AN ABSTRACT OF THE THESIS OF

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This thesis is an investigation into the human physiological response to a neutral drawing experience, drawing from art therapy and biofeedback to examine what is happening as the participants draw. The hypothesis was that hand temperature will rise while a person is drawing. A rise in hand temperature is associated with relaxation. To test this hypothesis, a quantitative study was developed which uses descriptive statistics. Participants were requested though the Department of Psychology and Special Education at Emporia State University. Out of an initial 100 students who responded 86 students were present at the data collection sessions and 82 sets of data are reviewed in this study. The participants were asked to draw in response to the directive "draw a person picking an apple from a tree" while the researcher recorded their hand temperatures over a 16 minute period. Out of the 82 usable sets of data, 48 showed a rise in hand temperature. None of the correlations that were made to explain why some participants did or did not show a rise in hand temperatures were statistically significant. The results are inconclusive but worth replicating with the limitations addressed. This present research can stimulate further investigations into the physiological responses to art making.

THE PHYSIOLOGICAL RESPONSE TO THE DRAWING EXPERIENCE

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

This thesis investigates the physiological response to art making. The researcher observed changes in hand temperature while participants were engaged in a neutral drawing activity. Data were gathered by using the thermal biofeedback technique of monitoring hand temperature. A questionnaire and an anxiety scale added a more detailed picture of participant responses to a single drawing activity. The hypothesis was that hand temperatures would raise while a person is drawing.

A rise in hand temperature is associated with relaxation (Fuller von Bozzay, 1980). As people consciously learn to relax the body, the physiological effect of the relaxation response (i.e., a decrease in muscle tension, heart rate, blood pressure, breathing rate, oxygen consumption) is opposite the effects of psychological stress (Stova, 1989). In the field of art therapy, art making can lead to relaxation as suggested by Marcia Rosal (2001), who discussed the use of art making to enhance relaxation in art therapy. Art therapists often work on this assumption even though the physiological aspect of art as a relaxation intervention has not been confirmed.

Developing this thesis has lead to a synthesis of concepts from art therapy and biofeedback. This study is intended to broaden the understanding of the therapeutic benefits of art making, offering descriptive statistics as data on physiological changes during art-making activities. The results provide some evidence for the use of art therapy for relaxation.

Literature Review

Biofeedback

A fundamental understanding of biofeedback is needed to explain the approach of this investigation into art therapy. Biofeedback makes known what is happening inside the human body. With this knowledge the person can learn to regulate consciously what normally are unconscious physiological processes.

Biofeedback leads to the ability to manipulate bodily processes, such as blood flow, breathing, heart rate, or muscle tension (Basmajian, 1989a). Electronic equipment is commonly used to provide auditory or visual information so that a person is able to learn to control processes inside the body that are normally involuntary (Basmajian, 1989a). With this equipment a feedback loop is developed in the interaction between the person and the instrument (Fuller von Bozzay, 1980).

A biofeedback loop leads to a person's ability to add consciousness into the physiological process. What was once an unconscious, involuntary action within the body is now a conscious and voluntary action through the use of biofeedback equipment and training (Green & Green, 1989). What is happening physiologically can be observed and measured. As internal changes happen, the person trains to relate consciously an internal feeling to the external feedback, thus closing the loop (Green & Green, 1989).

A benefit in using electronic equipment is that the equipment is able to provide "moment-to-moment" data with regard to changes in bodily responses (Miller, 1989). Perceiving these often minute changes provides a chance for rewards (such as collecting points in a computer game, making sounds rise and fall, or feelings of relaxation) to be given when positive movement is made in the desired physiological function (Miller,

1989). Through positive rewards, the person learns to make incremental changes in physiology until the desired effect is created without the use of the biofeedback equipment (Miller, 1989). This learning and the ability to create similar effects outside of the biofeedback session makes biofeedback effective in practice.

Biofeedback encompasses many goals and techniques to improve the lives of clients. Elmer and Alyce Green (1977), pioneers in biofeedback, state:

> Research in many laboratories has demonstrated voluntary changes in such diverse functions as blood flow, heart rate, blood pressure, brain waves, gastrointestinal functions, and airflow in the bronchial tubes (for asthma control). Increased, and sometimes restored, control in paralyzed or spastic muscles has also been demonstrated. (p. 43)

This list, although impressive, is not exhaustive. Uses of biofeedback encompass many aspects of an individual's life, such as improving physical disorders like asthma, bed-wetting, cardiovascular problems, cerebral palsy, chronic pain, epileptic disorders, gastrointestinal disorders, migraine headaches, muscle re-education, sexual dysfunction, Raynaud's disease, and voluntary movement disorders (Basmajian, 1989b; Fuller von Bozzay, 1980; Green & Green, 1977). In addition to physical issues, biofeedback can assist in psychotherapeutic interventions. The client learns about relationships among physiology, emotions, internal needs, drives, and emotional reactions (Fuller von Bozzay, 1980).

Most often the main goal of biofeedback training is to gain control over a physiological process while at the same time learning how to achieve and maintain a general state of relaxation consciously (Fuller von Bozzay, 1980). Through repeated

practice and training, the skill of relaxation develops both in the biofeedback session and everyday life (Fuller von Bozzay, 1980). An individual can train to enter a state of relaxation in many different situations until the use of biofeedback equipment is no longer needed.

