01 likely increased the overall amount of walking that he was doing as he began to feel stronger during the study to a greater degree than C02, impacting his average speed in a positive manner. During warm up, C01 walked with a greater speed than he walked normally and this most likely helped him to achieve a higher normal walking speed during the testing sessions. C02's warm-up pace was not that far above his normal walking pace. This differential in selected intensity of warm up could be an indication of the participants' selected intensity level for general exercise throughout the 12 weeks (outside the training sessions). Surgery, as well as radiation in the brain in C02 could also have potentially affected motor skill performance and, in turn, his walking confidence.

Finally, C02 had lower body musculoskeletal issues that may have prevented him from improving his walking pace.

Qualitative

The Week 3 Case Study Questionnaire focused on the individual's self efficacy and motivation for participation in exercise. When asked "Has exercise been an outlet for you in the past?", it is noted that neither participant has used exercise as a means for stress relief or enjoyment in the past. C01 exercised in the past only to look good, while C02 was forced to exercise in the military. Participants were asked if they viewed exercise as an outlet for stress relief or enjoyment after 3 weeks of study participation. C01 responded that he was completing exercise as a favor to his doctor; however, C02 stated that he is beginning to enjoy the sessions because he has changed his mind about what exercise means for him. While C01 was concerned about his ability to complete the entire 12 weeks of exercise, C02 had a positive outlook on his ability to complete the 12 weeks. Three weeks into the treatment C01 was already beginning to experience the physical side effects of loss of taste, dry mouth, burned skin, peeling of skin, mental and physical fatigue, and weakness of muscle. C02 reported a stiff neck and sore throat, but was not yet beginning to experience fatigue.

The differing physical responses could possibly be correlated to the differing lifestyle choices (smoking and consumption of alcohol) of participants before and during the initial stages of treatment, affecting both attitude and physical responses to the treatment and exercise. While smoking is a primary contributor to throat cancer, it can also worsen the physical side effects of treatment. While more research is still needed in

this area to distinguish why, one theory suggests that smoking deprives the body of much-needed oxygen which radiation therapy requires for the production of free radicals, which attack cancer cells (Chen, 2010).

As stated earlier, the surgery/radiation site of the neck in C01 compared to the scalp in C02 may have also significantly impacted the dietary habits of C01. A reduction in nutrient intake can trigger an increase in fatigue/energy loss and this could have impacted the qualitative responses of C01.

The Week 6 Case Study Questionnaire focused on the positive and negative outcomes that arose from participation in the exercise program. When asked about exercise and its effects on quality of life, both participants avoided using the term quality of life, but stated gains in activity and strength. C01 spoke about the effect that meeting with a trainer had on decreasing the excessive sleeping habits he had developed since he was diagnosed. Keeping strength was one of the most important motivators for C01 and C02 to continue exercising, and they were both hoping for strength gains as a positive outcome from exercise.

Both participants voiced their concern for the physical effects of their treatment being problematic for exercise. C01 reported fatigue, weight loss, dry mouth, fever, and simply not feeling well. C02 reported fatigue, neck sores, and knee pain. When asked if he felt more or less confident in his ability to complete the 12 week program, both participants reported that they felt more confident after the first 6 weeks. C01 also reported that he was more confident because he understood all the exercises and his capability to complete them. While many of the responses in week 6 were similar, the

side effects of weight loss (9 lbs in week 4) and excessive dry mouth in C01 seem to be premature compared to other survivors in the sixth week of treatment (Uta, Sven, & Alarcos, 2010). This finding could have possibly been due to both the site of radiation on his neck, and his choice to continue to smoke and drink.

The week 9 questionnaire was given over the phone due to the home-based nature of the participants' exercise sessions at that time, and many of the questions were centered around the changes in their perception of the workouts now that they were at home. When asked if the weekly calls to complete the questionnaire over the phone affected their decision to follow through with the workouts, they both replied that the calls helped with accountability, but that they would still have completed the remainder of the sessions without the calls. Both participants C01 and C02 reported being more confident in their ability to complete the 12-week protocol in week nine even though they were exercising on their own at home. Both C01 and C02 indicated that they would encourage other cancer survivors to participate in this exercise and nutrition program. At age 42, C01 also said that he thought someone over 75 may have a hard time participating, while C02 at the age of 70 did not set an age limit to the protocol.

Participants were again asked about the effect of the protocol on their quality of life. C01 spoke about how the exercise kept his mind off the treatment, and helped to loosen his neck. C02 talked directly about how his quality of life has improved throughout the protocol, but stated that he was not stronger than before he was diagnosed. He felt as though he would not have recovered as fast without the exercise. Similar to C01, C02 also reported that exercise helped to keep him mentally focused. C02 stated that the exercise was a mental distraction from thinking so much about his cancer. While

it appears the perceived physical components of quality of life were not affected similarly between the two participants, the mental components were.

The week 12 questionnaire was a reflection on participation in and completion of the study. Both participants felt that they had successfully completed all twelve weeks of the study, and C02 reported doing extra sessions during most of the second 6 weeks (beyond the two required sessions). While both participants listed many factors that helped them complete the program such as: a sense of achievement, feeling good after completion, and feeling stronger, neither reported any factors that hindered their participation. C01 listed extreme weight loss in week four as a physical limitation to completing workouts and C02 listed no physical limitations. C02 did report being limited in understanding and remembering the benefits that could come from nutrition and exercise. When asked if they saw any of the positive outcomes that they were hoping for from this study, both participants reported perceived strength and flexibility gains.

