COMPARING COGNITIVE SCRIPT TO ACTUAL BEHAVIOR: EMPHASIS ON SEAT-BELT USAGE.

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ABSTRACT

Schema theory has served as a useful guide for memory researchers. This study represents an attempt to extend schema theory by examining the relationship between a specific behavior and the corresponding scripted representation of that behavior. A one time behavioral observation of participants' seat-belt usage was compared with the content of participants' 'operating an automobile' script, which had been assessed with two tasks (a generation task and a rating task). A relationship was found between actual behavior (seat-belt usage) and the cognitive representation of behavior (script) in that seat-belt users gave a significantly higher frequency rating for the action 'lock seat-belt' than non-users. While not statistically significant there was trend for seat-belt users to generate the action lock seat-belt more than non-users. It was also found that actions which are not central to a script have a lower probability of being generated regardless of their frequency rating.

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CHAPTER 1

INTRODUCTION

In a review of the literature on schema theory, one will certainly find reference to the work done by Sir Frederick Bartlett (1932). He was interested in how participants' memory for natural language material would be influenced by their prior knowledge. One stimulus Bartlett used frequently was a story called "The War of the Ghosts" (p.65). This story is a North American Indian folk tale. It makes perfect sense to the people from whom it was taken. However, Bartlett was interested in finding out how English people, having different cultural stereotypes, would remember the story. He predicted that they would distort the meaning of the story to fit their cultural stereotypes. The results confirmed his prediction. For example, the following is a sentence taken from the original story: " 'Arrows are in the canoe' they said" (p.65). Now compare the original sentence with one recalled by one of Bartlett's subjects: " 'The arrows are in the boat', was the reply " (p.65). The majority of participants distorted the sentence in this way. The word "canoe" did not fit well within the cultural schema of the English participants, and so it was changed to the word "boat" in order to fit in with their cultural schema.

In his analysis of participants' responses, he found the idea of a schema useful in describing his results. From his work, Bartlett defined a schema as follows:

> Schema refers to an active organization of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response... All incoming impulses of a certain kind, or mode, go together to

> build up an active, organized setting... They have to be regarded as constituents of living, momentary settings belonging to the organism, or to what ever parts of the organism are concerned in making a response of a given kind, and not as a number of individual events somehow strung together and stored within the organism (p.201).

Humans gain experience of the world through the senses. A schema, according to Bartlett, can be understood theoretically as cognitive structure which influences mental processes. A schema is the term used to describe the structure that is a result of the brain organizing an endless supply of experiences into useful, prototypical representations.

Research on schema theory has followed the lead of Bartlett. For example, researchers have found evidence supporting the notion of cultural schemas (Harris, Lee, Hensley, & Schoen, 1988; Harris, Sardarpoor, & Meyer, 1989; Reynolds, Taylor, Steffensen, Shirly, & Anderson, 1982), object schemas (French & Richards, 1993; Kikuno, 1991; Rubin & Kontis, 1983), place schemas (Brewer & Treyens, 1981) and event schemas (Corson, 1990; Galambos, 1983; Hudson, Fivush, Kuebli, 1992; Hue & Erickson, 1991; Nakamura, Grasser, Zimmerman & Riha, 1985).

A cultural schema can be defined as the general knowledge that a person gains from living within a certain culture. For example, there is a American culture which is different than a European culture. Americans and Europeans differ in the way they dress, eat, and talk. The cultural experiences of the two groups will be composed of different behaviors and so the resulting cultural schemas will also differ between the two groups.

The study by Reynolds et al. (1982) supports the notion of a cultural schema. In their study, two groups of students (white and black) read a passage. A target incident was embedded within the passage. The target incident, which is called "sounding", is common among black, inner-city children. Sounding is a type of game where children verbally try to best someone in trading insults, with the winner gaining the approval of his or her peers. After reading the passage, a recall test was given to the students. White children were found to recall the incident erroneously as a fight, whereas the black children correctly recalled the incidence as verbal play. The black children's cultural schema included the game "sounding", and so they were able to retrieve this explanation from memory. The white children's cultural schema did not include the game "sounding", and so they retrieved the closest match they had in memory to the incident they read, which was a fight.