Achieving these various goals requires many different kinds of equipment such as the electromyographic feedback (EMG) for muscle activity training; electroencephalographic feedback (EEG), which utilizes brain wave activity; electrodermal feedback (EDR), which measures electrical activity of skin; and thermal feedback, which employs the temperature of the skin, usually hand temperature (Fuller von Bozzay, 1980). Different types of equipment can be used simultaneously depending on the needs of the client.

This study used thermal feedback to obtain physiological data. Thermal biofeedback is a simple and effective technique in treatment that provides a picture of internal functioning (Fuller von Bozzay, 1980b). The equipment is usually small, inexpensive, and accurate to .01 of a degree. Clinical psychologists and related professionals have found thermal biofeedback an important tool in their work (Basmajian, 1989b).

The workings of thermal biofeedback are rooted in the nature of the sympathetic nervous system (Fuller von Bozzay, 1980). The body responds to environmental conditions, biochemical factors, and psychological factors through an automatic response that adjusts body temperature as it attempts to maintain homeostasis (Fuller von Bozzay, 1980). The small blood vessels in the hands dilate or constrict in response to sympathetic nervous system activity, thus changing the temperature of the skin (Peffer, 1989). As

bodies relax, the sympathetic nervous system allows the blood vessels to dilate, thereby increasing skin temperature (Fuller von Bozzay, 1980).

Skin temperature rises during relaxation. Skin temperature falls during tension or anxiety. In a biofeedback session, a thermometer is placed on the middle finger of the non-dominant hand (Stova, 1989). With the thermometer in place, clients are able to watch their temperature rise and fall in response to internal feeling states. Clients soon find that emotional stress and anxiety directly affect the readings of the thermometer (Fuller von Bozzay, 1980).

Biofeedback for relaxation training requires the client to employ the biofeedback loop as a way to create and sustain a relaxed state (Fuller von Bozzay, 1980; Green & Green, 1977, 1989). This training may take anywhere from one month to as long as the client is continuing to gain physiologic control (Green & Green, 1977, 1989). Training is reinforced with daily or weekly sessions and/or home practice to maintain the skill of relaxation (Green & Green, 1977, 1989).

For this study, the thermal biofeedback equipment was not used as a relaxation training method. Using a training method for this study would have changed the purpose of the study from finding out what happens physiologically as the participants draw to whether or not art can be used as an additional method for relaxation training in a biofeedback context. Instead, thermometers were used to record changes in body temperatures while participants draw. This provided information that was useful in the context of assessing art making as a relaxing intervention. The information that is gathered in short periods of time, similar to this project, are not useful in reference to

therapy (Miller, 1989). However, biofeedback measurements support the verbal reports of relaxation by the clients (Green & Green, 1977).

Using the thermal biofeedback technique for this study supported personal observations in my biofeedback work with clients. If the client is experiencing difficulty relaxing, providing a drawing experience appears to initiate relaxation. The drawing experience appears to provide a non-threatening way to help the client move into a less anxiety-laden state. Is this change reflected in thermal biofeedback?

Art and Creativity

Art making changes emotional states and physical behavior in clients. As an artist, I have experienced my mind and body transforming as I engage in the process of art and creativity. The following was written in personal response to one of those moments:

> Finally it is quiet. The day has been long. My body is aching and my mind is swirling with the thoughts of the day. Before me there is a blank canvas. With my mind still reeling I pick up a brush, find a deep vibrant red, and confront the canvas. As an image begins to grow, I am transformed. Energy is now racing through me. What was once a labored and tired breath now comes smoothly and fully. My body, once aching, is now a smooth powerful instrument of creative energy. My mind, once fogged with thoughts and worry, is now in a state of flow and openness to this experience. For right now, there are no worries.
>
> (Goettemoeller, 2004, p. 3)

The above statements refer to the changes that happen within a person physically, cognitively, and emotionally when engaged in art making. Such reflection led me to further investigate creative experiences.

Art making leads to altered mental, emotional, and physical states. Dr. Betty Edwards (1989), who investigated the relationship of drawing and the brain, referred to entering an altered state of consciousness as a common experience to anyone who engages in art making. She connected this experience with meditation and other activities (e.g., jogging, needlework, and listening to music) that are often found relaxing or exhilarating (Edwards, 1989). She saw drawing as a way to quiet the mind and provide a chance to see the world in a new way (Edwards, 1989).

Deepak Chopra (1993), a leader in the mind/body medicine, discussed how creativity may change the brain itself in healing ways. Positron emission tomography (PET) scans discovered a particular rhythm in brainwaves corresponding to a creative state. When engaged in focused and pleasurable mental activity, the mind enters a state of brainwave activity that is relaxed yet alert, similar to a meditative state. When in this brainwave rhythm of creativity, an individual connects in a different way to reality; time slows and creativity flows (Chopra, 1993).

Within the field of art education Feldman (1970) discussed the release of tension when in the creative process. Tension and frustration normally accumulate. Art making can then be a way to release that tension in a socially acceptable way.

