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TABLE OF CONTENTS

(Peer Reviewed Articles)

Changes in Gluteus Maximus Muscle Strength and Thickness with and without Blood Flow Restriction Training	9
<i>(Short, Short, Acheson, Bratcher, Weatherholt, Owens, & VanWye)</i>	
An Exploratory Study to Understand Visitor Perceptions of White Nose Syndrome and Bat Colony Management at Carter Caves in Northeast Kentucky.	23
<i>(Lipe, Bradley, Watson, & Portmann)</i>	
Women's Perceptions of and Barriers to Mountain Biking in Northwest Arkansas	31
<i>(Irvin, Stokowski, Dittmore, Forsythe, & Christian)</i>	
Intravenous Drug Use in Perinatal HCV Cases in Kentucky	45
<i>(Corrone, Larkin, & Bhandari)</i>	
A Review of Qualitative Research in Sport Management: Utilizing a Descriptive Case Study Design	64
<i>(Upright & Forsythe)</i>	
Difference is Not Monolithic: Confronting Values and Beliefs Related to Cultural Competence	71
<i>(O'Neal, Thomas, Kolander, & Gleich)</i>	

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A Message from the Kentucky SHAPE President

Greetings from your 2020-2021 president. What an honor and privilege to serve as the president of this organization during this unprecedented time. I am so proud of the work that we are doing to push through this pandemic. KYSHAPE has led the way to help our profession on every level through virtual, and hybrid learning while keeping our students' and communities' safety and well-being on the forefront the entire time. As a result of our perseverance, we are walking our way to a new normal. Our hard work is paying off as we will host our first in person conference in July 2021 since the pandemic.

KYSHAPE is moving toward a new normal in 2021. We will continue to provide support and resources for the profession. We have lots of work to do to ensure that all have equal access to an education that includes wellness. I again challenge you to get involved and gather your colleagues so that we can make a difference for our students in Kentucky and across the nation.

Thank you for all you do, and I look forward to working with you for continued success and growth for KYSHAPE.

Finally, I would like to give a special thank you to Dr. Steve Chen, Stacy Forsythe, and Dr. Gina Blunt-Gonzalez for serving as our Journal co-editors, their time and commitment to this publication is a valuable asset to all KYSHAPE members and beyond. Also, thank you to our writers for your professional contributions to this edition.

Best wishes to all and stay well.

Respectfully Submitted

Robin A. Richardson 2020-2021 President

Acknowledgement

As the Editors of the Kentucky SHAPE Journal, we would like to show our appreciation to the following guest-reviewers for their assistance in reviewing this current issue.

Dr. Carol O'Neal, University of Louisville; Dr. Laurie Larkin, Eastern Kentucky University; Dr. A.J. Mortara, Berea College; Dr. Nathan Nevin, Bellarmine University; Ms. Patrese Nesbitt, Kentucky State University; and Dr. Jennifer Dearden, Morehead State University; Dr. Paula Upright, Western Kentucky University; Dr. Bryan Myers, Western Kentucky University; Dr. Raymond Poff, Western Kentucky University; Dr. Tammie Stenger-Ramsey, Western Kentucky University ; Dr. Joanna Melancon, Western Kentucky University ; and Dr. Patricia Todd, Western Kentucky University.

Sincerely,

Dr. Gina Blunt Gonzalez, Kentucky SHAPE Journal Co-Editor

Dr. Stacey Forsythe, Kentucky SHAPE Co-Editor

Dr. Steve Chen, Kentucky SHAPE Journal Managing Editor

Kentucky SHAPE Journal Submission Guideline

SUBMISSION OF A PAPER

The *Kentucky SHAPE Journal* (formerly *KAHPERD Journal*) is published twice yearly (spring and fall) by the **Kentucky SHAPE**. The journal welcomes the submission of empirical research papers, articles/commentaries, best practices/strategies, interviews, research abstracts (spring issue only) and book reviews from academics and practitioners. Please read the information below about the aims and scope of the journal, the format and style for submitted material, and the submissions protocol. Your work will more likely to be published if you follow the guidelines thoroughly.

Articles are accepted via an electronic attachment (must be in Microsoft Word format, doc or docx) through e-mail to the editor before the deadline dates. Submissions should be sent to one of the co-editors below based on the topic (nature) and discipline of the study:

- For an article related to health and physical education, health promotion, exercise science and exercise physiology, please email the submission to Gina Gonzalez: g.gonzalez@moreheadstate.edu
- For an article related to recreation and sport management/administration, sport sociology, and sport coaching, please email the submission to Tricia Jordan (tricia.jordan@wku.edu)

Deadlines:

Spring issue—March 1

Fall issue—September 1

Estimated publishing time: Spring issue—Mid May & Fall issue—Late November

AIMS AND SCOPE

The main mission is to bring together academics and practitioners to further the knowledge and understanding of issues and topics related to health, physical education, sport administration and marketing, exercise science, sport coaching, dance, and recreation, etc. We encourage submissions relating to these topics from a variety of perspectives.

FORMAT AND STYLE

When preparing manuscripts for publication in the *Kentucky SHAPE Journal*, authors should follow the guidelines set forth in the *Publication Manual of the American Psychological Association*, Seventh Edition, 2019. Manuscripts should not be submitted for publication elsewhere at the same time being reviewed by *Kentucky SHAPE Journal*. Authors are advised to proof the typing, and check references for accuracy. Articles should include an abstract of approximately 150 words including the rationale for the study, methods used, key findings and conclusions. Manuscripts should not exceed 20 double-spaced pages (not including references, tables, and figures).

The manuscript must be typed double-spaced, including the abstracts and references; please number each line. Tables, charts, pictures, diagrams, drawings and figures should be in black and

white, placed on separate pages at the end of the manuscript. They must be submitted photo-ready and reproduced to fit into a standard print column of 3.5 inches. Only one copy of each illustration is required, and captions and proper citations should be typed on the bottom of the table and diagrams; please clearly mark where the tables/figures belong in the text. Jargon should be reduced to a minimum, with technical language and acronyms clearly defined. The accuracy of any citations is the responsibility of the author(s).

For more specific style questions, please consult a recent edition of the journal.

CONTENT

All submissions should be written primarily to inform senior practitioners and academics involved in areas of health, physical education, recreation, and dance.

Research Manuscripts

Research articles should be well-grounded conceptually and theoretically, and be methodologically sound. Qualitative and quantitative pieces of research are equally appropriate. Formatting suggestion: Introduction, Literature Review, Methodology, Results, & Discussion, Conclusion, and Implication.

Book Reviews

Reviews of books and/or reports are welcome (around 1000-2000 words). Information concerning the book/report must be sent to the editor. Interviews (it would be nice to discuss with the editor beforehand) and best practice/strategy papers of 1,500-3,000 words should be objective and informative rather than promotional and should follow the following format: Objective/Background/Discussion and Practical Implication.

Research Abstracts

Research abstracts (300 words or less) are welcome. The submitted abstracts should have been presented (either an oral or a poster presentation) in the KAHPERD annual conference in the previous year.

*The editors are keen to discuss and advise on proposed research projects, but this is no guarantee of publication.

Case Studies

The purpose of using case studies in learning environments is to stimulate critical thinking. Such thinking skills as problem-solving, decision-making, creative thinking, visualizing, knowing how to learn, and reasoning should be stimulated as your case is discussed in learning environments. The guidelines found below provide authors guidance in writing case studies for publication in the *KAHPERD Journal*:

1. Use narrative form when writing your case(s). Consider telling a brief story about a controversial or problematic issue or incident in the field of discipline selected from the list of suggested subject areas, competencies, and educational levels. The story could, for example, illustrate principles or theories, describe events, and/or address problems or situations related

to the topic(s) you choose. You may include data to be analyzed or illustrated. Include a key character with a problem or dilemma to solve. Within the case, the key character may or may not attempt to solve the issue within the case.

For Example:

Suggested Subject Area	Competencies	Focus	Educational Level
Alcohol sponsorship and sales at collegiate venues	Diversity, ethics, decision making, social responsibility	Sport Management	Undergraduate, Graduate, or both
Class management	Leadership, strategic planning, communication	PE	Undergraduate, Graduate, or both
Design of fitness programs	Scientific training, First Aid training, sport psychology	Exercise science	Undergraduate, Graduate, or both
Tourism economic impact study	Economy, analytic skills, event planning	Recreation	Undergraduate, Graduate, or both
Developing a weight watching program	Nutrition, exercise knowledge, motivation....	Health, and health promotion	Undergraduate, Graduate, or both
Preparing a dance gala	Strategic planning, event management, dance performance	Dance	Undergraduate, Graduate, or both

- The case can be based on reality or fictional scenario. It can also evolve from one's own or others' actual experience. It can be deeply personal and reflective, yet it should be written objectively. The case is intended to simulate real life; therefore, the case does not have to be unrealistically neat. Rather, the issue can be messy and complex.
- Case authors should provide questions and solution ideas. Often, when writing and discussing case(s), it is advised to allow readers to discuss analyses and compromise, make their own interpretations, and draw their own inferences regarding solutions. Although solutions may not always extensively included, case authors are encouraged to cover detailed solutions that helps educators discuss the cases in a more informed and insightful way with students.
- To provide an optimal learning opportunity through the case(s), four elements should be included in the case study submission:
 - Abstract and learning objectives: a summary of case and its purpose, learning outcomes and applications (75-150 words)

Fill in the following boxes

Suggested Subject Area	Competencies	Focus	Educational Level

- b. Introduction of case: presentation of issues, challenges, problems, and various thoughts
- c. Teaching notes: addressing discussion questions, guidelines for discussions, and pros and cons of different solutions
- d. References

SUBMISSIONS AND REVIEW PROTOCOL

Submission of a paper to the publication implies agreement of the author(s) that copyright rests with *Kentucky SHAPE Journal* when the paper is published. *Kentucky SHAPE Journal* will not accept any submissions that are under review with other publications. All manuscripts submitted will be peer-reviewed by 2 to 3 professionals/experts. Authors will normally receive a decision regarding publication within six to eight weeks. Rejected manuscripts will not be returned.

(Peer Reviewed Article)**Changes in Gluteus Maximus Muscle Strength and Thickness with and without Blood Flow Restriction Training**

Jeffery L. Short, Western Kentucky University
Hannah R. Short, Western Kentucky University
Adam E. Acheson, Western Kentucky University
Wesley A. Bratcher, Western Kentucky University
Alyssa M. Weatherholt, University of Southern Indiana
Johnny G. Owens, Owens Recovery Science
William R. VanWye, Gannon University

Abstract

The purpose of this study was to assess the effect of low-intensity resistance training (LI RT) with and without blood flow restriction (BFR) on gluteus maximus strength and thickness. Forty-six healthy participants (17 men, 29 women) volunteered. Participants were randomly assigned to the experimental group (LI RT+BFR) or the control group (LI RT). Limb occlusion pressure (LOP) was assessed for each participant. The cuff was inflated to 80% LOP for the LI RT+BFR group, and, although the cuff remained on, LOP for the LI RT group was at 0%. Both groups performed bent-knee hip extension with an elastic band for 4 sets (30, 15, 15, and 15 repetitions). Pre and post maximal gluteal strength and thickness were assessed with a cable machine and ultrasound, respectively. Although statistical differences were found within each group on pre and post muscular strength and thickness measures ($p=0.00-0.02$), there were no statistical differences between the groups for strength or thickness ($p=0.12-0.46$). There was a trend towards improved muscle thickness in the LI RT+BFR and improved muscle strength in the LI RT group. In summary, LI RT+BFR resulted in clinically significant changes in gluteus maximus strength and thickness.

Keywords: Proximal hypertrophy, Delfi's personalized tourniquet system (PTS), limb occlusion, low-intensity resistance training.

Introduction

It is recommended that an individual perform resistance training at an intensity of at least 60% of their one-repetition maximum (1-RM) to improve muscular strength and hypertrophy (Garber et al., 2011). However, these intensities are often inappropriate for individuals with disease, injury, or those who are undergoing post-operative rehabilitation (VanWye et al., 2017). Therefore, the use of alternative training methods is necessary to achieve physiological changes without injury. One such method is blood flow restriction (BFR) training. BFR training is performed via the application of a tourniquet-style cuff on the proximal aspect of a limb just before exercise. The cuff is pneumatically inflated or manually tightened to a pressure that occludes venous blood flow but allows reduced arterial blood flow. The goal is to achieve localized cellular and hormonal changes, ultimately improving neural activation and enhanced recruitment of type II motor units

(Fatela et al., 2016). The benefit of BFR training is that it is performed at low intensities (i.e., 20-30% of 1-RM) yet results in early muscle hypertrophy (Loenneke et al., 2012a).