There has also been research which has provided empirical evidence for the psychological reality of a type of schema referred to as an object schema. An object schema is comprised of all the features that define any given object. The (1991) study by Kikuno serves as a good illustration of an object schema. The object schema under investigation in his study was that for Japanese coins. He had 50 Japanese women draw two types of Japanese coins (1 and 10-yen coins) from memory. He found that memory for Japanese coins was poor over-all and participants recalled more distinctive features than common features. He concluded that the coin schema consists of more distinctive features than common ones.

Brewer and Treyens (1981) examined the concept of a place schema.

Their experiment allowed for an ecologically valid test of how a person's memory of a place may be affected by schema saliency and expectancy. The setting for this experiment was a room located in a psychology building that was designed to look like an office of a graduate student. Objects were placed throughout the room that were either consistent with the office schema (desk, chairs, typewriter) or inconsistent (a skull, bulletin board). Some objects normally found in an office were completely omitted (no books on the bookshelf). Participants were brought into the experimental room and asked to wait, while the experimenter proceeded to make sure that the prior participant had finished. The experimenter waited for 35 seconds before reentering the experimental room and collecting the participant. At this time they entered a different room, and the experimenter explained to the participant that the true purpose of the experiment was for the participant to recall objects from the experimental room. The participant was then administered a memory test.

The results of the written recall test indicated that a total of 88 different objects had been recalled by one or more of the participants. Of these, 19 were objects that were not present in the experimental room but normally might be found in an office (referred to as inferred objects). Each participant on average recalled 1.13 inferred objects. A total of 29 participants recalled that the office had a desk and chairs. Only eight subjects recalled that the office had a skull or a bulletin board. The data reported here coincides with the idea that episodic information is integrated with prior knowledge. The authors explain that this integration is accomplished by our schema for rooms and go on to say that "The power of the schema-based information on subjects' recall of the room is evident when a subject draws in a window or a set of shelves that are not present" (Brewer & Treyens, 1981 p.217).

An event schema can be thought of as the general actions that make up a common event and the people who typically participate. Event schemas are frequently referred to as scripts. Fayol & Monteil (1988) have defined a script as a "cognitive structure that refers to a body of knowledge associated to a sequence of events that occurs frequently in a specific order" (p.336). The most frequently used example of a script is the restaurant script. A person goes to a restaurant, orders a meal, eats the meal, and then leaves. These are the basic actions that make up the restaurant script.

Nakamura, Grasser, Zimmerman & Riha (1985) provide a good illustration of an event schema. The participants in their study were students who were enrolled in a laboratory course. During a 15 minute lecture, the lecturer performed actions that were either relevant to a lecture schema (e.g., writing on a blackboard), or irrelevant (e.g., taking off a watch). A surprise recognition memory test was administered after a period of 20 minutes. Results show that the participants' recognition memory were better for script-irrelevant actions than for actions which were script-relevant. That is, participants were significantly better at deciding whether or not a particular action was actually performed or not by the lecturer for script-irrelevant actions. This data corresponds nicely with schema theory. The script-relevant actions performed by the lecturer were a subset of the general actions that make up a lecture schema. These actions were integrated into the lecture schema once it was instantiated. The script-irrelevant actions were not integrated into the lecture schema, and therefore, were significantly easier to identify.

As can be gathered from the above brief review there is a large amount of evidence which supports schema theory (see Alba & Hasher, 1983, for an alternative interpretation of the research that is used in support of schema theory). Lately, there has been considerable attention given to one type of schema mentioned, the script. One reason for the focus on scripts is that their nature allows researchers to examine their structural and featural composition (see Shank & Abelson, 1977). This is a shift from the majority of the research studies cited thus far which have examined how schemas operate to influence or bias memory without any interest in the featural representations that compose a schema.

A study by Galambos (1983) was one of the first studies to investigate the featural representations of scripted activities. His study produced normative data on 30 scripts (referred to as 'activities' by Galambos) and 12 accompanying component actions for each of the 30 scripts. For example, one of the 30 activities he examined was called 'starting a car'. Some of the accompanying actions were 'put key in ignition', 'turn key', and 'depress accelerator'. He found substantial agreement among participants in terms of how familiar they were with each of the 30 activities, how the sequence of events for each activity was arranged, and how distinct each activity was.