Potential Limitations

A limitation related to C02's participation was that he ended radiation treatment two weeks prior to the week 6 assessment. In this situation, a new meeting place for the exercise sessions was established causing a decrease in convenience for the participant, as well as possible environmental changes that may have affected the warm up and cool down protocols. For example, C02 used the hallway of the oncology office in his warm up and cool down during the first 4 weeks. When the meeting place changed for week 5, he was forced to walk outside due to lack of space. In the warmer, non-climate controlled

environment, C02 likely slowed his warm-up walking speed, which may have impacted his walking pace during the week 6 and 12 assessments.

Another limitation that may have resulted from the week 5 exercise session site change was related to the resistance training protocol. Some of the resistance band exercises, particularly the leg curl exercise, had to be adapted when the location of training was changed. The leg curl exercise requires the participant to hook the opposite end of the resistance band to something sturdy and heavy. Changing the position or angle of the anchor for these exercises could, in turn, have an effect on the resistance provided to the subject. This adaptation could have caused a decrease in resistance consistency and a reduction in potential adaptation to the protocol

CHAPTER 5

CONCLUSION

The results of the study point toward a positive impact of dietary counseling and resistance training on muscle strength, lean muscle mass, functional ability, and exercise adherence in two individuals with head and neck cancer. The participants' reports of feeling stronger and more flexible as well as satisfaction with the outcomes likely influenced their adherence to the diet/exercise sessions as well their perceived quality of life during treatment. Through the qualitative questionnaire, it is anticipated that a clearer understanding of the decision to exercise in cancer survivors may be established. With this qualitative tool, professionals may acquire a better understanding of the barriers to exercise that head and neck cancer survivors experience at different points in their treatment. This understanding may enable professionals to better encourage survivors to be active and improve their treatment tolerance. Further research is still needed in this area, but it appears that this protocol leads to positive outcomes and is well tolerated.

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APPENDIX

Appendix A

Condition and Progression Qualitative Questionnaire

Week 3 Questionnaire

- 1) What were your thoughts initially when you found out you were in the exercise group?
- 2) What are some of your most pressing health concerns other than your cancer diagnosis?
- 3) Are there any specific areas of your life that you are hoping exercise could improve the quality of?
- 4) Has exercise been an outlet for you in the past (stress relief or enjoyment)?
- 5) Do you consider exercise to be an outlet for you now (do you look forward to your exercise sessions)?
- 6) Do you have any worries about completing the entire 12 weeks of exercise?
- 7) Have you begun to notice physical effects of your treatment?
- 8) Is an exercise regimen something that you would recommend to other cancer survivors?

Week 6 Questionnaire

- 1) In your opinion has exercise in addition to nutritional counseling improved your overall quality of life?
- 2) Are there any positive outcomes that you are seeking from this exercise regimen?
- 3) In what ways have the physical effects of your treatment been problematic for exercising?
- 4) Have you developed additional health concerns other than your cancer diagnoses?

- 5) Have you noticed any day to day differences in your diet affecting your exercise sessions (energy, enthusiasm)?
- 6) Do you feel more or less confident in your ability to complete the 12 week program?
- 7) How do you feel about the intensity of the exercise sessions (too much, too little)?
- 8) How do you feel about being randomized into the exercise group as opposed to the nutrition only group?

Week 9 Questionnaire

- 1) Have your home workouts been as successful as working out in your supervised session?
- 2) Do you find it harder to get motivated for your home workouts?
- 3) Do the weekly calls I am making have an effect on your decision to follow through with the workouts?
- 4) Is there a way that I can better encourage you in your home workouts?
- 5) Are you more/less concerned about completing the 12 weeks at home?
- 6) Is this exercise program something that you would encourage other cancer survivors to do?
- 7) What are some positive/negative outcomes that you feel have resulted from your participation in this program?

- 8) Do you feel that the exercises you are completing are improving your quality of life as a cancer survivor?

Week 12 Questionnaire

- 1) Do you feel that you successfully completed all 12 weeks of this study?
- 2) What were factors that helped you achieve/hindered the completion of the program?
- 3) What were the most physical/mental limitations that made completing workouts in these last three weeks difficult?
- 4) Did you realize some of the positive outcomes that you were hoping for from this study?
- 5) In your opinion, did this exercise program in addition to nutritional counseling help improve your quality of life?
- 6) Is there anything that we could have done differently within the study to accommodate you?
- 7) While working out on your own, did you find yourself keeping up with the appropriate intensity of your workouts?
- 8) What were some major differences in your exercise regimen from supervised to unsupervised sessions?

VITA

Graduate School
Southern Illinois University

Chelsea S. Bradley

Date of Birth: May 9, 1987

1101 Grand Ave, Apt. C10, Carbondale, Illinois 62901
816 East Sunset Drive, Steeleville, Illinois 62288

chelseasamantha@live.com

Southern Illinois University Carbondale
Bachelor of Science in Education, Exercise Science, May 2009

Special Honors and Awards:
Biltmore Who's Who

Research Title:

A CASE STUDY COMPARISON OF THE EFFECTS OF A RESISTANCE TRAINING
AND NUTRITION INTERVENTION IN HEAD AND NECK CANCER SURVIVORS

Major Professor: Dr. Philip Anton