An abundance of evidence exists to support the effects of muscle hypertrophy and strength when lifting lighter loads and using a BFR training protocol (Loenneke et al., 2012a). Despite the promising results seen in the muscles distal to the BFR cuff, fewer studies have examined the proximal musculature changes. It would seem plausible that muscular changes proximal to the cuff would occur given BFR results in systemic increases in insulin-like growth factor-1 (IGF-1), which is an essential hormone in promoting resistance-training induced skeletal muscle hypertrophy (Abe et al., 2005). It appears the use of high volume BFR resistance training (i.e., multiple exercises) results in proximal hypertrophy of both the upper and lower extremities (T. Abe et al., 2005; Bowman et al., 2019, 2020; Hedt et al., 2020; Lambert et al., 2019; Yasuda et al., 2010). However, there is a lack of data regarding the effect of low volume BFR resistance training on proximal muscle strength and hypertrophy, especially for the lower extremities. Therefore, the purpose of this study is to examine the effects of low-intensity resistance training (LI-RT) with and without BFR on gluteus maximus muscle strength and thickness. We hypothesize that BFR, combined with a commonly used exercise targeting the gluteal muscles, would result in increased gluteus maximus muscle strength and thickness.

Methods

Participants and Study Design

This was a six-week intervention study that recruited 46 participants aged 18-30 years. Each participant performed the intervention two times per week for six weeks (12 visits). Participants' muscle thickness and strength were assessed at baseline and six-weeks following enrollment into the study. Participants were included in the study if they were healthy individuals between the ages of 18-30 and had moderate-intensity exercise experience (i.e., participated in any form of exercise training within the past three months). Participants were excluded from the study if there were lower extremity pathology, known cardiovascular disease, use of tobacco, and currently exercising at high intensity. The Institutional Review Board approved this study to protect human subjects, and each participant gave written consent before participation.

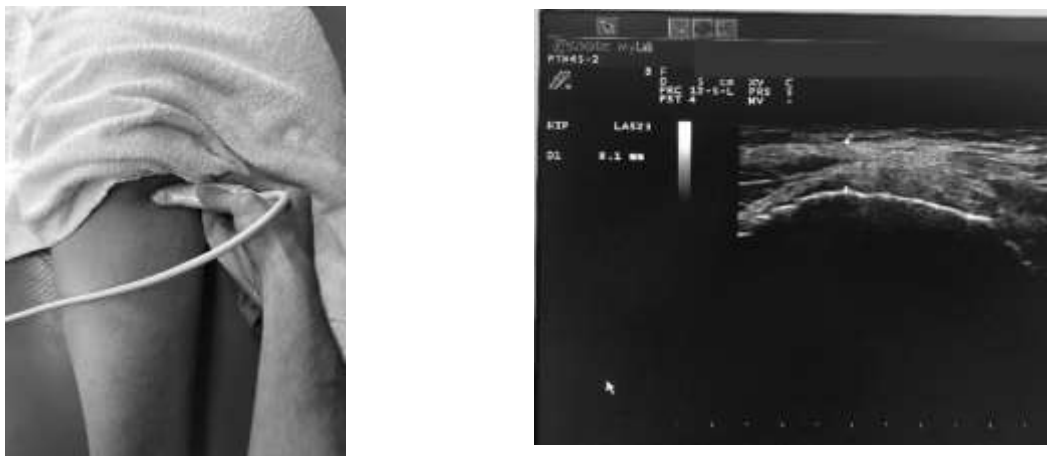
During the first study session, participants were screened for cardiovascular disease risk factors or any known disorders via intake forms and the Physical Activity Readiness Questionnaire (PAR-Q+) (Bredin et al., 2013). Once the screening was finished, participants were randomly assigned a number and placed to either the experimental (LI RT+BFR) or the control group (LI RT). Once assigned to a group, the participants received an introductory course to familiarize themselves with the study's equipment. Baseline height (to nearest 0.1 cm) and weight (to nearest 0.1 kg) were measured using the mechanical scale with an attached telescoping height rod (Detecto model 439 Eye). The Delfi's personalized tourniquet system machine (PTS) (Delfi Medical Innovations Inc., Canada) (see 'Intervention') was used for the BFR exercise intervention. Baseline and post six weeks muscle thickness and strength were measured by ultrasound (see 'Testing Procedures') images of the left gluteus maximus thickness followed by the left hip extension one repetition maximum (1-RM) (see 'Testing Procedures') test.

Testing Procedures

Muscle thickness was assessed using the MyLab25Gold Esaote ultrasound (Esaote MyLab™25 Gold; Esaote, Florence, Italy). The MyLab25Gold Esaote has inter-rater reliability that ranges from 0.688 – 0.913 for measuring gluteus maximus (Jeong et al., 2017). Ultrasound measurements were obtained by the 10 MHz frequency. The ultrasound procedures for measuring gluteus maximus thickness at baseline and post 6 weeks include the following in this order: 1) participants lie prone on a mat table and then draped using a towel to expose the left gluteal fold and ischial tuberosity; 2) ultrasound gel was placed on the participant's skin, and the linear probe was used to find an adequate image of the gluteus maximus cross-sectional thickness; 3) the image was found by gliding up the hamstrings until the ischial tuberosity was identified; 4) the probe was then angled approximately 45 degrees upward to achieve a clear image of the cross-sectional thickness of the gluteus maximus, and; 5) participants were asked to perform a slight hip extension of the left LE to differentiate between muscular tissue and subcutaneous tissue on the image. One investigator (HS) was responsible for finding the image using the probe, while another investigator (JLS) was responsible for taking the image and determining the cross-sectional thickness measurements. A total of three images were obtained for each participant. The three measurements' average was determined to ensure that each measurement was within .3 mm of each other.

An intra-rater reliability study was conducted to ensure accurate cross-sectional area measurements of the gluteus maximus. This intra-rater reliability study included ten participants in which one investigator conducted ultrasound imaging of the left gluteus maximus muscle. The second investigator recorded the measurements of each ultrasound image (Figure 1). Each participant was asked to return a week later, where the same process was completed to compare measurements. For the ultrasound reliability study, a total of 10 (seven males, three females) participants were included (mean age of 24.0 years old, the average height of 172.0 cm, and an average weight of 72.9 kg). The intra-rater reliability of the ultrasound pilot study was excellent (ICC=1.000) with a 95% CI [0.998 – 1.000].

Figure 1. Location of the Ultrasound linear probe and the resulting image.



Muscle strength was assessed using the FreeMotion EXT Dual Cable Cross machine. The left hip extension 1-RM procedures for measuring muscle strength at baseline and post 6 weeks include

the following in this order: 1) each participant completed a five-minute self-paced walk as a warm-up followed by a demonstration of how to complete the 1-RM; 2) each participant was positioned over a mat-table with their torso on the table and feet on the floor (Figure 2); 3) the cable of the FreeMotion Cable Cross exercise machine was attached to a cuff on the participant's left LE, just proximal to the knee; 4) each participant was asked to keep their knee flexed to approximately 90 degrees to help reduce the recruitment of the hamstrings while enhancing the recruitment of the gluteus maximus muscle, and; 5) each participant's 1-RM was found using the standardized method from ACSM (Riebe et al., 2018). Each participant was asked to complete one repetition through a full range of motion. Strong verbal encouragement was provided in each trial, and two minutes of recovery was allowed between attempts. Subjects were considered to achieve their 1-RM based on the inability to complete a concentric repetition to neutral hip extension. If a participant could lift the maximum amount of weight of 150 pounds (68.2kg), the participant performed the maximum number of lifts that he/she could perform. The number of repetitions performed was then used to predict the individual's 1-RM (Ware et al., 1995).

Figure 2. Starting position and ending position of 1-RM.



Ten participants were recruited to perform a 1-RM reliability study of the gluteal hip extension using the FreeMotion Cable Cross exercise machine. The 1-RM reliability study involved 10 participants (five males, five females) (mean age of 23.6 years old, the average height of 175.8 cm, and an average weight of 73.5 kg). The intra-rater reliability of the 1-RM gluteal hip extension pilot study was excellent (ICC=0.96) with 95% CI [0.854 – 0.990].

Intervention

Before each exercise session, the investigators reviewed the strengthening exercise with each participant and established/adjusted the proper resistance. Resistance was provided with non-latex

elastic bands (Theraband®). The elastic band resistance can be altered by selecting from various tensions, labeled by color. For this study, red (~1.81 kg), green (~2.27 kg), blue (~2.72 kg), black (~3.18 kg), and silver (~4.54 kg) bands were utilized (*TheraBand Professional Non-Latex Resistance Bands, Sets*, 2019). The bands were wrapped around the limb, and, therefore, the resistance resulted in double the tension (in kg) reported above (e.g., the black band would have provided ~6.36 kg in this study). The resistance level of the elastic bands was selected based on the participant's perception with a resistance goal of "easy to somewhat easy" (i.e., score of two to three out of 10) measured via the OMNI-RES (Naclerio et al., 2017). This resistance was determined before the BFR cuff application for both groups. At the start of each intervention session, the resistance level was determined to address the progression and overload training principles. Most participants peaked at the green or blue elastic band. Once the proper elastic band was set/adjusted, the participant first performed a five-minute treadmill walking warm-up at a self-selected speed.

After the warm-up, the participant's left LE was fitted for the appropriate cuff associated with the PTS for BFR. The cuff was positioned on the left thigh's proximal portion in the groin area, just distal to the fold of the gluteal muscles. In all intervention sessions, the investigator positioned the cuff on the left thigh to ensure proper positioning. With the subject lying supine, the total limb occlusion pressure (LOP) was determined. After calibration, the investigator adjusted the cuff pressure depending on the participant (intervention vs. control). The intervention group BFR cuff pressure was set to 80% of the participant's LOP, while the control group BFR cuff was set to 0 mmHg cuff pressure (no occlusion).

Quadruped hip extension was used for gluteus maximus strengthening of the left and right lower extremities. Selkowitz et al. discussed exercises that activated superior and inferior portions of the gluteus maximus determined via electromyography (EMG) (Selkowitz et al., 2016). They concluded that hip abduction and/or external rotation (ER) had significantly higher EMG activity in the superior portion, while hip extension (EXT) activated both portions of the gluteus maximus.

The elastic band was applied to the distal thigh just above the knee. The participant extended their left hip in the quadruped position while keeping the knee flexed to 90 degrees. Then the participant lifted the foot toward the ceiling to achieve a neutral hip extension for a two-second count and then returned the leg to the starting position for a two-second count. After completing a set on the left, the participant then performed the exercise on the right, alternating this sequence until all sets were complete. A total of 4 sets of 75 repetitions (30, 15, 15, and 15 repetitions) were performed on each LE with a 30 second rest period between sets, as has been previously described in the literature (Patterson et al., 2019). Upon completing the training session, the participants completed a cool-down of treadmill walking for five minutes at a self-selected speed. The starting and ending positions of the intervention exercise are shown in Figure 3.

Figure 3. Starting and ending positions of intervention exercise.



Statistical Analysis

The sample size was determined using an estimated medium effect size of 0.25 and the desired power of 0.7, resulting in 50 participants per group. Accounting for an attrition rate of 10%, this brought the desired sample size to 55 participants per group. Subject demographics were reported with descriptive statistics (mean and standard deviation). Between-group comparisons of age, baseline thickness, and 1-RM were conducted with independent t-tests and gender with chi-square analysis. Intra-rater reliability of both 1-RM testing and ultrasound cross-sectional thickness was assessed with a model three intra-class correlation coefficients (ICC). Muscle thickness and strength measures were analyzed using a mixed model ANOVA with one within groups factor (time) and one between-groups factor (intervention group). An alpha level of .05 was used to determine statistical significance. Further analysis of the results was conducted to determine clinical significance. The mean (SEM) standard error and minimal detectable change (MDC) were calculated for muscle thickness and strength. Muscle thickness SEM and MDC were calculated by running a Post Hoc Analysis of the three pre-test trials of all 46 participants giving an ICC of 0.99. The SEM and MDC were calculated for muscle strength by using the ICC from the reliability pilot study of 0.96.