Art and the Body

With awareness about how the mind and body interact, do different states of consciousness change the physiology of the body? Relaxation and meditation change various physiologic responses such as skin temperature, which can be seen with biofeedback equipment. However, research about the relationship between art and physiological responses is lacking.

Norman Cousins (1979), a journalist who personally discovered the power of the mind-body connection in healing, discussed the transformative nature of being in a creative state and the power of that state to change the hormones of the body. For one of the people he interviewed, Cousins (1979) stated that artistic creativity triggered production of cortisone to combat the interviewee's arthritic pain. The interaction of this man's body and mind created substances safer and more effective than anti-inflammatory medication (Cousins, 1979). However, this relationship has not been supported by systematic research.

Samuels and Lane (1998) are pioneers in the study and use of art and creativity in medicine. They combined personal experiences of the healing nature of art with medical knowledge to begin their use of art as part of their healing work. Their discussion of the relationship between healing and art is the most relevant reference related to this investigation into physiological changes and art making.

When an individual is engaged in art making, the autonomic nervous system is triggered resulting in relaxation (Samuels & Lane, 1998). Measurable physiological changes such as lowering of blood pressure and a slowed heart rate are initiated, (Samuels & Lane, 1998). This study's use of the thermometer to detect change in skin temperature adds to Samuels and Lane's research into art and healing.

Summary

The hypothesis of this study was that hand temperatures would raise while a person is engaged in a neutral drawing activity. The review of biofeedback supports the notion that a connection between relaxation and hand temperatures exists. The review of the art and creativity literature supports art making as a way relax. Logically, combining

these two ideas produces the prediction that as a person makes art, hand temperature should rise.

This study adds descriptive statistical data to the observations and assumptions about what happens as a person is making art. While art therapists know that art is healing, awareness of how it may heal the body is based on intuition and observation. This awareness opens up opportunities for powerful changes in the lives of art therapy clients. Art therapists would be able to systematically offer certain art exercises to clients experiencing physiological stress with scientific understanding of the effects of the art experience.

This study utilized descriptive statistics adding new data and information to the field of art therapy. The thermal data collected while participants drew and the statistical correlations between anxiety and skin temperature provide a foundation for further research. The goal of this study was to expand the possibilities of further research into the physiological impact of art making in the use of art in treatment.

CHAPTER 2

METHOD

This quantitative study utilized descriptive statistics to analyze the correlations among hand temperature, anxiety, and art making in a sample of college students. Digital thermometers were used to gather the thermal information from the participants, thus observing the physiological response to art making.

Participants

Volunteer undergraduate students, age 18 or older, in psychology classes at Emporia State University were research participants. The participants were obtained from a volunteer sign up-sheet in the psychology department. A total of 100 students signed up to participate in this study. Of those students who responded, 86 came to the data gathering sessions. They were divided into 10 groups of 10 or fewer participants in each group.

Instruments

A Participant Information Form (Appendix A) was used to obtain demographic information. It also contained questions regarding level of previous artistic experience to help gauge preexisting anxiety with the artistic process.

A pilot study found that lack of information regarding previous artistic experience was a limitation to the study. In the pilot study, feelings of being judged in regards to drawing ability might have accounted for lowering of skin temperature. The information provided by the Participant Information form (Appendix A) presented a clearer picture of what is happening as the participants draw.

The Beck Anxiety Inventory (Beck & Steer, 1993) was used to provide information about each participant's incoming level of anxiety. The pilot study showed that skin temperatures of participants went down for those who were already anxious, as seen by low overall skin temperature readings. The anxiety screening adds information to the thermal data so stronger conclusions can be made in regard to how the art making activity affects the physiology of anxious verses non-anxious participants.

The Beck Anxiety Inventory (Mental Measurements Yearbook, 1993) has internal consistency reliability between .85 and .94. Beck, Epstein, Brown, and Steer (as cited in Beck Anxiety Inventory, 1993) gave a test-retest reliability coefficient of .75 over a one week time period. Concurrent validity of the inventory with the Hamilton Anxiety Rating scale is reported as .51, with the anxiety subscale of the Cognition Check List .51, and with the State-Trait Anxiety Inventory a correlation of .58 was found with Trait anxiety and .47 with State anxiety (Beck & Steer, 1993).

A digital in/out thermometer with a ten-foot cord and sensor was used to measure changes in the hand temperature of each participant. The thermometer (Digi-thermo, item #33080) is sold through Harbor Freight Tool Company. In the information provided with the thermometer, a reliability in measurement of temperature measured in 1/10 degree and an accuracy of + or – 1 degree Celsius is provided. The sensor was placed on the middle finger of the non-dominant hand with a piece of tape. As Fuller von Bozzay (1980) stated, "A thermistor placed on a distal digit, which is most responsive to the stress stimuli, allows measurement of skin temperature changes" (p. 29).

Procedure

Two drawing directives were used in this study. The first was a free drawing. Participants were told, "Please use one sheet of the drawing paper and the oil pastels provided to draw whatever you would like to draw. You will have five minutes to complete this part of the exercise. I will let you know when the time is over." This free drawing was used to provide the participants an opportunity to get accustomed to the materials and the situation in a way similar to what would happen in an art therapy situation. The temperature readings were not recorded at this time.