The participants in Galambos's study also rated the actions on a scale from 1 to 12 for centrality, distinctiveness, sequence, and standardness. The centrality and standardness dimensions will be examined more closely. Centrality refers to how important an action is to the activity. That is, does an action have to be done in order to complete the activity? Standardness is the frequency in which each action is performed for each activity. Galambos calculated the mean centrality and standardness ratings given by participants (see table 1). The two dimensions overlap somewhat, but an action that

Table 1

The mean ratings participants gave for each action in the activity 'starting a car'. Ratings were supplied based on four dimensions: centrality, distinctiveness, sequence, and standardness.

STARTING A CAR

Action	Sequence		Centrality		Distinctiveness		Standardness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Unlock the Door	1.06	.25	4.33	3.75	3.00	2.37	7.13	3.03
Open the Door	1.94	.25	5.27	3.63	2.00	1.16	6.75	3.89
Get into Auto	3.00	.00	7.40	2.61	5.19	2.54	8.25	1.65
Adjust the Seat	4.13	.50	5.00	2.48	4.56	2.85	4.38	2.80
Lock Seat-belts	5.37	.62	4.13	2.10	4.62	3.14	4.25	2.67
Key in Ignition	6.44	1.03	9.53	2.53	7.94	1.12	8.75	.78
Check the Mirrors	7.19	1.97	5.07	1.98	5.13	1.67	6.38	2.50
Shift into Neutral	8.06	1.61	7.27	3.19	4.75	3.34	4.69	3.74
Turn the Key	8.63	.81	10.93	1.75	3.44	2.16	8.75	.78
Check the Traffic	10.81	.75	4.80	2.78	3.31	2.47	6.62	2.85
Depress the accelerator	10.37	1.63	8.93	2.09	5.63	2.78	7.69	2.58
Shift into Drive	11.00	.89	5.33	3.50	5.88	2.96	6.00	3.9

Source: Galambos, J. A. (1983). Normative studies of six characteristics of our knowledge of common activities. Behavior Research Methods & Instrumentation, 15(3), 327-340.

receives a high standardness rating does not necessarily have to be a central action.

Take for example, the action 'unlock the door'. It received a mean rating of 4.33 for centrality and 7.13 for standardness. Even though the action received a high standardness rating the corresponding centrality rating was low. Unlocking the door is considered to be a peripheral action because it is not a necessary action with regard to 'operating an automobile'. However, even though 'unlocking the door' is not a central action with regard to 'operating an automobile' it still can be a standard action, one that is completed frequently.

The action 'lock seat-belt' received a mean rating of 4.13 for centrality and 4.25 for standardness. It seems reasonable for seat-belt usage to receive a low rating on the centrality dimension because wearing a seat-belt, just like unlocking the door, is not a necessary condition for starting a car, whereas putting the key in the ignition and turning the key are necessary conditions for starting a car. Interestingly, the low mean rating obtained for the standardness dimension does give reason for concern. Research shows that the use of seat-belts reduce the risk of fatal injury to front seat passengers by 45%, and reduce the risk of moderate-to-critical injury by 50% (National Safety Council, 1996). Even given the safety value of seat-belts, a nation wide observational study done in 1994 showed that only 67 percent of drivers use their seat-belts (National Safety Council, 1996).

Given the data on the effectiveness of seat-belts in saving lives, it is troublesome to find that the participants in Galambos' study gave a low rating for seat-belt usage on the standardness dimension. Remember, standardness refers to the frequency in which an action is performed for a given activity. It would be of interest to find out if the low mean rating seat-belt usage received for the standardness dimension could be related to the fact that people do not always use their seat-belts. One way to do this is to compare a person's cognitive representation of the activity, the script, with his or her actual behavior.

If Bartlett's definition of a schema as an organizer of past experiences holds true, then a relationship should exist between a person's cognitive representation (script) and their actual seat-belt usage. When participants are asked to supply their script for 'operating an automobile', seat-belt usage should be an action if the participants frequently use their seat-belt. However, there may be some variability due to the frequency in which a person engages in the behavior. Since seat-belt usage is not a central action, it may be that there is a minimum frequency required before it becomes a true member of the operating an automobile script.