Results

A total of 46 participants (17 males, 29 females) were included and completed the study with an average age of 22.5 ± 2.3 years old, an average height of 167.8 ± 9.4 cm, and an average weight 73.2 ± 17.1 kg. Table 1 outlines the group demographics, baseline measurements and demonstrates the non-significance between groups. Although recruitment resulted in 95 potential participants, 40 of these individuals did not respond to follow-up communication to schedule for the study. Thus, 55 potential participants remained. Five were excluded due to meeting the exclusion criteria. Thus, 50 participants began the study; however, four participants were lost due to attrition. One due to tobacco use, which was not revealed until intake. One due to a hypotensive event after the first session of intervention. One participant was excluded due to a history of cardiac arrhythmias, which was revealed after intake and group placement, but before intervention. The fourth participant was lost due to scheduling conflicts. Three of the four who dropped out of the study were in the experimental group. Therefore, 88.5% of the LI RT+BFR participants and 95.8% of the LI RT participants finished the pre- and post-testing. Of the 12 sessions that were to be attended

during this study, the LI RT+BFR group completed an average 11.7 sessions (range 10–12 sessions), whereas the LI RT group attended an average 11.9 sessions (range 10–12 sessions); thus, adherence was 97.8% and 99.3% for the LI RT+BFR and LI RT groups, respectively.

Table 1. Group demographics and baseline measurements.

Category	BFR + Exercise	Exercise Only	P-value
Gender	Males = 10 Females = 13 (56.5%)	Males = 7 Females = 16 (69.6%)	0.840
Age (years)	22.3 ± 2.3	22.3 ± 2.4	0.950
Height (cm)	168.6 ± 9.9	166.9 ± 9.0	0.715
Weight (kg)	72.4 ± 11.4	74.0 ± 21.6	0.089
Baseline Thickness (mm)	7.4 ± 2.3	7.3 ± 2.4	0.737
Baseline 1-RM (lbs.)	109.9 ± 55.3	85.4 ± 39.5	0.107

Figure 4 demonstrate the pre- and post-intervention muscle thickness of the gluteus maximus, showing that the BFR group experience more muscle thickness. However, the interaction between the intervention group and time was non-significant ($F_{1,44}=1.713$, $p=0.197$). There was a significant main effect of time ($F_{1,44}= 21.998$, $p=0.001$), with a cross-sectional thickness of the gluteus maximus increasing significantly after the six-week intervention with a mean difference of 0.55 mm and 95% CI (0.317-0.794). The main effect of intervention group was non-significant ($F_{1,44}= .155$, $p=.695$) with mean difference of 0.28 mm and 95% CI (-1.14-1.70).

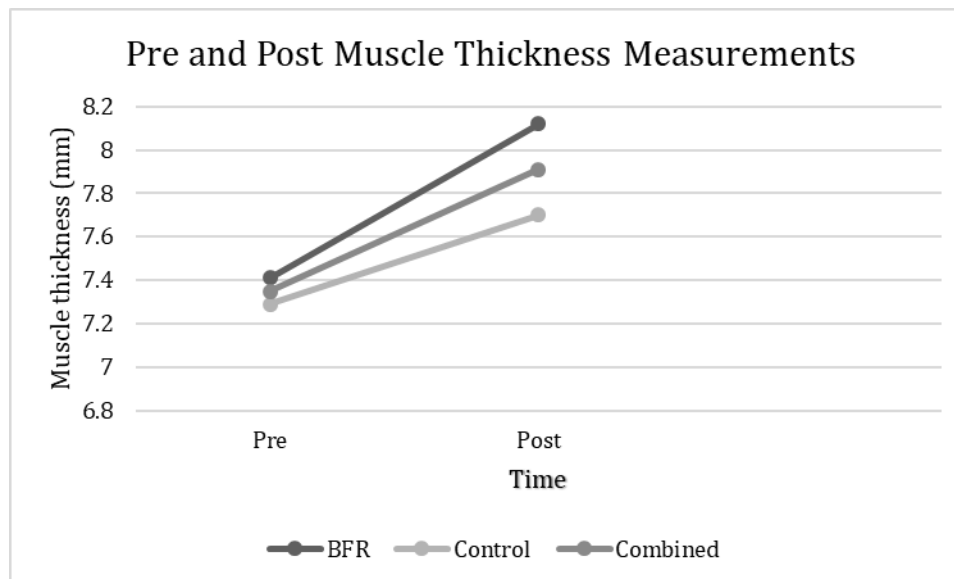


Figure 4. Pre- and post-muscle thickness measurements in the BFR, control and combined groups Indicates differences between pre- and post- muscle thickness measurements ($p=0.001$)*

Figure 5 demonstrates the pre- and post- 1-RM measurements of the gluteus maximus, showing that the BFR group increased muscle strength. However, the interaction between the intervention group and time was non-significant ($F_{1,44}= .645$, $p=0.426$). There was a significant main effect of time ($F_{1,44}= 85.23$, $p=0.001$), with the gluteus maximus strength increasing significantly after the

6-week intervention with a mean difference of 14.2 kg and 95% CI (11.1-17.4). The intervention group's main effect was non-significant ($F_{1,44} = .155$, $p = .695$) with a mean difference of 9.9 kg and 95% CI (-2.8-22.6).

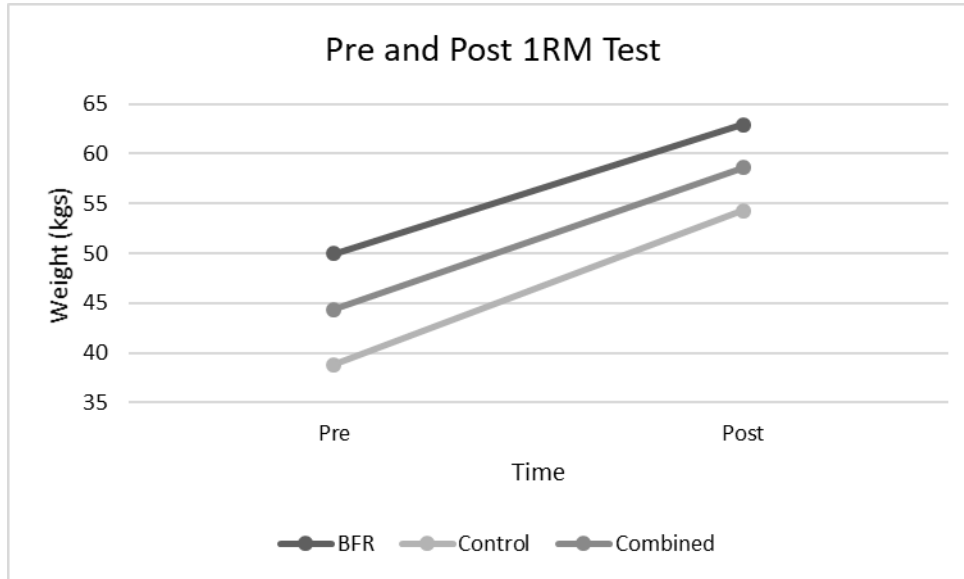


Figure 5. Pre- and post-intervention 1-RM Tests in the BFR, control and combined groups

* Indicates significant differences between pre- and post-1-RM tests ($p = 0.001$)

Further analysis of the results was conducted to determine if clinical significance existed. The ICC for muscle thickness resulted into SEM and MDC of 0.07 mm and 0.21 mm, respectively. The MDC was then compared to the post-test averages of ultrasound measurements for both groups, and the measurements exceeded the MDC, which signifies that clinical significance did exist. The ICC for muscle strength resulted into SEM and MDC of 2.7 kg and 7.4 kg, respectively. The post-test measures for both groups were compared to the MDC and were determined that clinical significance did exist.

Discussion

This study indicates that the gluteus maximus thickness and strength increased after a six-week training program for both groups. The addition of BFR did not result in an additional proximal muscle thickness and strength gains than the control group. However, clinical significance was found between the groups with BFR, resulting in clinically meaningful additional proximal muscle thickness and strength gains.

Our results are consistent with previous findings that the addition of BFR did not result in additional proximal muscle thickness and strength gains compared to the control group (Brumitt et al., 2020; Sakamaki et al., 2011.) Brumitt et al. used the side-lying shoulder external rotation exercise with BFR, which did not result in proximal muscular changes compared to the control group (Brumitt et al., 2020). Another study that found no difference in lower extremity proximal muscle changes was Sakamaki et al., which used a 10-minute BFR walk training exercise two times a day, six days per week for 3 weeks (Sakamaki et al., 2011). The authors of both studies

concluded that the lack of changes proximally is possibly due to the inadequate stimulus provided during the intervention (Brumitt et al., 2020; Sakamaki et al., 2011). Thus, a lack of volume appears to be the commonality between these two studies and ours.

In contrast, studies that utilize a higher volume exercise protocol combined with BFR have found additional proximal muscle size and strength gains (T. Abe et al., 2005; Bowman et al., 2019, 2020; Hedt et al., 2020; Lambert et al., 2019). An older study by Abe et. al. found that the combination of BFR and lower extremity exercises (squat and leg curls) performed at 3 sets each, two times per day, six days per week for two weeks, resulted in increases in gluteus maximus muscle size (Abe et al., 2005). This older study is different to our current study because the authors used a different type of BFR cuff (KAATSU) and training protocol. Bowman et al. (2019), a newer study, used the same BFR cuff and training protocol as this current study and found that lower extremity muscle size and strength increased more compared to the control group. However, this study used multiple exercises in contrast to our study, resulting in a higher volume exercise protocol.

To the best of our knowledge, there are only a few studies where the combination of BFR and a lower volume exercise protocol resulted in additional proximal muscle size and strength gains compared to the control group (Thiebaud et al., 2013; Yasuda et al., 2010). A study by Yasuda et. al. reported that combining BFR and the bench press exercise at 30% 1RM, twice a day, six days a week for two weeks, resulted in superior muscle size gains in the BFR group (Yasuda et al., 2010). Specifically, the proximal chest muscles were more extensive than the distal triceps muscles. Similarly to our study, muscle size was measured by using ultrasound. Even though this study only used one exercise, this exercise was a multi-joint, free weight exercise combined with a higher intensity in which they performed it. These additional factors may have generated a greater stimulus needed to elicit proximal muscular changes.

Additionally, muscles distal to the cuff (triceps) may have fatigued during the bench press exercise resulting in an increased pectoralis muscle recruitment because the authors noted an increase in iEMG output of those muscles towards the end of the BFR exercise. Similar proximal muscle strength gains as the high volume BFR training studies, a study by Thiebaud et al. found that a low volume BFR training protocol in combination with two band exercises (seated row and shoulder press) resulted in an additional increase in upper body proximal muscle strength gains in the BFR group (Thiebaud et al., 2013). Therefore, the compound movements combined with the BFR low volume training protocols used in these studies above suggest that those movements stimulate trunk adaptations, which may necessitate additional proximal muscle thickness and strength gains compared to the control group. Our study did not involve compound movements and did not recruit a synergistic downstream muscle below the cuff, which may explain why our results are consistent with the Brumitt et al. study.

It should be noted that this study has a few strengths. First, this study utilizes a standard BFR method noted throughout the majority of published BFR works, four sets of 30, 15, 15, and 15. Second, we accounted for an attrition rate of 10. By the end of the study, our attrition rate was only 4, with a high percentage of sessions completed throughout the study. Lastly, we believe that this study resembles the equivalent of a clinical/gym setting in terms of the exercise used and the change within scheduling from week to week revolving around the college student schedule. Just

as a patient/client may not attend a therapy/exercise session on the same day and time from week to week and not maintaining 100% attendance, we noticed the same throughout our study.

Even though our study has several strengths, there are some limitations. One limitation is the lack of statistical significance found in the muscle thickness between the two groups could be attributed to multiple factors. First, the lack of achieving the desired sample size may have resulted in a lack of statistical significance due to a lack of power. Increased sample size would have increased the study's power and, thus, may have resulted in statistical significance. Second, only one exercise was performed throughout the intervention, which may not have been enough volume to stimulate the gluteus maximus to result in significant strength and thickness. The exercise performed was a quadruped hip extension exercise with Thera-bands used as resistance. Since the trunk is unsupported, compensations such as increased lumbar lordosis, recruitment of the hip abductors, and hamstrings recruitment were possible. Therefore, an adequate overload of the gluteus maximus may not have been achieved to observe significant strength and hypertrophy gains. Third, the protocol for Thera-band usage should be followed as described to ensure that each participant is receiving the full amount of resistance that the band is intended to apply. The total number of sets and repetitions were consistent with previous BFR studies that resulted in muscle strength and hypertrophy (Patterson et al., 2019). However, the load applied and the need to use a subjective scale for estimating the training load, OMNI-RES, may have limited the amount of needed to require proximal changes. It has been suggested that the exercises should be taken to failure if proximal changes under BFR are desired (Abe et al., 2012; Mattocks et al., 2018). Lastly, although participants were scheduled twice a week, they were not scheduled on consistent days. This could have affected each participant's ability to recover from session to session. As previously mentioned, some sessions were missed in both groups. Participants that missed sessions were asked to use their current Thera-band resistance and to complete the session on their own using the same sets and reps. However, the BFR group would not have completed the exercise with BFR during these sessions, affecting the results. Overall, in a clinical/gym setting, it would not be abnormal for patients to have altered schedules from week to week and/or for them to miss treatment/exercise sessions. Therefore, clinicians/exercise professionals should strive to establish consistent schedules for their clients and encourage regular attendance.