The second drawing directive, "Draw a person picking an apple from a tree" (PPAT), was first described by Victor Lowenfeld (Gantt & Tabone, 1998, p. 5). This particular drawing was used to provide a neutral directive. The observed thermal data was correlated with scores from an anxiety scale and a questionnaire in regards to previous experience with art making. Participants were given 16 minutes to draw. Thermal data was collected every two minutes for a total of nine temperature readings. A time of 16 minutes was used instead of the 20 minutes originally used in the pilot study, in response to the researcher's observation that many of the participants completed their drawings before the twenty minutes were completed. This resulted in a decrease in temperature reading for some participants skewing the results.

Before the research session tables and chairs were arranged so that 10 places were prepared for drawing. At each seat a temperature sensor was placed with the digital display placed near researcher and assistant. At each chair two pieces of drawing paper, a package of oil pastels, and two sharpened pencils was placed. A package of other materials was placed on top of the drawing paper. The package contained two consent

forms (Appendix B) one that was signed for the researcher and another that was given to the participant for contact information. Also included in the package were the Participant Information Form (Appendix A) and the Beck Anxiety Inventory (Beck & Steer, 1993; Appendix C). Each form was coded with a number from 1 to 100. This code number was placed on all information produced by that individual.

Participants who had a cold or flu that would have affected their body temperature were asked not to participate. Participants who were under 18 years old were allowed to stay in the information gathering session and obtained research points. However, the data gathered from these participants were not included in the results due to lack of appropriate informed consent. Participants were asked to refer to the informed consent form in front of them. The researcher verbally read the informed consent to the participants and time was given for questions and answers. The participants were asked to sign the document and then the researcher's copy was collected.

The participants were asked to fill out the participant information form (Appendix A) in front of them. They were given approximately 5 minutes to fill it out at which time it was collected.

The participants were then asked to fill out the anxiety screening, the Beck Anxiety Inventory (Beck & Steer, 1993; Appendix C), which was placed before them. Participants were given 12 minutes to complete the form. The scales were then collected.

Temperature sensors were placed on the middle finger of the non-dominant hand of each participant. The sensors were secured by a piece of tape. Both the researcher and research assistant worked with each individual to ensure that the tape and sensor were

placed comfortably on the participant's finger to ensure that the circulation of blood was not restricted.

Participants were told the following, "Please use one sheet of the drawing paper and the oil pastels provided to draw whatever you would like to draw. You will have five minutes to complete this part of the exercise. I will let you know when the time is over." The temperature readings were not recorded at this time. Participants were asked to place their corresponding code number on the piece of drawing paper and the drawings collected.

The drawing script (Appendix D) was read to the participants. The directive "Draw a person picking an apple from a tree" was used. Participants were given 16 minutes in which to draw. The researcher recorded each participant's temperature on a number-coded sheet (Appendix E). The temperature was recorded during the first minute of drawing time and then every two minutes for a total of nine temperature readings.

Participants were asked to place their corresponding code number on each sheet of drawing paper that was used. The drawings were collected, and temperature sensors were removed. The participants were thanked for their participation and given their research point, at which time the research session was concluded.

A research assistant aided the researcher in handing out and collecting the materials, placing the thermometers on the participants, and recording the thermal data of the individual participants on a temperature record sheet (Appendix E). Also, the research assistant aided in computing the thermal data and in scoring the Beck Anxiety Inventory (Beck & Steer, 1993).

To maintain confidentiality the informed consent documents and the data were stored in a locked box in my home. All information with participants' identifying data has been destroyed. Selected anonymous drawings have been kept for educational and presentation purposes.

CHAPTER 3

RESULTS

Thermal Data

Temperature increase. Out of the 82 sets of data 48 showed a rise in temperature from the first reading to the last with a mean rise of 2.05 and a standard deviation of 1.85. In regards to the age of the participants whose temperatures rose, 34 out of the 48 (71%) were age 18 through 20 and 14 (29%) participants ranged from the ages of 21 through 43. In regards to gender in this group of participants, 16 (33%) participants were male and 32 (67%) were female.

In the thermal data from participants whose temperatures rose during the drawing directive, the highest and lowest temperature that was reached over the 16-minute period was computed. The highest temperature had a mean of 88.51 with a standard deviation of 4.29. The lowest temperature had a mean of 85.76 with a standard deviation of 4.94. The difference between the means of the highest and lowest temperature attained is 2.75.

Temperature decrease. Out of the 82 data sets 29 showed a decrease in temperature with a mean drop of –1.38 and a standard deviation of 1.20. In regards to the age of these participants, 17 of the 29 (59%) were the ages of 18 through 20 and 12 (41%) participants were 21 through 47. In regards to the gender of participants whose temperatures went down, 3 (10%) were male and 26 (90%) were female.

In the thermal data from participants whose temperatures fell during the drawing directive, the highest and lowest temperature that was reached over the 16-minute period was computed. The highest temperature reached had a mean of 81.12 with a standard deviation of 5.50. The lowest temperature reached had a mean of 79.17 with a standard

deviation of 5.30. The difference between the means of the highest and lowest temperature attained is 1.95.