The purpose of this study was to compare seat-belt usage with the cognitive representation of behavior or script. The first hypothesis addressed by this study is that seat-belt usage should be contained in the cognitive script of those people who were observed wearing their seat-belts. Conversely, seat-belt usage should not be contained in the cognitive script of those people who were not observed wearing their seat-belts. The second hypothesis predicts that frequency ratings for seat-belt usage will differ between seat-belt users and non users. Seat-belt users should supply a higher frequency rating for the action 'lock seat-belt' than non seat-belt users.

CHAPTER 2

METHODS

Participants

Participants consisted of thirty-two students, (10 male, 22 female), recruited from several of the parking lots on the campus of Austin Peay State University. The experimenter waited at the entrance of a parking lot and approached motor vehicles as they entered the lot. The experimenter used the following criteria in the selection of motor vehicles: (a) It was the first car the experimenter spotted entering the lot, either at the beginning of the day of recruitment or as soon as the experimenter concluded recruiting a prior motor vehicle driver, and (b) the experimenter was able to make a definitive judgment of the drivers seat-belt behavior. A friendly 'hello' greeting was read to each participant at this time, which included a verbal invitation to participate in the experiment. If the operator agreed to participate in the experiment a time and place of assessment was assigned to them. Each participant was given a written summary of the experiment which also included the date, time and place of assessment. During this process, the experimenter covertly observed and recorded the participant's seat-belt usage. Each participant was told that they would be eligible to win a $20.00 prize if they participated in this research study. In some cases participants obtained extra credit for their participation.

Procedure

Upon arrival at the laboratory, participants were asked to sign an informed consent statement. Next, participants were given a generation task which required participants to generate the actions they would complete for four given activities: (a) changing a flat tire, (b) washing your hair, (c) operating an automobile, and (d) shopping for groceries (see Appendix A). The activity of interest for this experiment was 'operating an automobile'. The other three activities were included as filler items. The generation task was used as a way to assess the participants' cognitive scripts. When they had finished the generation task, the participants were given a rating task. For the rating task participants were provided with the same activities used in the generation task. However, this time instead of having to generate the actions, they were supplied with the corresponding actions (based on normative data from Galambos, 1986) and were asked to rate each action based on how frequently they engage in the action. The frequency ratings were based on a scale from 1 meaning 'never' to 10 meaning 'always' (see Appendix B). Each participant was debriefed after they finished the rating task.

CHAPTER 3

RESULTS

Generation Task

Out of a total of 19 seat-belt users, 10 participants included seat-belt usage in their self generated cognitive script while 9 did not include the action. Out of a total of 13 seat-belt non-users 3 participants included seat-belt usage in their self generated cognitive script while the other 10 did not. A 2 by 2 Chi-square analysis indicated that the tendency to include seat-belt usage in the self generated script did not differ between the groups $\chi^2(1, N = 32) = 2.8, p > .09$.

Rating Task

The average frequency of seat-belt users was 9.57 ($SD = 1.61$). The comparable average for non seat-belt users was 5.46 ($SD = 3.62$). Leven's test for equality of variances showed the variances of the two groups to be unequal $F = 19.19, p < .001$. Given that the assumption of homogeneity of variances had not been met, the decision was made to use the approximate randomization technique to compare the two means, instead of a t-test (See Edgington, 1973, or Sawilowsky, 1990 for an explanation of the technique). The approximate randomization technique worked by randomly shuffling the obtained participants' ratings into two groups. The resulting mean for each randomly defined group was then computed. Next the computer calculated the mean differences for each group. This procedure was repeated 10,000 times and resulted in a distribution of differences between the means. The proportion of these differences that exceeded the obtained difference of 4.094 was .001. This suggests that the difference in frequency ratings for the two groups was unlikely to occur by chance.

CHAPTER 4

DISCUSSION

The first hypothesis for this study stated that seat-belt usage should be contained in the cognitive script of those people observed wearing their seat-belts. Conversely, seat-belt usage should not be contained in the cognitive script of those people who were not observed wearing their seat-belts. There was no difference found between the self generated cognitive scripts of users and non-users with regard to seat-belt usage. There seemed to be a trend where non-users were somewhat less likely than users to generate seat-belt usage. It would have been desirable to increase the number of participants to determine if the trend was real. Unfortunately, the current method of recruitment did not allow for this. Out of a total of 39 non-users who were signed up for participation only 33% (13) showed up. In contrast, out of a total of 37 users who were signed up 51% (19) showed up. In order to obtain a larger sample, more time was needed for recruitment than was available. This is one important point that should be taken into consideration when using a recruitment method similar to the one used in this study.