Clinical Application

With this study's results in mind and previous research conducted, we believe that LI RT + BFR has many applications and benefits. BFR can be used on individuals who have been injured, healthy, elderly, and athletes (Hughes et al., 2019; Hwang & Willoughby, 2019; Mattocks et al., 2018). Most often, after an injury, athlete or not, the amount of weight lifted is significantly reduced, so much so that the weight they can lift does not meet the threshold needed to see strength and hypertrophy gains (Scott et al., 2016; Wernbom et al., 2008). BFR allows the athlete to work at a lighter resistance and still receive the strength and hypertrophy needed for recovery (Scott et al., 2016). The strength and hypertrophy gains seen with BFR have shown to be comparable to those working at 70% of their 1-RM after an ACL injury. (Hughes et al., 2019). Healthy athletes can also use BFR to provide additional strength and hypertrophy gains and improved performance (Wortman et al., 2020).

BFR can also be used for those who might be post-surgical or non-weight bearing for various reasons (DePhillipo et al., 2018). Those who are post-surgical or are of a non-weight bearing status may be prone to disuse atrophy, in which BFR can be applied to decrease to such atrophy (Takarada et al., 2000). BFR allows the patient to exercise at a lighter resistance and still receive strength and hypertrophy gains needed to promote recovery (DePhillipo et al., 2018; Loenneke et al., 2012b; VanWye et al., 2017).

Lastly, it is difficult for those of the elderly population to exercise at such a high intensity needed for hypertrophy and strength gains, due to frailty, being a novice in resistance training, joint complications, or cardiopulmonary impairments (Vechin et al., 2015). Since “resistance training has been widely recommended to offset some of the age-related impairments in functionality and alterations in body composition,” it can be recommended that LI RT + BFR can be an alternative for the elderly population (Vechin et al., 2015).

Conclusion

In summary, it was determined that gluteus maximus thickness and strength increased significantly from pre-test to post-test for both groups. However, BFR did not provide any additional benefit to the intervention. We did find clinical significance for both proximal muscle thickness and strength between groups. Based upon these results, we conclude that this information can be applied within the clinic/gym setting with those patients/clients who have had recent surgery, experiencing muscle atrophy, and/or lack of strength. We recommend that further research be conducted to continue to examine the effects of BFR on proximal musculature. These future studies should include multiple exercises, a mid-point (i.e., 3-4 weeks) measurement of muscle thickness and strength, and larger sample size to increase the study's effect size and power.

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An Exploratory Study to Understand Visitor Perceptions of White Nose Syndrome and Bat Colony Management at Carter Caves in Northeast Kentucky

Aaron Lipe, Eastern Kentucky University

Michael J. Bradley, Arkansas Tech University

Kelly Watson, Eastern Kentucky University

Julia Portmann, James Madison University

Abstract

Cave tourism is a popular activity and provides unique educational opportunities for visitors to caves across the United States. The flow of tourists in and out of caves creates a unique challenge in mitigating the spread of a deadly fungal pathogen called White Nose Syndrome (WNS). Cave tourism in Kentucky is a popular activity throughout the state. To continue offering caves as tourism destinations, proper cave and bat population management is needed to mitigate the spread of WNS. Studying visitor opinions and preferences provides information to optimize cave management education and interpretation. This exploratory study offers an initial step to understanding Kentucky's cave visitors and offers suggestions for better on-site education efforts.

Keywords: Cave tourism, Kentucky cave, white nose syndrome, bat colony management

Introduction

Since 2006, more than one million North American bats have been killed due to White Nose Syndrome (*Pseudogymnoascus destructans*), the fungal pathogen responsible for the collapse of many bat populations (Frick et al., 2010). White Nose Syndrome (WNS) in Kentucky was first documented in 2011 and is known to primarily affect bat species that overwinter in caves (Turner et al., 2011).

With many visitors traveling and exploring multiple caves, uninfected cave systems can be exposed to WNS through improperly sanitized clothes and gear. Many Kentucky's cave parks have a high number of visitors per year, such as Mammoth Cave National Park with 551,590 visitors in 2019 (Mammoth Cave visitation by year, 2021). Carter Caves visitation is not specifically available, however, the caves have been closed to visitors from March 2019 to current due to Covid19 protocol. WNS is known to spread via clothes and caving gear as visitors move from one cave to another (Salleh et al., 2021, p.2). Educating and changing the behaviors of cave tourists could aid efforts in the conservation of endangered bats and preventing the spread of WNS (Mayle & Bradley, 2016; Larson et al., 2018). The purpose of this study was to identify cave visitor perceptions of bat colony management, WNS, and educational outreach by various cave managing agencies.

This exploratory study identified visitor knowledge of white nose syndrome management, bat colony management, and sustainable cave tourism. The focus of the research was to identify the difference in knowledge and attitudes between visitors that participated in a guided tour and those who did not. The data helped the authors determine the influences of programming, interpretation, and education on the behaviors and perceptions of cave visitors.

Literature Review

Kentucky is home to sixteen species of bats that primarily eat insects (insectivorous). They respond to the decreased insect availability during the winter months by hibernating or migrating south to warmer areas. Bats that hibernate in caves are most susceptible to WNS, as the fungus proliferates in cold, damp spaces and attaches to the skin of hibernating bats (Turner et al., 2011). Bats become more active in response to the irritation of the fungal infection, which leads to dehydration, electrolyte imbalance, and critical loss of fat stores necessary to survive winter hibernation (Carr et al., 2014). Surveillance for WNS is crucial for monitoring and potentially mitigating the spread of the fungal pathogen (Pettit & O'Keefe, 2017; Hicks et al., 2020).

Sixteen known caves and two mining complexes serve as winter bat hibernacula in the Great Smoky Mountain National Park. A brown bat was found with the disease in 2010; three additional bats tested positive for the disease in 2011. Between December 2012 and April 2013, bats in the park were frequently observed flying outside during daylight hours, suggestive of WNS infection. National Park staff issued an official release to the public about the potential risk of being exposed to sick bats; they also requested patrons report any sick bats or abnormal bat behavior (Carr et al., 2014).

After discovering WNS infection in Great Smoky Mountains National Park, researchers expected to see increased mortality rates in the bat population. However, during the winter 2013 count, overall bat numbers in the park were not drastically affected. To monitor the spread of WNS, a passive acoustic detector was deployed at the entrance of a cave with WNS-positive bats and used to monitor bat activity for two years (Carr et al., 2014).

In July 2010, the National Park Service Office of Public Health proposed an expanded WNS surveillance strategy using opportunistic sampling of bats already submitted to state public health laboratories for rabies testing (Griggs et al., 2012). Mammoth Cave National Park, the world's largest cave system and home to thirteen different bat species, was the focus of the pilot project. When the study was first discussed in 2010, Kentucky was a WNS free state, but Tennessee had recently reported cases that spring in a cave system less than 80 miles from Mammoth Cave (Griggs et al., 2012).

The goals of the Griggs et al. (2012) study were to enhance acoustic WNS surveillance in counties in and around Mammoth Cave and to demonstrate a feasible and cost-effective surveillance system. After multiple meetings around the state, the surveillance concept was well-received and protocols were developed for submitting rabies-negative bats to the Southeastern Cooperative Wildlife Disease Study (SCWDS) (Griggs et al., 2012). Protocols outlined elements for the submission process, including procedures for submitting rabies-negative bats, and the communication of test results. Although the sample of tested bats was relatively small, the endeavor was a critical first step in developing protocols for using rabies-negative bats for WNS testing and fostering cooperation and communication between state departments of wildlife and health. The low-cost system shows promise for use in other states where WNS may emerge in the future and where the cost of surveillance prohibits testing. The project also showcased a unique

collaboration between wildlife management, human health, disease ecology, and environmental stewardship (Griggs et al., 2012).

As scientists begin to understand how WNS will affect caves and bat populations in Kentucky, it is important to understand how to best approach human use of caves and best manage human visitation to these areas. To date, there are no known studies of visitor perceptions of WNS in Kentucky. Additionally, few other studies have investigated cave visitor knowledge of White Nose Syndrome. For example, an Australian-based study (Salleh et al., 2021) found 65.9% of visitors are aware of prevention methods in place, but only 23.9% fully adhered to them. The researchers noted additional targeted education is needed to increase adherence to protocol. In a study in the Great Smoky Mountains National Park (Fagan et al., 2018), researchers noted better information is needed to tailor programming and outreach materials related to WNS education.

Cave tourism operations are currently lacking valuable information that could shape management decisions aimed at preventing the spread of WNS and protecting existing bat colonies. Therefore, this study was designed to evaluate perceptions and general knowledge of WNS among Kentucky cave visitors. Awareness of visitor perceptions and knowledge related to White Nose Syndrome may help cave managing entities develop targeted programming and education that lead to behavior modification related to cave visitation.

Methods

Participants in this study included adults (ages 18 and older) visiting Carter Caves State Resort Park in Olive Hill, Kentucky, January 15-April 15, 2017 for a guided interpretive program through one or more of the caves on site. This state park is known for its numerous caves and forested trails, making it a popular spot for locals and visitors throughout the year. The instrument in this study was a self-administered questionnaire that included Likert scale and demographic questions. Using previous surveys related to WNS (Carr et al., 2014; Fagan et al., 2018), the researchers and Carter Caves interpretive programs staff designed a survey to identify participants' knowledge and perceptions of bat colony management, cave tourism, and white nose syndrome. The statements and questions included in the final version of the survey may be seen in Tables 1 through 3.

The targeted respondents were adults who visited one of the Carter Caves on a guided tour. To accommodate scheduled guided tours, survey administration dates and times were chosen throughout a five-month period when guided tours were scheduled. The researcher on site for the day would approach each group as they completed the guided experience and ask if any adults would be willing to take part in a post-experience self-administered survey. This was announced once at the conclusion of the guided tour. This process was intentionally non-intrusive and thus also meant a lower participation rate for this study. The researchers estimate a total of 471 adults were present when asked about participation in the survey. A total of 58 respondents completed questionnaires after their guided cave tour experience, for a 12.3% response rate.

Results

As shown in Table 1, there were slightly more male participants (N=30, 52%) than female (N=28, 48%). Most respondents had at least a high school diploma (N=13, 22%), some college (N=17, 29%), or an undergraduate degree (N=16, 28%). Most respondents were White/Caucasian (N=54, 93%). Twenty-six respondents were attending their first cave tour interpretive program (45%) while thirty-one (55%) respondents reported having attended at least one previous program at Carter Caves State park or another location.

Table 1. Demographic description of respondents

Variable	N	%
Male	30	52
Female	28	48
Less Than High School	1	4
High School	13	22
Some College	17	29
Undergraduate	16	28
Post Graduate	8	4
Caucasian Non-Hispanic	54	94
Hispanic/Latino	2	3
Have attended guided tour before today	31	55
Have not attended guided tour before today	26	45

Researchers collected information related to visitor bat conservation perceptions (see Table 2) and visitor attitudes toward nine different White Nose Syndrome management options (see Table 3). In general, respondents noted they learned more about cave environments, ecosystems, and conservation of bats and their habitat. However, they were not willing to pay more (entry fees) to support conservation. In regards to management of caves, respondents supported the idea of decontamination of caves, but were neutral on many of the other management options presented in the survey. Respondents did not support closing the caves, providing additional food for bats, or alternative bat habitats as management options.

Table 2. Conservation perceptions of respondents.

Statement	Mean	Std Deviation
I learned much about bats and cave environments from my visit or guided tour.	2.15	0.73
I would not have visited this cave if bats were not present.	3.70	0.98
After my visit today, I plan to do more to participate in conservation practices in my daily life.	2.67	1.06
I learned much about White Nose Syndrome during my visit or guided tour.	2.39	1.18
Bats are an important part of our ecosystem.	1.68	0.75
After my visit today, I have more appreciation for wildlife and natural areas.	2.13	0.83

Caves and bat populations should be conserved for future generations.	1.71	0.65
I am willing to pay higher entry or program fees so more/enhanced conservation practices can be implemented.	2.68	1.02
Mean	2.39	0.9

Table 3. Bat colony and cave management preferences of respondents.