No change in temperature. Out of the 82 data sets 5 showed no change in hand temperature. This does not mean that there was no change in temperature over time, only that the last temperature reading was the same as the first over the 16-minute drawing time. In regards to the ages of the participants who showed no change in hand temperature, four out of the five (80%) participants were 20 and under and one (20%) participant was 43 years old. One of the five participants was male (20%) and four (80%) were female.

Within the group of participants whose temperatures showed no change from the first and last temperature readings during the drawing directive, the highest and lowest temperature was computed. The highest temperature reached had a mean of 86.58 and a standard deviation of 3.17. The lowest temperature had a mean of 84.78 with a standard deviation of 3.56. The difference between the highest and lowest temperature is 1.80.

Anxiety

The Beck Anxiety Inventory was given to all participants in this study. Scores in this scale can range anywhere from 0 to 63 (Beck & Steer, 1993). "Total scores from 0-7 points are considered to reflect minimal level of anxiety; scores of 8-15 indicate mild anxiety; scores of 16-25 reflect moderate anxiety; and scores of 26-63 indicate severe anxiety" (Beck & Steer, 1993). Within the 82 sets of data, anxiety scores from the Beck Anxiety Inventory ranged from zero to 45. The number of participants who responded with minimal anxiety was 39 (48%); those who responded with mild anxiety were 25 (30%); those responding with moderate anxiety equaled 13 (16%); and those who

responded with severe anxiety equaled five (6%). Overall there was a mean of 10.13 and a standard deviation of 2.27 within the 82 anxiety scores from the Beck Anxiety Inventory.

Art Experience

Of the 82 participants 20 (24%) answered "yes" to the question "Do you feel you have had more artistic experience then the average person?" The other 62 (76%) participants answered "no." Within the 48 sets of data from participants whose temperatures went up, 12 (25%) participants answered "yes" and 36 (75%) answered "no" to the question of art experience. Within the 29 data sets from participants whose temperatures went down, five (17%) answered "yes" and 24 (83%) answered "no" to the question of art experience. All participants (100%) whose temperatures stayed the same said no to the question of art experience.

Art as a Positive Experience

Of the 82 participants 64 (78%) answered "yes" to the question "Has your artistic experience been positive?" The other 18 (22%) participants answered "no." Within the 48 sets of data from participants whose temperatures went up, 40 (83%) participants answered "yes" and 8 (17%) answered no to the question of art as a positive experience. Within the 29 data sets from participants whose temperatures went down, 20 (69%) participants answered "yes" and 9 (31%) answered "no" to the question of art as a positive experience. Of those 5 participants whose temperatures stayed the same 4 (80%) answered "yes" and 1 (20%) answered "no" to the question of art as a positive experience.

Art to Impress Others

Of the 82 participants, 35 (43%) answered "yes" to the question "When engaged in an artistic activity do you find yourself wanting to impress others." The other 47 (57%) participants answered "no." Within the 48 sets of data from participants whose temperatures went up, 16 (33%) participants answered "yes" and 32 (66%) answered no to the question regarding the desire to impress others with art. Within the 29 data sets from participants whose temperatures went down, 13 (45%) participants answered "yes" and 16 (55%) answered "no" to the question. Of those five participants whose temperatures stayed the same four (80%) answered "yes" and one (20%) answered "no" to the question regarding the desire to impress others with art.

Pearson Product Moment Correlation Coefficient

The SPSS program was used to find the Pearson product moment correlation coefficient between the thermal data and anxiety scores from the Beck Anxiety Inventory. The first correlation computed was between the temperature increase set of thermal data and the anxiety scores from the same participants. No significant relationship was found. Out of 48 sets of data a Pearson correlation of -.11, p =.46 was found.

The second correlation computed was between the temperature decrease set of thermal data and the corresponding anxiety scores. No significant relationship was found. Out of the 29 sets of data a Pearson correlation of -.11, p =.57 was found.

One-Way Analysis of Variance

Using one-way analysis of variance (ANOVA) temperature differences by gender were analyzed. All relationships were analyzed at a significance level of .05. Men had

nearly significant higher temperatures then women $F(1, 80) = 3.44, p = .07$ Men had a mean temperature change of 1.55 ($SD = 2.42$) while women had a mean temperature change of 0.46 ($SD = 2.18$).

Anxiety differences by gender were also analyzed with the one-way analysis of variance (ANOVA) with significance set at a .05 level. Women had significantly higher anxiety then men, $F(1, 80) = 4.16, p > .05$. Men showed a mean anxiety score of 6.47 ($SD = 6.43$), which is "considered to reflect minimal level of anxiety" (Beck & Steer, 1993). Women showed a mean anxiety score of 11.24 ($SD = 9.53$), which is said to "indicate mild anxiety" (Beck & Steer, 1993).

Three other relationships were analyzed using the one-way analysis of variance (ANOVA). The data came from the questions about previous art experience given on the participant information form and the amount of change in temperatures. No significance was found in the following three sets of data. The first set was temperature change by amount of art experience, $F(1, 80) = .80, p = .07$. The second set was temperature change by art as a positive or negative experience, $F(1, 80) = .14, p = 2.28$. The third set was temperature change by the desire to impress others with art, $F(1, 80) = .67, p = .18$.