It was interesting that only 50% of seat-belt users generated the action seat-belt usage. Upon debriefing, participants who did not generate seat-belt usage were asked why they did not generate the action. The typical response was that seat-belt usage was so automatic that when they were generating their script it did not come to mind. This finding is consistent with the notion that a central action (i.e., one that is crucial to the performance of an activity) will be more available for retrieval from memory than a peripheral action (i.e., one that is not crucial to the performance of the activity) (Galambos, 1983). This finding is interesting because it shows that it is possible for someone to forget about an action which they almost always report doing. This lends support to the psychological validity of schema theory. The nature of scripts, given their hypothesized structure, predicts that a central action (i.e., put key in ignition) would be activated and likely to be retrieved from memory under the conditions of the current study. A peripheral action (i.e., seat-belt usage) would not necessarily be activated and so may not be as likely to be retrieved from memory.

The second hypothesis for this study stated that frequency ratings for seat-belt usage would differ between seat-belt users and non-users. Seat-belt users should supply a higher frequency rating for the action 'lock seat-belt' than non seat-belt users. It was found that seat-belt users frequency ratings for seat-belt usage was higher than non-seat-belt users. Those classified as seat-belt users reported that they almost always use their seat-belts while non-users reported using seat-belts only about half of the time.

This result suggests that observing a person behaving a certain way one time could be a good predictor of how that person will behave in the future. In order to achieve this conclusion however research would need to be done to find out if frequency ratings can predict actual behavior. This reciprocal relationship cannot be determined by the results of the current study. However, if future research supported this notion then frequency ratings could be substituted for actual behavioral observations. Making behavioral observations can be time consuming and sometimes is not even a viable option. Because of the problems with making direct behavioral observations, psychologists often use self-report measures as substitutes for direct behavioral observations. The findings from the current study suggest that frequency ratings could serve as reliable self-report measures. The reliability of frequency ratings in predicting behavior could be investigated in future studies. Frequency ratings can provide a lot of information about behavior that may be missed by other self-report measures.

It would be of great interest if future research could be done to replicate this finding with regard to other behaviors such as dating. It would be interesting to find out how comparable a person's dating script is with how he or she actually behaves on a date. Behaviors such as kissing, hugging, or sexual advances could be investigated. It would be very beneficial to be able to predict who is likely to be sexually aggressive during a date.

The generation and frequency rating tasks used in this study might also turn out to be very useful. In contrast to an explicit self-report measure that directly asks someone if he or she wears a seat-belt, the tasks could serve as implicit self-report measures. Take for example the following scenario: A person is buying auto insurance and is asked the question "do you use your seat-belt?" If this person thinks he or she could get a reduced rate for doing so, he or she may be inclined to say "yes" regardless of whether he or she actually uses the seat-belt. The method used in the current study asked a similar question but in a different context. Participants were led to believe that they were supplying normative data on scripted behavior. There were other scripts added as filler items in order to distract the participants' attention. In this context participants would not be able to figure out that they are being asked to report their seat-belt behavior. It would be interesting to find out whether or not a person would become aware with regard to the insurance scenario that they were being asked the question do you wear your seat-belt. Future research could test for any differences between the generation and rating tasks and questionnaire style self-report measures.

The current study has provided evidence that actual behavior (seat-belt usage) is related to the cognitive representation of behavior (script). It would be very interesting to find out if, as suggested by Sabghir (1982), a change in a person's schema could bring about a change in behavior. It is the goal of some therapies to change behavior by changing how a person thinks. This changing of how a person thinks can be thought of as a type of cognitive restructuring. Imagine for a moment that a person, a non seat-belt user, is put into a hypnotic state. Imagine also that while this person is hypnotized they are required to repeat over and over the following: "I always wear my seat-belt". Finally imagine that this person's 'operating an automobile' script was cognitively altered (seat-belt usage added as an action) as a result of his or her repeating the phrase 'I always wear my seat-belt'. Would this person, then be more likely to wear his or her seat-belt? Is it possible that a person's behavior can be changed from this type of cognitive restructuring? Future studies could investigate the possibility of changing behavior as a result of changing the representation of behavior.