Statement	Mean	Std. Deviation
Caves should be closed to visitors during the active season.	3.17	1.08
Caves should be closed to visitors all year.	4.13	0.70
Decontamination procedures should be in place for visitors entering or exiting a cave.	1.84	0.93
We should decontaminate caves.	1.08	1.11
We should eradicate bats with WNS.	3.33	1.22
We should provide food within cave(s) for bats.	3.56	0.97
We should treat bats (fungicide).	2.81	1.11
We should try to find alternative habitats for bats.	3.80	0.91
Caves should be closed to bats if the bats in the caves are known to host WNS.	3.13	1.04
Mean	3.21	1.01

Discussion

In general, visitor knowledge and perceptions related to bat colonies and WNS was lower than expected. For example, 7 of the 8 statements in Table 1 fell below the neutral option, perhaps interpreted as the visitors being unconcerned or having learned little related to their cave. The major take away from this set of statements is visitors are not likely to visit the cave if bats are not present (Table 2). In that WNS can drastically affect bat populations, taking such a statement seriously may mean taking drastic measures to preserve bat populations and mitigating WNS affects on bats. The researchers believe additional, targeted interpretive and environmental education programs are necessary to allow visitors to better understand bats and their habitats (Abrams et al., 2020).

As noted in Table 3, the mean score for all management questions was 3.21 (neutral), with most of the management questions ranging from 2.81 to 4.13. This may suggest participants' specific opinions related to cave management for this research site are neutral, perhaps interpreted as they are open to a variety of management options. The management option that garnered significant support, decontamination, may require less preemptive public education, whereas getting public approval for closing caves may be a bit more challenging. The other management options in Table 3 may require some proactive initiatives, but the public is likely to accept management actions taken in regards to WNS. However, previous research (Abrams et al., 2020), may suggest preemptive education and interpretive programming be considered to help align thoughts, behaviors, and opinions of current and future visitors.

For this study, the researchers surveyed visitors who completed an in-person guided cave tour. However, various non-personal interpretation (signs, posters) was also available to tourists at various points during their visit to the lodge and visitor center. Research participants were potentially exposed to non-personal interpretation in addition to their guided cave tour. Previous research has shown interpretation, including signage, exhibits, guided tours, and behind-the-scenes opportunities, to be effective in influencing and increasing visitor knowledge and opinions related to specific topics (Ren & Foltz, 2016). However, in-person methods of interpretation, including ranger talks and guided interactions with resources, may yield higher knowledge gains than non-personal methods (Powell et al., 2020).

As people continue to visit caves, education and interpretation efforts to increase WNS awareness, cave ecology, and bat colony management are important to help reduce transmission of WNS from cave to cave and provide visitors with foundational knowledge to understand future management decisions related to cave habitats. These efforts increase visitor knowledge and potentially alter cave tourism behaviors (i.e. disinfecting clothes). Additional research is needed to identify specific methods to increase the benefits of education on visitors' knowledge and behaviors to ensure the future sustainability of cave tourism.

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Women's Perceptions of and Barriers to Mountain Biking in Northwest Arkansas

Rebecca Irvin, University of Arkansas

Sarah Stokowski, Clemson University

Stephen W. Dittmore, University of Arkansas

Stacey A. Forsythe, Western Kentucky University

David D. Christian, University of Arkansas

Abstract

The purpose of this study was to better understand women's perceptions of and barriers to mountain biking in Northwest Arkansas (NWA), known for having some of the best trails in the United States. Using descriptive statistics, the results of an online survey ($N = 150$) revealed descriptors that detoured women from participating in mountain biking: *mountain biking is a male-dominated sport* ($M = 3.88$, $SD = 0.92$), *the gear is too expensive* ($M = 3.87$, $SD = 0.96$), *people who ride mountain bikes are super athletic* ($M = 3.57$, $SD = 1.04$), *when I think of mountain biking, I picture men* ($M = 3.35$, $SD = 1.02$). The results of this study may influence outdoor education professionals, parks and recreation programming, cycling advocacy organizations, and any who make marketing materials for the outdoor industry.

Keywords: mountain biking, bicycling, women, women, recreation

Introduction

While equal gender representation continues to increase in outdoor recreation and throughout the cycling industry, it appears that men are more apt to try and learn the sport of mountain biking when compared to their female counterparts (Outdoor Foundation, 2020). According to the Outdoor Foundation (2020), "while the percentage of females that make up moderate [outdoor recreational] participants has increased, the overall all number of females [has] decreased" (p. 5). Men (55%) are also more likely to participate in biking (Outdoor Foundation, 2020) and there may be a variety of constraints that would detour any person (men or women) from participating in the sport (White, 2007). The literature often ignores women's participation in outdoor sports and there appears to be a gap on the literature regarding potential gender bias in outdoor recreation. Therefore, the present study inquired to: (1) describe women's perceptions of learning to mountain bike and (2) identify barriers or constraints to participation in mountain biking.

Mountain biking is historically a male dominated sport (Boniface, 2006; Green, 1998; Outdoor Foundation, 2020). However, mountain biking continues to grow in popularity as participation in mountain biking increased 400% between 1987 and 2000 (Getz & McConnell, 2014; Koepke, 2005). Koepke (2005) noted an increase in female participation in the sport. The Corporate Research Associates Inc. (CRA; 2010) noted the demographics of active riders tended to be male, young, middle class, and with companions who shared an interest in cycling. According to the Outdoor Foundation (2020), 15.9% of all Americans (and 24.6% of American youth) participate

in some type of biking (motocross [BMX], mountain, road); yet, there is a lack of racial minority participation given that 74.3% of participants are Caucasian.

Outdoor recreation includes many activities such as hiking, camping, rock climbing, whitewater kayaking, backpacking, mountain biking, and many more activities. Of the Americans who did not participate in outdoor recreation, 46% reported a desire to begin participating (Outdoor Participation Report, 2018). Of those who did not participate in outdoor sports, almost half expressed interest in participation (Outdoor Participation Report, 2018). Thus, there is a need to figure out why individuals choose not to participate in outdoor recreation. The top five reasons people reported that kept them from getting outside were: (1) “Too busy with family responsibilities” (2) “Outdoor recreation equipment is too expensive” (3) “Do not have anyone to participate with” (4) “Lack the skills or abilities” (5) “Have a physical disability” (Outdoor Participation Report, 2018, p. 15). This study hopes to identify constraints among women in the sport of mountain biking.

It is also important to note that the COVID-19 pandemic has impacted outdoor recreation participation (Rice et al., 2020). Rice et al. (2020) found that “urban outdoor enthusiasts are disproportionately impacted by the recreational burden of the pandemic-reducing their participation, changing their recreational settings, and reducing backcountry recreation to greater degree than residents in rural areas” (p. 6). Participation in outdoor recreation may serve as a way of coping (Rund et al., 2011). In regard to the cycling community, during the pandemic bike sales flourished and eventually led to a bike shortage (Goldbaum, 2020, May 18). The sales of leisure bikes increased by 121% from the year prior to the pandemic (Goldbaum, 2020, May 18). Thus, in a post-pandemic world, there may be an increased interest in outdoor recreation, specially the sport of mountain biking.

Mountain biking, like other late-modern outdoor sports, is technically advanced, involves high speed and human agility, requires that a person own or have access to a specialized bike and requires infrastructure (Skar et al., 2008). Mountain biking is practiced in a variety of ways and it takes place on soft-surface (unpaved) trails. Beginner mountain biking can include a simple ride through the woods that requires very little training or skill acquisition. Intermediate mountain biking may require a rider to negotiate steep terrain, rocks and tree roots in the middle of the trail, narrow trails, and/or tight turns. Advanced riding can include the most technically advanced trails with large obstacles, drops, ledges, exposed edges, and/or features that allow a rider to perform tricks (such as riding on a wall). Intermediate to advanced riding also often includes riding in seclusion, which has added benefits of spending time in nature.

Understanding how women learn and why they participate in mountain biking helps recreation professionals promote, structure, and execute mountain biking events (LaChausse, 2006). Gender has an effect on motivational factors for participating in outdoor and endurance sports (LaChausse, 2006; Ogles & Masters, 2000; Pomfret & Bramwell, 2016). Additionally, there is a demand from women for more technically advanced adventure tourism is rising and with it is the “supply of women-only adventure holidays” (Pomfret & Bramwell, 2016, p. 1450). As such, there is a need to focus on women, specifically, in regard to the sport of mountain biking.

Northwest Arkansas (NWA), which includes the cities of Bentonville, Rogers, Springdale, and Fayetteville, is a region that demonstrates the demand for cycling among women. According to Explore Arkansas (2020, September 11), since hosting the International Mountain Bicycling Association (IMBA) World Summit in 2016, the Red Bull Pump Track World Championship in 2019 — and now as host of the 2022 Cyclocross World Championships — NWA has earned a reputation as one of the top off-road cycling destinations in the nation! (para. 3).

The region is home to many mountain biking resources and opportunities to learn the sport (e.g., group rides, clinics). In fact, the state of Arkansas has become a destination for cyclist with more than 400 miles of biking trails (Explore Arkansas, 2020, September 11). The region boasts mountain biking events and races for amateurs and professionals year-round. In 2019 alone, prior to the shut down due to the COVID-19 pandemic, the area hosted multiple events and programs for women:

1. Women Shred—in conjunction with the Bentonville Film Festival, women have the opportunity to go on rides with professionals. The group rides, which were free to anyone, sold out in one day.
2. Women of Oz—a program funded by a grant from the Walton Family Foundation hosted monthly skills clinics and group rides for women.
3. Liv Ladies AllRide—a skills camp for women that takes place over a 3-day weekend.
4. NICA GRIT—a program that recruits girls in junior high and high school to join their institution's mountain biking teams.
5. Little Bellas—a program for girls ages 7 to 13-years old that promotes companionships, skill development, and having fun while riding bicycles.
6. OORC Women Give Back—a series of volunteer opportunities for women to give back to the mountain biking community through trail maintenance and building opportunities.

Gary Vernon, the director of cycling programs for the Walton Family Foundation was quoted saying, “2019 will be remembered as the year women’s mountain biking exploded in Arkansas” (Finding NWA, 2019). Considering the area host several events for women, there is clearly a demand for mountain biking. If women in the Ozark Mountains (where NWA is located) are interested in the sport, perhaps there is a demand for the sport in other parts of the country with similar terrain. Specifically, perhaps women want to get involved in mountain biking but there are barriers that detour participation.

The purpose of this study was to better understand women’s perceptions of and barriers to mountain biking in NWA. The present study was guided by the following research questions:

RQ1: How do women perceive mountain biking?

RQ2: What barriers detour women from participating in mountain biking?

The data collected may assist outdoor recreation professionals, parks and recreation programmers, bike shop owners, and non-profit and private entities in advocating to get more women on bicycles. The findings will allow organizations to provide inclusive programming and meet the specific needs of women in regard to learning and participating in mountain biking. This present study may

also assist organizations in creating marketing materials and signage that dismantle the gender stereotypes that may exist regarding mountain biking. If stereotypes about mountain biking exists (e.g., *it's dangerous*), then the data may assist in debunking such misconceptions. Additionally, the data collected in this study may help professionals in the field to better understand how to create a supportive environment while facilitating skills clinics and leading group rides. Lastly, this study may provide insight to the biggest barriers of entry into the sport for women and provide practitioners with data to assist in promoting the sport.

Literature Review

Single-sex Education

When teaching the technical skills needed to participate in mountain biking, an instructor must set up a learning environment where the student is willing to take risks and potentially fail. Studies (Loeffler, 1997; Boniface, 2006) have demonstrated that women in outdoor career development generally perform better in a supportive environment led by women. Such all-women or all-girl learning situations have been shown to positively affect the experience of women in outdoor education settings (Hornibrook, et al., 1997; Warren 1996; Warren & Loeffler, 2006; Whittington et al., 2011).