Summary

In summary the hypothesis was partially supported. There was a rise in skin temperature for 48 out of the 82 participants over the 16-minute period of drawing in response to the art directive "Draw a Person Picking an Apple from a Tree." Another 29 participants showed a drop in temperature over the same time period and five participants had the same temperature reading at the end of the drawing as the beginning. The amount

of change in mean temperature was greater for those participants whose temperatures went up then for those whose temperatures went down, 2.05 compared to –1.38.

In the thermal data over the whole 16-minute time, the highest and lowest temperatures were found and means computed. For the 48 participants whose temperatures rose, the mean of the highest temperatures was 88.51, while the mean of the highest temperatures for those that temperatures went down was 86.58. This shows a difference of 1.93.

Age and gender differences were noticed between the groups of participants whose temperatures rose or fell. In the group whose temperatures rose 29% of the participants were age 21 and over, while ages in the group whose temperatures fell 41% were 21 and over. In the group whose temperatures rose, 33% were men, while in the group whose temperatures fell, 10% were men.

No significant correlation was found between changes in skin temperature and anxiety levels from the Beck Anxiety Inventory. Similarly no significant relationships were found between the questions about previous art experience given on the participant information form and the amount of change in temperatures. However, men had nearly significantly higher overall temperatures than women and that the women had significantly higher anxiety scores on the Beck Anxiety Inventory than men.

CHAPTER 4

DISCUSSION

Origins of the Study

This thesis delves into areas that have not been systematically researched. In an attempt to provide a richer body of research in the field of art therapy this study used a biofeedback technique to examine the effects of art therapy. As a result there is very little literature to support this research.

Review of the Hypothesis

The hypothesis of this study was that hand temperatures would raise while a person is engaged in a neutral drawing activity. In a very basic sense the hypothesis was supported by results that 59% of the participants did show a rise in hand temperatures as they drew. This study looked at anxiety levels and art experience in attempts to give clarity to the fact that some participants' temperatures rose while drawing and others fell. The researcher assumed that these psychological factors would be correlated to the change in physiology. The data show that in fact there was no significant relationship between rise and fall of hand temperatures and anxiety or the art-related questions from the participant information form.

In the field of biofeedback, rising hand temperatures are known to be related to relaxation. Results in this study show that 48 (59%) participants relaxed in physiological way while drawing. The data do not show correlations to support an explanation of why 48 (59%) participants relaxed while drawing or why the other 34 (41%) participants did not relax while drawing. However, some interesting patterns lead to further research that

can help us understand what happens physiologically when participants are engaged in drawing.

Patterns

Gender. In the data related to gender an interesting pattern emerged. The data show that male participants tend to raise their hand temperature while drawing. Over all there were fewer male participants than female; 23% men to 77% women. 10% more than the overall percentage of men in the study had their hand temperature rise while drawing showing that they respond with physical relaxation to the drawing experience.

To look more closely at gender differences, the one-way ANOVA was used to compare gender with anxiety and gender with changes in temperature. Here the data indicated that men showed a greater rise in temperature than women. This indicates that there is a difference between men and women's responses to the drawing activity. However, further examination shows psychological differences between men and women's anxiety scores on the Beck Anxiety Inventory. Using one-way ANOVA, women have significantly higher anxiety scores than men. The *(Diagnostic and Statistical Manual of Mental Disorders)* (DSM-IV TR) presents similar gender differences in regard to Generalized Anxiety Disorder. "In clinical settings, the disorder is diagnosed somewhat more frequently in women then in men (about 55%-60% of those with the disorder are female). In epidemiological studies, the sex ratio is approximately two-thirds female" (American Psychiatric Association, 2000, p. 474). In summary, men were more likely to show a rise in temperature than a fall in temperature, men had a greater temperature change than women, and men had lower anxiety scores than women.

Age. Another pattern was found in the data, which relates to age differences among participants. A greater percentage of participants age 20 and under had a temperature rise while drawing. Out of the 42 participants whose temperatures went up, 71% were age 20 and under, for the 29 participants whose temperatures went down only 59% were 20 and under, which shows a 12% difference between the groups. Thus the younger participants tended to respond to the drawing experience with a rise in hand temperatures more so than the older participants.

Thermal patterns. The most relevant pattern to the data is related to overall levels of temperatures within the different groups of participants. Participants whose hand temperatures went up had overall higher temperature readings than did those participants whose temperatures fell. The participants who showed no temperature change from the beginning to the end of the drawing time had overall temperatures in-between the levels of the other two groups. Between the highest temperatures reached, those that went up had 7.39° higher temperatures while drawing than the group whose temperatures went down. Looking at the lowest temperatures reached during the drawing experience, there is a difference of 6.59° between the participants whose temperatures rose and those whose temperatures fell.

These figures suggest that for participants who were already physiologically more stressed (shown by low hand temperature readings during the drawing experience), the act of drawing was unable to help them relax. However, for those participants who were already more physiologically relaxed (shown by their high hand temperature readings) the drawing experience was able to help them relax even more. The data shows that temperatures of participants that rose showed a greater thermal change than those whose

temperatures fell; a mean of 2.05 compared to –1.38. This indicates that for those participants whose temperatures rose during the drawing experience, drawing had a greater effect on their physiology than the other two groups.