The current study has shown that schemas are representative of the specific actions which are involved in certain activities. Of course this study concentrated on one activity (operating an automobile) and one action (lock seat-belt). By gaining access to an individual's schema we have knowledge of the past behavior of this individual. This study has expanded the usefulness of schema theory by showing that a schema can be used as a reliable indicator of a person's past behavior.

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APPENDIX

Please generate a list of steps that **you** would go through during each of the activities provided below. Please include all the detail necessary to describe the activity from beginning to end.

Here is an example:

Ex 1 **Going to a Movie.** Include all the steps from *checking the newspaper* (beginning) to *leaving the theater after viewing movie* (end). Note: The beginning and ending steps **you** actually do may be different from the ones listed, please list the steps that **you** would go through.

First, I would check the newspaper to see what movies are playing and where. I would then pick out a movie to watch. I would also find out the time of the movie. I would then go to the theater about 5 minutes before the scheduled starting time of the movie and wait in line to buy a ticket. After purchasing my ticket I would give the usher my ticket. I would then find a place to sit down. I might go and by some pop or popcorn during the previews. I would then watch the movie and leave after it was over.

1) **Changing a Flat Tire**. Include all the steps from *setting the brake* (beginning) to *putting away the jack* (end). Note: The beginning and ending steps **you** actually do may be different from the ones listed, please list the steps that **you** would go through.

2) **Washing Your Hair**. Include all the steps from *getting the shampoo* (beginning) to *blow drying hair* (end). Note: The beginning and ending steps **you** actually do may be different from the ones listed, please list the steps that **you** would go through.

3) **Operating an Automobile**. Include all the steps from *opening the car door* (beginning) to *moving the car* (end). Note: The beginning and ending steps **you** actually do may be different form the ones listed, please list the steps **you** would go through.

4) **Shopping for Groceries**. Include all the steps from *making a list* (beginning) to *putting shopping bags into trunk* (end). Note: The beginning and ending steps **you** actually do may be different form the ones listed, please list the steps **you** would go through.

APPENDIX B

For each one of the following activities, please rate the actions that **you** would go through in completing the activity based on how frequently you engage in the action on a scale from 1 "never" to 10 "always". For example, someone "doing the dishes" (activity) might sometimes "put on an apron" (action) and at other times not. The action "putting on an apron" might receive a rating of 5 from this person. The following actions might correspond to the actions that you had previously provided or there may be additional actions provided for which you did not generate in the first part, but now recognize as an action that you do indeed go through in completing the given activity. Please provide a rating for all the actions that are provided below.

1. **Washing Your Hair**

Get the Shampoo	____
Turn on Water	____
Wet your Head	____
Apply the Shampoo	____
Work up Lather	____
Rinse with Water	____
Apply Creme Rinse	____
Get a Dryer	____
Turn off Water	____
Blot up Water	____
Turn on Dryer	____

2. **Operating an Automobile**

Unlock the Door	____
Open the Door	____
Get into Auto	____
Adjust the Seat	____
Lock Seat-belts	____
Key in Ignition	____
Check the Mirrors	____
Shift into Neutral	____
Turn the Key	____
Check the Traffic	____
Depress Accelerator	____
Shift into Drive	____

3. Shopping for Groceries

Make a List ______
Enter the Store ______
Get a Cart ______
Go to the Shelves ______
Reach for Items ______
Check the Price ______
Load the Cart ______
Go to the Checkout ______
Pick Shortest Line ______
Unload the Cart ______
Pay for Items ______
Pick up Bag ______

4. Changing a flat tire

Set the Brake ______
Take out Jack ______
Take out Spare ______
Position the Jack ______
Take off Hubcap ______
Raise the Car ______
Unscrew the Lugs ______
Remove Bad Tire ______
Put on Spare ______
Screw on Lugs ______
Let car Down ______
Put away Jack ______

VITA

Lawrence Armand Fortier was born in Minneapolis, Minnesota on March 25, 1971. He graduated from St.Croix Falls High school in May, 1989. The following August he entered University of Minnesota and in December, 1994 received the degree of Bachelor of Arts in Psychology. He then entered Austin Peay State University in January 1995 and in December of 1997 received a Master of Art's degree in Psychology.