Whittington et al. (2011) conducted a study utilizing focus groups to better understand the benefits of girls (aged 10-17) that participated in outdoor adventure programming. Girls in the study completed programs in rock climbing, sea kayaking, mountaineering, backpacking, canyoneering, and mountain biking. The study concluded that benefits of all-girl programming allowed girls to feel safe, connect personally with other girls, and reduced stereotypical pressures (Whittington, et al., 2011). Similarly, Evans et al. (2020) study demonstrated that outdoor recreation increased “self-efficacy and self-empowerment” (p. 1) among middle school girls. Stereotypical pressures may influence girls to make riskier decisions such as going faster than they are comfortable in an effort not to appear weak or scared (Bialeschki & Henderson, 1993; Culp, 1998; Evans et al., 2020; Whittington et al., 2011). In a sport like mountain biking, such irrational decisions may have negative consequences (e.g., discontinuation of sport participation, injury, death). However, with a better understanding of the female perspective of the sport, programmers can design content to better assess and manage risks. Single-sex education may be a way to mitigate risk because in highly competitive co-ed environments beginners are likely to demonstrate lower self-efficacy (Beveridge & Scruggs, 2000; Whittington, et al., 2011). Teaching technical skills in co-ed environments also results in slower skill acquisition for women (Beveridge & Scruggs, 2000; Whittington, et al., 2011).

Whittington et al. (2011) study demonstrated that single-sex programs resulted in greater “skill acquisition” (p. 4). The dominant behaviors of males in technical learning situations have been shown to cause women to silence themselves, withholding questions and opinions (Whittington, et al., 2011). Men speaking up and asking questions might also direct the progression of teaching in a non-linear format. For example, in a co-ed clinic, if men are the only ones asking questions, it may cause the instructor to begin jumping around from one skill to another instead of teaching a gradual progression of skills that build on previously learned skills.

With that being said, separating men and women beyond foundational skills may pose a learning curve that could potentially hurt the skill acquisitions of women. In Boniface's (2006) study, participants reported that having climbing partners of the opposite sex was a deterrent to participation. A male participant in the study reported that climbing with a female partner was difficult because the male participant felt that his female partner did not have enough endurance to keep up. Therefore, female-specific educational programming could be productive in teaching fundamental skills to progress women in outdoor recreational activities.

In Whittington et al. (2011) study, one participant stated, "it isn't just any all-girls group that is a good experience. In fact, many other all-girl groups I avoid like the plague" (p. 7). It is important to note that the all-girl programming in the Whittington et al. (2011) study followed curriculum centered around community support. The participant's statement, nonetheless, may serve as a reminder that all-girl programming can have an appropriate place in outdoor education.

Spatial Ability

Spatial ability is defined as a human's ability to locate one's body in space and time (Warren & Loeffler, 2006). Spatial ability is imperative for mountain biking as participants need to be able to proficiently manipulate a bike over technical sections of trail in order to advance in the sport. In order to move into intermediate and advanced levels of the sport, riders must also grow more comfortable moving their body and bike over steep terrain and at increased speeds. Gender differences in spatial abilities favors men (Nordvik & Amponsah, 1998; Warren & Loeffler, 2006), as spatial ability in a man's brain holds a specific neurological function that appeared consistently in at least four specific spots in the right hemisphere (Pease & Pease, 2000). Women, however have no specific locations for spatial ability in the brain and therefore scored lower on spatial tasks when compared to their male counterparts (Pease & Pease, 2000, Warren and Loeffler, 2006). This is theoretically one reason women may display difficulty in gaining technical ability in mountain biking.

While women have a more difficult time developing technical skills, this population has been found to be more willing to participate in practice drills (DeBoer, 2004; Warren & Loeffler, 2006) and open to multiple lessons that gradually increase in technical difficulties (Warren & Loeffler, 2006). This implies that beginner drills and session-ing (repeatedly riding a small section of trail until the rider displays confidence riding the section) on rides could help women feel supported and not alienated. An example of a direct application is offering a clinic for beginners who want to learn the fundamentals of mountain bike but are hesitant about hitting the trails with no prior knowledge of what skills are needed to successfully ride a mountain bike.

Confidence

Women often lack confidence during the learning process and even after a technical skill is learned, women may continue to perceive themselves as lacking competence (Loeffler, 2006). Despite being highly skilled and trained, women have been shown to view themselves as incompetent (Loeffler, 1997; Warren & Loeffler, 2006). Appling (1989) observed the behavior of female participants in outdoor leadership programming and described women as "avoiding leadership,

being fearful of physical challenge, avoiding assertiveness, manifesting feelings of intimidation or inadequate self-esteem” (p. 11). There is limited research that looks at women, as the majority of the literature (Evans et al., 2020; Whittington et al., 2011) has focused on the benefits of outdoor recreation in girls.

Male-dominated Sport

Qualitative data suggests that among women there is a perception that outdoor sport is male-dominated (Wright & Gray, 2013; Warren & Loeffler, 2006; Green, 1998; Boniface, 2006). Current instruction provided in mountain biking might appeal to masculine traits; therefore, the sport may be unattractive to women. This is especially true if the instruction is provided by a male instructor who is unaware of the learning differences between men and women. Instruction for outdoor sports has a long history of praising technical skills and physical abilities (Wright & Gray, 2013). The outdoor education history also has a long history of creating gender stereotypes around its leaders, consistently implying that men are better at technical (hard) skills and women are better at interpersonal (soft) skills (Wright & Gray, 2013). This gendered approach effects how women perceive their experiences on a bike (Wright & Gray, 2013).

Wright and Gray (2013) study also suggests that females who enter the industry as a profession face stereotypes:

We are necessarily masculine or overly ‘butch’ – or that we must unflinchingly face any challenge, with fearless determination and a cup of ‘toughen-up’... This conundrum is the double bind of prejudice: on the one hand, treated as inadequate or even odd for wanting to be in the field, but also subjected to unrelenting scrutiny and judgment, and held to a higher standard (p. 1).

Women who desire to take the sport of mountain biking to advanced levels might be subject to similar stereotypes. Such stereotypes and stigmas may present a constraint to participation. As such, it is important for practitioners to understand the current climate surrounding the sport of mountain biking in order to providing positive experiences for women in the sport. Mountain biking is not unique regarding such preconceived notions about women in sport. As Coakley (2016) points out, women are often viewed as invaders in sport and are expected to abide by traditional gender normative ideologies.

While praising technical skill ability and physical ability has a positive effect on men in outdoor sports, the opposite is true for women (Warren & Loeffler, 2006). However, when it comes to outdoor sports, being able to advance in the sport and feel confident requires a participant to gain technical skill. It is necessary for women to find positive gain in their technical skills (e.g., maneuvering a bike over a rocky section of trail) and physical abilities (e.g., climbing increasingly steep terrain) to advance as riders. There is an expectation in mountain biking that one should be able to ride the entire trail without stopping. This might require a rider to lift the bike over obstacles, ride over exposed tree roots and rocks, descending over uneven terrain, or climbing for miles to the top of a mountain or hill. This type of skills advancement usually requires failure (e.g., falling off, crashing, placing feet down, getting off, and walking). To the new riders, crashing or having to walk may make the participant feel like a failure, but at some point, all riders fail. Within the sport of mountain biking, failing allows one to increase their physical abilities. If programmers

can create environments where women do not feel like failures in these instances, and supportive coaching is provided to diffuse emotions and feelings of defeat, it is likely that the industry will begin to capture many more women.

Participant Motivation

Research rapidly demonstrates why people choose to participate in outdoor recreation, outdoor tourism, endurance sports, competitive and non-competitive sports. Women who participated in recreational forms of exercise reported motivational factors of weight loss, fitness, and socialization (Bond & Batey, 2005; Frederick & Ryan, 1993; Gill & Overdorf, 1994; Hodge et al., 2008; Krouse et al., 2011). Outdoor recreation helps some participants experience a sense of authenticity (Skar et al., 2008; Williams, 2002). Female ultrarunners (athletes running a distance greater than a marathon) reported physical health and psychological as motivational factors for participation. In regard to mountain biking, Skar et al. (2008) study of women in Norway found that physical exercise, contemplation, and nature served as motivational factors for participation.

In a study of motives of competitive and non-competitive cyclists, LaChausse (2006) found that women were significantly more likely than men to report motives regarding weight, affiliation, and self-esteem as reasons for participating. However, this study had a major limitation in that out of 1,239 cyclists only 256 were women and of those only 35 identified as mountain bike riders (LaChausse, 2006). Competitive female athletes reported motivation factors of “achievement, personal accomplishment, and empowerment” (Krouse, et al., 2011, p. 2835). The only significant difference between road cyclists and mountain bikers was that mountain bikers were more likely to report motives related to life meaning while road cyclists reported motives related to goal achievement (LaChausse, 2006).

Methods

In order to answer the research questions, an instrument comprised of 33 statements using a 5-point scale ranging from “strongly disagree” to “strongly agree” was created. Some of the statements were adapted from White’s (2008) study, “A Structural Model of Leisure Constraints Negotiation in Outdoor Recreation” while others were crafted based on themes (e.g., single-sex education, spatial ability, confidence, the idea that mountain biking is a historically male-dominated sport, participant motivation) discovered in the literature review. As such, the instrument addressed barriers of entry into the sport of mountain biking and motivation for participating in mountain biking. Demographic questions included age, gender, whether or not the person has children living at home, and whether or not the participant currently participates in mountain biking.

Convenience sampling and snowball sampling was utilized, as participants were recruited to take the survey using social media platforms (i.e., Facebook, Instagram) over a 10-day period. The social media post included a picture of a bike and asked, “women in Northwest Arkansas, please take (and share) the following survey on mountain biking.” The initial post was shared on the primary investigator’s social media page(s). Using Google forms, each respondent had the opportunity to identify their gender as “female,” “prefer not to respond,” or “prefer to self-

describe.” All answers were included in the study, because this study did not want to eliminate the barriers that transgender women, gender-fluid, and non-binary riders’ experience.

Theoretical Framework

While current and accurate data about the constraints to outdoor recreation participation exists, not a lot of theoretical development has occurred around the issue (Walker & Virden, 2005). Crawford and Godbey’s (1987) theory categorized leisure constraints into three groups, as White (2008) argued: constraints affect not only participation but also acquisition of leisure preferences. They organized constraints into three categories: intrapersonal constraints defined as individual psychological qualities that affect the development of leisure preferences (e.g., shyness), interpersonal constraints defined as social factors that affect development of leisure preferences (e.g., lack of companions), and structural constraints comprised of factors that intervene between development of leisure preferences and participation (e.g., financial resources). (p. 344).

Later, Crawford et al. (1991) shifted their ideas of these categories so that intrapersonal and interpersonal constraints affect which sports participants prefer and structural constraints intercede between one’s preferences and participation. For example, a woman might already participate in rock climbing and might desire to learn to mountain bike. However, if she does not have access to a mountain bike, because of financial constraints or she does not know where to rent a bike, she might be delayed in her participation in the sport.

Results

In total, 150 women completed the survey. The participant ages ranged from 19-70 years old ($M = 30.5$). All participants identified their sex as female. Seventeen percent of respondents reported they have children (newborn to 12th grade) living at home, and 83% did not have children or did not have children that live at home. Thirty-four percent of respondents currently participated in mountain biking. Of those, 24% have been mountain biking for one year or less, 26% reported mountain biking for 2-3 years, and 50% indicated they have been mountain biking for 3.5 to 25 years.

Based on the descriptive statistics, it appeared that the participants agreed with the statements: *mountain biking is a male-dominated sport* ($M = 3.88$, $SD = 0.92$) and *the gear is too expensive* ($M = 3.87$, $SD = 0.96$). All other constraints had a standard deviation greater than one implying that the whole sample had varying responses. The following constraints had the highest mean scores: *mountain biking is a male-dominated sport* ($M = 3.88$, $SD = 0.92$), *the gear is too expensive* ($M = 3.87$, $SD = 0.96$), *people who ride mountain bikes are super athletic* ($M = 3.57$, $SD = 1.04$), *when I think of mountain biking, I picture men* ($M = 3.35$, $SD = 1.02$). *I will never consider learning to mountain bike* ($M = 1.79$, $SD = 1.06$), was not a constraint but rather is an indication of participant motivation.