These thermal patterns actually help support the hypothesis that hand-temperatures rise while an individual is engaged in a neutral drawing activity. However, they also lead to an alternate conclusion than the hypothesis, that hand temperatures rise when a person who is *already physiologically relaxed* is engaged in a neutral drawing activity. The patterns of gender and age are intriguing and may lead to further research, but it is the thermal patterns that this study has to offer as clear data about the physiological response to art making.

Limitations

A limitation of this study is that the room temperature was not recorded during the 10 different data gathering sessions. This could have affected the thermal data. Another limitation of this study is the design of the Participant Information Form and the questions about artistic experience. If responses had been formulated using a Likert scale, the resulting data could have been compared with the other data such as thermal data and demographics in a more precise way. Finally if another type of biofeedback equipment, such as electrodermal (EDR) or electromyographic (EMG) feedback equipment could be used to gather other types of physiological data along with the thermal data, this research could reveal more about the effects of art making.

Future Research

Increasing the number of participants this study and using more measures of physiology would be a way to further develop this research. Adding a self-report of

affective and/or physiological stress levels either before the drawing or pre and post could add more data to this line of investigation. In developing ideas for future research, there are two shifts of paradigms that this study has helped to evolve. These two shifts of paradigms may increase clarity, goals, and procedures for more research.

Physiological predisposition. This study supposed that psychological factors are directly related to any physiological changes occurring as the participants were engaged in a drawing activity. This supposition was not supported. Further research based purely on physiological responses may clarify the data; looking at physiological predispositions instead of anxiety self-reports and feelings about previous art experience. Participants could be asked to come in for temperature readings before the drawing happens so baseline on thermal data can be found. Other measures of physiological stress and the fight or flight response could be measured to find out how entrenched the participant is in a chronic level of physical stress.

Biofeedback training versus data gathering. This study was designed using biofeedback as a data gathering method. A biofeedback-training paradigm could be used in further studies. This would add behavioral and learning aspects to the basic physiological changes studied in this thesis. Biofeedback training done over time might reveal stronger changes in physiology during art making. A training method would also involve the development of stronger affective changes in the participants when engaged in drawing, leading to a broader view of the effects of art making.

Summary

This study documents physiological responses to art making, more specifically the thermal response to art making. While more participants showed a rise in hand

temperature than showed a decrease, the difference was not statistically significant. The anxiety and previous art experience data were gathered in hopes to clarify why some participants did not show a rise in temperature. When this data was correlated with rise and fall of temperatures, the correlations were not significant. However, patterns were discovered in the data related to age, gender, and thermal data. The thermal data gave the most interesting results leading to an alternate hypothesis for future research; hand temperatures rise when a person who is already physiologically relaxed is engaged in a neutral drawing activity.

While there are no significant findings in this study, the data does suggest directions more research in this area. Patterns in data discovered in this study provide starting points for that research. The study of the physiological responses to art making will increase the supporting data of art therapy as a profession.

REFERENCES

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., rev.). Washington, DC: Author.

Basmajian, J. V. (1989a). (Ed.). *Biofeedback principles and practice for clinicians* Baltimore: Williams & Wilkins.

Basmajian, J. V. (1989b). Introduction: Principles and background. In J. V. Basmajian (Ed.), *Biofeedback principles and practice for clinicians* (pp. 1-4). Baltimore: Williams & Wilkins.

Beck Anxiety Inventory (1993 ed.). In J. C. Impara & B. S. Plake (Eds.), *The thirteenth mental measurements yearbook* (pp. 96-100). Lincoln, NE: The Buros Institute of Mental Measurements.

Beck, A. T., & Steer R. A. (1993 ed.). *Beck Anxiety Inventory manual.* San Antonio, TX: Harcourt Brace.

Chopra, D. (1993). *Ageless body timeless mind: The quantum alternative to growing old.* New York: Harmony Books.

Cousins, N. (1979). *Anatomy of an illness as perceived by the patient: Reflections on healing and regeneration.* New York: W. W. Norton & Company.

Edwards, B. (1989). *Drawing on the right side of the brain.* New York: Putnum.

Feldman, E. B. (1970). *Becoming human through art: Aesthetic experience in the school.* Englewood Cliffs, NJ: Prentice-Hall.

Fuller von Bozzay, G. D. (1980). *Projects in biofeedback.* Dubuque, IA: Kendall/Hunt.

Ganntt, L., & Tabone, C. (1998). *Formal Elements Art Therapy Scale: The rating manual.* Morgantown, WV: Gargoyle.

Goettemoeller, D. (2004). [Personal journaling]. Unpublished manuscript.

Green, E. E., & Green, A. M. (1977). *Beyond biofeedback.* San Francisco: Delacorte Press / Seymour Lawrence.

Green, E. E., & Green, A. M. (1989). General and specific applications of thermal biofeedback. In J. V. Basmajian (Ed.), *Biofeedback principles and practice for clinicians* (pp. 209-222). Baltimore: Williams & Wilkins.

Miller, N. E. (1989). Biomedical foundations for biofeedback as a part of behavioral medicine. In J. V. Basmajian (Ed.), *Biofeedback principles and practice for clinicians* (pp. 5-16). Baltimore: Williams & Wilkins.

Peffer, K. E. (1989). Equipment needs for psychotherapists. In J. V. Basmajian (Ed.), *Biofeedback principles and practice for clinicians* (pp. 337-345). Baltimore: Williams & Wilkins.

Rosal, M. (2001). Cognitive-behavioral therapy. In J. A. Rubin (Ed.), *Approaches to art therapy: Theory and technique* (pp. 210-225). Philadelphia: Brunner-Routledge.

Samuels, M., & Lane, M. R. (1998). *Creative healing.* New York: Harper Collins.

Stova, J. M. (1989). Autogenic training and biofeedback combined: A reliable method for the induction of general relaxation. In J. V. Basmajian (Ed.), *Biofeedback principles and practice for clinicians* (pp. 169-196). Baltimore: Williams & Wilkins.

Appendix A

Participant Information Form

Participant Information Form

Please fill out the following questionnaire. This information will be used for research purposes only and your information will be kept strictly confidential.

Code-number:_____

1. Age: _____
2. Gender: _____
3. Major:

   _____

4. Year in college:

   _____

5. Do you feel you have had more artistic experience then the average person?

   Yes_____ No_____

6. Has your artistic experience been positive?

   Yes_____ No_____

7. When engaged in an artistic activity do you find yourself wanting to impress others?

   Yes_____ No_____

Appendix B

Informed Consent

INFORMED CONSENT

The Department of Psychology at Emporia State University supports the practice of protection for human participants in research and related activities. The following information is provided so that you can decide whether you wish to participate in the present study. You should be aware that even if you agree to participate, you are free to withdraw at any time, and that if you do withdraw from the study, you will not be subject to reprimand or any other form or reproach.

In this study you will be asked to fill out a brief questionnaire about yourself and an anxiety scale. You will be given paper and art supplies and asked to draw for five (5) minutes. Then you will be asked to place a temperature sensor on the middle finger of your non-dominate hand, which will be secured with a piece of tape. Next you will be asked to spend about fifteen (15) minutes drawing. There is no expectation of drawing ability. You are welcome to draw any way you wish. Once that time is up the sensors will be removed and the drawings collected. You will each be given one (1) research point for your participation. This study will take approximately sixty (60) minutes.

There is no risk involved in participation of this study. If you experience any discomfort in the process you may leave at anytime. Your information will be kept confidential. Only the researcher and research assistants will have access to your name. Information gathered here, including drawings, may be used for educational purposes and publication. Your name will not be associated with the drawings or any of the results. If you wish to know more about this thesis you may contact my advisor Dr. Nancy Slater, 341-5814, Visser Hall 304. If you would like to know the results of the study or have more questions after this session please contact me, Dareth Goettemoeller, at 620-343-7914.

Benefits of this study may include enjoyment of the drawing experience and relaxation. The benefits are for educational purposes only. If your instructor offers credit, it shall amount to a total of one (1) point.

Thank you, in advance, for your participation in this study. Your cooperation is invaluable to this research project.

"I have read the above statement and have been fully advised of the procedures to be used in this interview. I have been given sufficient opportunity to ask any questions I had concerning the procedures. I likewise understand that I can withdraw from the study at any time without being subjected to reproach. My signature below denotes consent to partake in this exercise."

Participant's Signature _____ **Date**_____

Mental health services are available to ESU students at:
Student Life & Counseling Center, 211 Morse Hall 341-5221
Counselor Education Clinic at the Earl Center, 341-5799

Appendix C

Beck Anxiety Inventory 1993 Edition

Beck Anxiety Inventory 1993 Edition

(Not available for reproduction)

Appendix D

Drawing Script

Drawing Script

The following script will be read to the participants before beginning the art directive.

In the next task you will have about 15 minutes to draw. Please feel free to draw in any way you like. Please remain in your seat during this time and do not talk with your neighbors. If you need an additional piece of paper, raise your hand, the research assistant (state name) or I will bring you a new piece of paper. I will let you know when our time is up. If you finish the drawing please start a new one.

Using the drawing materials please draw a Person Picking an Apple from a Tree.

The first temperature recording will be taken immediately following the script.

Appendix E

Temperature Record

Temperature Record

For researcher and assistant use only.
One sheet per participant.

Code-number: _____

Record temperature at 2-minute intervals:

1. _____(0 min) (beginning temp.)
2. _____(2 min)
3. _____(4 min)
4. _____(6 min)
5. _____(8 min)
6. _____(10 min)
7. _____(12 min)
8. _____(14 min)
9. _____(16 min) (ending temp.)

I, Dareth Goettemoeller, hereby submit this thesis to Emporia State University as partial fulfillment of the requirements for an advanced degree. I agree that the Library of the University may make it available to use in accordance with its regulations governing materials of this type. I further agree that quoting, photocopying, or other reproduction of this document is allowed for private study, scholarship (including teaching) and research purposes of a nonprofit nature. No copying which involves potential financial gain will be allowed without written permission of the author.

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12-7-04

Date

The Physiological Response to the Drawing Experience

Title of Thesis

Signature of Graduate Office Staff

1-10-05

Date Received