Table 1. Mean and Standard Deviation

Intrapersonal	Overall		Non-Experienced		Experienced	
	Mean	SD	Mean	SD	Mean	SD

When I think of mountain biking, I picture men.	3.35	1.02	3.46	1.01	3.14	1.02
Mountain biking is a male-dominated sport.	3.88	0.92	3.89	0.91	3.86	0.94
I'm scared that I would not be welcomed if I tried to learn to mountain bike.	2.29	1.08	2.34	1.06	2.20	1.08
People who ride mountain bikes are super athletic.	3.57	1.04	3.76	0.97	3.20	1.05
I do not have the coordination to ride a mountain bike.	2.54	1.38	2.76	1.36	2.12	1.37
I lack confidence in my ability to learn a new skill.	2.28	1.17	2.26	1.17	2.31	1.17
I lack confidence in my athleticism to try a sport like mountain biking.	2.50	1.37	2.72	1.38	2.08	1.37
I am too shy to seek out opportunities to learn how to mountain bike.	2.63	1.32	2.80	1.34	2.29	1.31
Mountain biking looks scary.	3.31	1.30	3.51	1.26	2.92	1.30
I am intimidated by mountain biking.	3.22	1.27	3.47	1.15	2.73	1.27
If I wanted to learn to mountain bike, I would make it happen.	3.91	1.06	3.67	1.12	4.37	1.08
I will never consider learning to mountain bike.	1.79	1.06	2.10	1.12	1.20	1.06
Interpersonal	Mean	SD	Mean	SD	Mean	SD
I don't know any women who ride mountain bikes.	2.25	1.51	2.55	1.60	1.67	1.51
I don't know anyone who mountain bikes.	1.70	1.16	1.99	1.30	1.14	1.16
I only know men who mountain bike.	2.15	1.32	2.24	1.29	1.96	1.32
I do not have access to someone to teach me to mountain bike.	2.33	1.38	2.69	1.45	1.65	1.37
I don't have friends interested in mountain biking.	2.79	1.51	3.23	1.46	1.94	1.50
My friends prefer to do other things.	3.58	1.23	3.92	1.10	2.92	1.24
I lack enough information to consider learning to mountain bike.	2.47	1.30	2.80	1.26	1.82	1.30
I would like to learn to mountain bike in an all-female environment. (Ex: Women's Beginner Skills Clinic)	3.63	1.13	3.62	1.08	3.67	1.14
I would prefer to learn how to mountain bike from a female instructor.	3.71	1.10	3.77	1.07	3.59	1.12
Structural	Mean	SD	Mean	SD	Mean	SD
The gear is too expensive.	3.87	0.96	3.93	0.90	3.76	0.99
I do not have the time to learn to mountain bike.	3.09	1.26	3.45	1.17	2.37	1.26
I do not have a bike.	3.27	1.76	4.02	1.43	1.80	1.75
I don't know what kind of bike to ride.	3.17	1.56	3.67	1.41	2.20	1.55

I cannot afford to buy a mountain bike.	3.43	1.44	3.75	1.30	2.82	1.44
I do not have a means of getting to a trail to ride.	2.00	1.22	2.27	1.32	1.47	1.21
I would like to try the sport before I financially invest in the gear.	3.95	1.24	4.34	0.91	3.20	1.26
I don't know where to ride.	2.89	1.51	3.34	1.40	2.00	1.50
I don't know what trails are safe.	3.34	1.48	3.81	1.25	2.43	1.48
I do not have the physical ability to ride a mountain bike.	1.91	1.10	2.14	1.15	1.45	1.10

Discussion

Using descriptive statistics, the results of an online survey ($N = 150$) revealed descriptors that detoured women from participating in mountain biking: *mountain biking is a male-dominated sport* ($M = 3.88$, $SD = 0.92$), *the gear is too expensive* ($M = 3.87$, $SD = 0.96$), *people who ride mountain bikes are super athletic* ($M = 3.57$, $SD = 1.04$), *when I think of mountain biking, I picture men* ($M = 3.35$, $SD = 1.02$). Overall, the women perceived mountain biking as a male dominated costly sport for athletic people. However, the data also demonstrated that the majority of the participants reported having the physical ability to mountain bike. Additionally, the statement, *if I wanted to learn to mountain bike, I would make it happen* ($M = 3.91$, $SD = 1.06$) is positive in that the participants agreed that if they wanted to participate in the sport, they would figure out a way to participate.

The lowest mean scores indicated that the participants knew individuals that mountain biked (but most likely men) and appeared to be willing to try the sport. The lowest mean scores reported were: *I don't know anyone who mountain bikes* ($M = 1.70$, $SD = 1.16$), *I will never consider learning to mountain bike* ($M = 1.79$, $SD = 1.06$), *I do not have a means of getting to a trail to ride* ($M = 2.00$, $SD = 1.22$), *I only know men who mountain bike* ($M = 2.15$, $SD = 1.32$), *I don't know any women who ride mountain bikes* ($M = 2.25$, $SD = 1.51$). These results are generally optimistic. Crawford and Godbey (1987) described three constraints to leisure preferences: intrapersonal, interpersonal, and structural. In the present study, there appeared to be some psychological factors (intrapersonal) that may have detoured women from participating. For example, the participants felt that mountain biking was male dominated, and the sport perhaps went against the traditional gender orthodox ideologies some women may abide by (Coakley, 2016). The literature involving outdoor recreation seems to echo these findings in the present study in that women do not participate in mountain biking due to barriers such as gender stigma (Bialeschki & Henderson, 1993; Culp, 1998; Evans et al., 2020; Whittington et al., 2011). There were also factors the participants noted that appeared to be inconsistent with Crawford and Godbey's (1987) sentiments regarding intrapersonal factors that serve as barriers to participation. For example, the participants did not report being shy or feeling like mountain biking was too scary, further, the sample did not express disagreement in having confidence to participate in the sport. Literature has demonstrated that same-sex programming, specifically for women may provide a positive entry for women in outdoor activities (Evans et al., 2020; Whittington et al., 2011). Thus, same-sex programming should be considered to encourage participation in the sport.

Regarding the interpersonal constraints identified by Crawford and Godbey (1987) the participants indicated that they knew people who mountain biked and would be apt to learn the sport from all female instructors and would prefer female instructors. Once again, the present study demonstrated the need for all-female led programming (Evans et al., 2020; Whittington et al., 2011). Additionally, this study also showed that by offering outdoor activities for women, NWA is meeting the needs of this group. Thus, other communities should look to NWA in an effort to increase female participation in the sport of mountain biking.

Lastly, the respondents indicated that mountain biking gear was *too expensive*, which is not surprising considering that entry into the sport requires specific apparel and equipment (e.g., mountain bike, pedals, and helmet). Advancing in the sport typically requires specific shoes, gloves, glasses, technical clothing, spare bike tubes, tools, water bottle or hydration pack, and possibly even a GPS. This is a structural constraint and according to Crawford et al. (1991) recreational constraint model. Ultimately, if women cannot afford the gear necessary to participate, the structural constraint intercedes and ultimately keeps women from trying the sport. As the present study indicated, the majority of the participants did not own a bike. According to Coakley (2016) social class as well as socioeconomic status may serve as barriers to sport participation. Therefore, perhaps the parks and recreational departments throughout NWA could allow women to borrow equipment. In NWA, the non-profit group, Women of Oz, made efforts to deconstruct the idea that women needed expensive shoes and clothing to participate in mountain biking. Women of Oz organizing a photo shoot where women came dressed in all styles of clothing in an effort to demonstrate inclusion in the sport of mountain biking.

Conclusion

Overall, the results depicted in table one provided a snap shot into the perceptions and potential barriers to women participating in the sport of mountain biking. Mountain biking is a sport that should be accessible to all women regardless of ages, fitness levels, and socioeconomic status. The data demonstrated that women felt they could participate in the sport. Additionally, the participants indicated that they had access to trails which is a testament to the investment NWA has made in providing the infrastructure for participation in outdoor recreation. The future landscape of mountain biking could be headed towards a more gender-neutral and gender-balanced space if professionals work consistently to make the sport more accessible to women. This study may also be connected to the promotion of physical activity and recreation as a whole, specifically among women. This line of research and area of study has the potential to influence physical activity and the promotion of physical among women. This study also demonstrates the need (and want) for female involvement in non-traditional activities (e.g., kayaking, mountain biking). Educators, curriculum designers, the outdoor industry, and marketing professionals stand to benefit from the results in the present study which assists in identifying ways to achieve inclusive excellence by identifying barriers and constraints to increase participation in mountain biking, and in turn, increase the motivation for participants. This study will add to the growing pool of research in this relatively new outdoor activity that has increased greatly in recent years with the technological advancements made in equipment and mountain bike trails systems. In addition, this study ties in with the eco-tourism advances within the biking community in regard to how mountain biking can

continue to be crucial part of local economies that support mountain biking and other adventure sports.

Limitations and Future Research

Like all research, the present study has limitations. The scale was created to answer the research questions. Although the scale was grounded in previous research, the validity of the scale was not tested. The responses from participants were varied, making data analysis difficult; therefore, descriptive statistics was utilized. A follow-up to this study would be to run an exploratory factor analysis to determine if any of the constraints are related. Additional research on women who currently participate in mountain biking and how they negotiated the constraints to participate in mountain biking would further progress the understanding of capturing and retaining women.

The present study was conducted to examine mountain biking in NWA specifically. Although the region has become a popular destination for mountain biking, the results of this study should not be generalizable to other parts of the country. However, the results may be applied to other mountain biking communities in order to attract female participants.

The sample of the present study should also be viewed as a limitation. Due to the sampling technique and the way participants were recruited, a response rate could not be determined. Additionally, limitations of this survey included the 34% of respondents that already participate in mountain biking. Considering the research question addressed women's barriers to participation, a stronger sample would have consisted of women who do not participate in the sport. Researcher positionality could be a factor in the participants, as the sample was limited to those who saw the post on Facebook and Instagram. It can be assumed that those who saw the post(s) and responded were in the network of the primary investigator. The primary investigator is an active mountain biker and consumer of outdoor recreation who leads beginner mountain biking rides and skills clinics. Future research should employ a different sampling technique to attract participants.

There was consistency in the data regarding respondents' interest in participating in all-female learning settings and being taught by women. Follow up research should explore how all-female learning environments effect women mountain bikers. Future work may even look at co-ed experiences of mountain bikers. With this, a study that focuses on the interpersonal constraints of mountain bikers should also be employed.

Given the potential implications of this study, the idea of framing should be utilized in future work. It is important to investigate how mountain biking is framed to attract participation. Additionally, the marketing of mountain biking programming, events, apparel, and equipment also warrants further investigation.

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Intravenous Drug Use in Perinatal HCV Cases in Kentucky

Rachael Corrone, Eastern Kentucky University

Laurie Larkin, Eastern Kentucky University

Michelyn Bhandari, Eastern Kentucky University

Abstract

Hepatitis C Virus (HCV) is a common blood borne infection with an incidence that has tripled between 2009 and 2018 in the United States (Ryerson et al., 2020). Kentucky ranked 7th in the nation in 2017 for the highest prevalence of HCV (CDC, 2020b) and has an incidence rate that is more than twice the national average (CDC, 2017). Women who are pregnant with HCV can transmit their infection to their child which may result in disease and death (Safir, 2010). Rates of children born to HCV positive mothers in Kentucky tripled between 2011 and 2014 (CDC, 2016b). The purpose of this study was to assess rates of newly reported cases of perinatal HCV in Kentucky from 2016 to 2019, determine reported injection drug use (IDU) and incarceration rates, and compare the HCV and IDU rates over time for women by region. Results showed the highest rates of newly reported perinatal HCV cases occurred in Eastern and Northern Kentucky regions. IDU rates were similar to newly reported HCV rates and generally followed the same reporting and regional patterns. Results indicate a need for targeted interventions to lower IDU and HCV rates in perinatal women throughout Kentucky.

Keywords: HCV, IDU, incarceration, perinatal

Introduction

Hepatitis C (HCV) is an infection of the liver caused by the blood borne virus (CDC, 2019). This virus is spread through any exposure to blood or any body fluids that hold blood (CDC, 2020a). HCV is most commonly spread through sharing equipment used for injection drug use (CDC, 2020a). HCV is ten times more likely (per injection) to be spread than Human Immunodeficiency virus (HIV) (CDC, 2015). Although less common, HCV can also be spread by accidental needle sticks, sexual contact, being born to a mother with HCV, sharing razors, or getting tattoos/piercings (CDC, 2020a).

Despite the many ways HCV can be transmitted, injection drug use remains the most frequent mode of transmission (CDC, 2020a). It is estimated that between 38.1% and 68 % of injection drug users (IDU) have HCV antibodies and around 33% of IDU get infected with HCV within the first year of injecting (CDC, 2015).

Other risk factors often related to HCV infection may include a slow job market, incarceration, a lack of activities for youth, depression, poor access to care, and drug related stigma (Cloud et al., 2019). Slow job markets and lack of activities may lead people to start doing drugs to cope as well as to have something to do (Cloud et al., 2019). Mental illness and lack of access to care may increase a person's risk to using drugs as a coping mechanism or as a form of "self-medication" (Cloud et al., 2019). Drug users that go without treatment because of the stigma surrounding it can have a greater risk of poor mental health and HCV infection (Cloud et al., 2019).

HCV in the United States

HCV infection affects around 2.4 million adults in the United States and almost half of these individuals may be unaware that they are infected (CDC, 2018a). People who are unaware of their HCV status are more likely to spread the infection as well as let the disease progress until they develop cirrhosis, liver failure, or other liver disorders because HCV can be asymptomatic until this progression (University of Louisville, 2020). Only 20-30% of newly infected individuals experience symptoms (CDC, 2017). HCV is also the primary cause of cirrhosis of the liver or liver failure (Koneru et al., 2016). After liver diseases set in, the natural progression of the disease is death (CDC, 2019).

The number of HCV cases have increased drastically across the United States with the incidence rate starting at .29 per 100,000 in 2010 and increasing to 1.04 per 100,000 in 2017 (CDC, 2019). In the “Morbidity and Mortality Weekly Report” by the CDC, the nation’s incidence rate increased 294% between 2010 and 2015 (Campbell et al., 2017). Not only has HCV incidence and prevalence increased, but the infection has also started having more detrimental complications in those infected compared to those infected with HCV in previous decades (Brawley, 2015). Approximately 20,000 Americans die from HCV each year, which is greater than HIV, tuberculosis (TB), and pneumococcal diseases combined (CDC, 2016a) which indicates an increasingly important public health problem in the United States. Not only does this affect the health of American citizens but it also costs billions of dollars in the nation annually (Hofmeister, 2018).

HCV in Kentucky

While the rise in HCV cases is a national issue, some states have higher rates of HCV than others. One of the top three states in the nation with the highest prevalence of HCV is Kentucky (Wilburn, 2019). Approximately 42,500 people in Kentucky live with HCV (Wilburn, 2019). In 2019, approximately 42,500 people were diagnosed with HCV in Kentucky but because many individuals are unaware of their HCV status, there are estimated to be more than 77,850 cases (Wilburn, 2019). This is because only an estimated 45-85% of cases have been diagnosed (Lyons et al., 2016).

HCV in Incarceration

Over 17% of the incarcerated population in the U.S. has been diagnosed with HCV, while it is only found in 1% of the rest of the population (Brawley et al., 2016). HCV prevalence in the incarcerated population of Kentucky ranged from 14% to 37% (Kranz, 2017). Of those screened for HCV upon incarceration between 2010 and 2013, one third tested positive (Kranz, 2017). Only 14.5% of those who tested positive sought out treatment (Kranz, 2017). Rural incarcerated women are at an even greater risk due to IDU and risky sexual behaviors (Peteet, et al., 2018).

HCV in Women

Across the United States, there has been a 22% increase of HCV infection of women of childbearing age (WCBA) and a 68% increase of infant infection between 2011 and 2014 (CDC, 2016b). In

Kentucky, the HCV detection rate tripled in WCBA between 2011 and 2014, and the rate of infants born to HCV positive mothers increased by 124% (CDC, 2016b).

HCV positive mothers and their young children have a specific type of HCV called perinatal HCV (Humbaugh, 2014). Perinatal HCV is defined as Pregnant (or recently pregnant) mothers and their children under five that test positive for HCV (Humbaugh, 2014). To monitor this population, Kentucky legislators developed 902 KAR 2:020 in 2015, which is an amendment to require establishments across the Commonwealth to report communicable diseases, including HCV (Wilburn, 2019). This means HCV positive mothers and newborns born to HCV positive mothers will be reported at the time of birth (Wilburn, 2019). Then, in 2018, legislators created KRS 214.160 which is an amendment to require all pregnant women to be tested for HCV as well as children born to HCV positive mothers (Wilburn, 2019).

Perinatal HCV information has been reported by multiple health agencies across the state and put into a state data tracker and now can be used to assess who, where, and why WCBA are contracting HCV. Knowing how many pregnant women and new mothers in each region have HCV and their reported IDU or incarceration may give health professionals the data needed to make better informed decisions and implement greater prevention strategies to address this health problem. In addition, HCV data may help health professionals better tailor their programs to fit the needs of WCBA to more effectively use their resources to educate and prevent transmission and infection of HCV throughout the state and ultimately, save lives.

The purpose of this study is to determine the number of newly reported perinatal HCV cases in Kentucky, the rate of the 15 regions (Barren River, Big Sandy, Bluegrass, Buffalo Trace, Cumberland Valley, Fivco, Gateway, Green River, Kentucky River, Kentuckiana Regional Planning & Development Agency (KIPDA), Lake Cumberland, Lincoln Trail, Northern Kentucky, Pennyryle, and Purchase.), and the rate of reported IDU and incarceration in this population over a 3-year period. It is hypothesized that the incidence of perinatal HCV significantly increased between 2016 and 2018, a significantly higher number of cases will be in the Eastern Kentucky regions versus the other regions, and that higher reports of incarceration and IDU will coincide with higher reports of HCV. IDU drug use will also have a higher rate in eastern Kentucky, but despite this, incarceration rates will be greater in the Northern region of Kentucky because of the Women's Correctional facility there. Understanding the number of perinatal HCV cases associated with IDU and incarceration may help public health practitioners address the underlying factors and prevent future perinatal HCV cases in Kentucky.

Review of Literature

HCV in the United States

HCV transmission has increased greatly across the United States (Zibbell et al., 2018). This can be directly related to the rise of the opioid epidemic (Wu et al., 2019). Rosenberg et al., (2018) conducted a study that used a statistical model to determine the prevalence of HCV in the United States. Using information from The National Health and Nutrition Examination Survey (NHANES), researchers found a reported 2,035,100 cases (Rosenburg et al., 2018). Through other literature

analyses, authors found an estimated 231,600 more cases of HCV in the United States overall (Rosenburg et al., 2018).

HCV in Appalachia and Kentucky

Hepatitis C infection has spread rapidly through America, and the Appalachian regions of Kentucky, Tennessee, Virginia, and West Virginia have some of the highest rates in the country (Zibbell et al., 2015). These Appalachian regions consist of Eastern Kentucky, Eastern Tennessee, and Southwest Virginia and have been greatly affected by drug use and HCV (Zibbell et al., 2015).

In 2015, the CDC conducted a vulnerability assessment to determine which counties in the United States were at highest risk for having an outbreak of HCV and an increase in drug use. This study used several environmental risk factors related to drug use, socioeconomic status (SES), and educational attainment to rank all the counties in the United States (Handel et al., 2016). Out of the 200 most vulnerable counties in the nation, 54 were counties in Kentucky (CDC, 2018b). The CDC also determined that the entire state was at risk for an increase in hepatitis infection due to injection drug use (CDC, 2018b). The CDC then encouraged states to conduct their own assessment in 2019.

Tennessee was another state that was at an increased risk for hepatitis infection, and they conducted their own assessment modeled after the assessment conducted by the CDC (2018b) and used similar risk indicators (Rickles et al., 2017). The researchers used 78 indicators to determine risk and to rank counties (Rickles et al., 2017). This shows that without long term interventions, this issue will continue in at risk counties, and spread to those around it (Rickles et al., 2017).

Kentucky is in the process of conducting their own vulnerability (modeled to be like the CDC's and Tennessee's assessments) assessment currently and results will be forthcoming (Wilburn, 2019). Current data estimates that around 40,000 people in Kentucky have HCV, although the number could be 3 to 4 times higher (Louisville Future, 2019). These infections have consistently increased with the use of opioids and most new cases are attributed to sharing injection drug equipment (Louisville Future, 2019).

HCV and Incarceration

Those who are incarcerated are especially at risk for HCV and a study completed in a Missouri jail found that out of 304 participants, 50 inmates (16.5%) had HCV (Wenger et al., 2014). Wenger et al., (2014) also found incarcerated women had a prevalence rate that was three times that of men and women combined.

A study completed by Staton-Tindall et. al (2015) included 22 women who were incarcerated from 3 separate facilities in Appalachia. These women participated in four focus groups and discussed the prevalence of IDU in Appalachia, its link to HCV, and the consequences of HCV. The participants were apathetic to contracting HCV and had no fears of the health effects it could have on them (Staton-Tindall et al., 2015). This suggests the heightened prevalence rate of this population could be because many women consider HCV to be "no big deal" because everyone they know has it (Staton-

Tindall et al., 2015). These women who participated in this study also had little knowledge of the adverse health effects HCV causes (Staton-Tindall et al., 2015).

A similar study conducted in Perry County, Kentucky and found that 42.7% of new HCV infections could be prevented in the PWID population by removing the effects of incarceration (Stone et al., 2020). Incarceration brings individuals from high-risk environments for IDU, into the high-risk environment of prisons and jails where IDU and risky sexual behavior is common (Peteet et al., 2018). This is magnified by the number of individuals incarcerated who are unaware of their HCV status and unable to receive or refuse treatment (Kranz, 2017). The study conducted by Stone Et Al., also describes a lack of therapeutic options to treat opioid addiction and shows incarceration may play a role in the spread of HCV and is an important risk factor to recognize.

HCV and IDU

IDU is the greatest risk factor of HCV and a study conducted by Zibbell et al (2018) found that between the years of 2004 and 2014, the rate of HCV increased by 133% which is directly connected to the growing number of PWID. The largest increase was found to be in the age groups of 18-29 and 30 to 39 years old (Zibbell et al., 2018) which saw rates increase by 400% and 325% respectively (Zibbell et al., 2018). For those between the ages of 18 and 29, the admission to treatment centers based on drug injection use increased between 622% and 817% depending on the drug of choice (Zibbell et al., 2018). For those in the 30–39-year-old group the rates of admission increased between 77% and 169% (Zibbell et al., 2018). The study conducted by Zibbell et al., (2015) shows that 73% of HCV cases were related to IDU. In another study that focused on 400 incarcerated rural women, 75.3% reported lifetime drug use (Staton et al., 2017). It has also been reported women engage in riskier injection practices such as being injected by others, by sex partners, and being more likely to participate in risky sexual behaviors in exchange for drugs (Kushner, 2018).

A study completed in Australia found that women participate in risky injection use because they are more likely to use injection drugs in a group, rely on others to supply the drug equipment, and because they are more likely than males to feel uncomfortable injecting themselves throughout the entire time of their IDU (NDARC, 2010). Women are also more likely to be pressured into using injection drug use by an individual who regularly shares drug equipment, supporting the idea that sharing equipment is normal (NDARC, 2010). Those who encourage others to start IDU for the first time are called initiators. Initiators are usually a man the woman trusts, which will increase the likelihood of sharing drug equipment (NDARC, 2010). Women who inject drugs who are in a relationship are also more likely to be reliant on their partner for shelter or other necessities, which decreases the likelihood the woman will request clean equipment or safe sex practices to maintain the relationship (NDARC, 2010). Women may also see sharing equipment as a form of trust or intimacy (NDARC, 2010).

Another study found that young women who had been abused were more likely participate in drug use and more likely to choose partners that promoted risky sexual and drug related behaviors (Clark et al., 2018). In cases where a partner is not involved, a Kentucky study found that these risky practices are also related to a reported apathy among rural women related to the risks and consequences of HCV (Staton-Tindall et al., 2015).

IDU in Kentucky

In 2009, IDU began to increase across the nation in what is called the opioid epidemic (Liang et al., 2018). The number of IDU and deaths have spiked, and so has HCV infection, especially in rural areas (Liang et al., 2018). One of the areas most affected by the opioid epidemic is Kentucky. In 2018, Kentucky had a death related to opioid overdose rate of 23.4, which is greater than the nation's rate of 20.7 (NIH, 2020). While prescription opioid deaths and heroin related deaths have dropped slightly since 2017, deaths related to synthetic opioids are steadfast and high (NIH, 2020). Kentucky had a synthetic opioid death rate of 17.9, which is close to twice the United States' rate of 9.9 (NIH, 2020).

HCV in Women and Infants

A population that is greatly affected by HCV that is often overlooked is women (Jhaveri, 2014). A study Conducted by Esmaeili (2017) suggests that the incidence rates between men and women are similar or that women's rates of HCV may be higher. HCV can cause adverse health effects and death in anyone who is infected with the virus, but it can be extremely dangerous for pregnant women and their children (Koneru et al., 2016). This is because the HCV virus can live in the placenta and slow or disrupt intrauterine fetal growth (Huang et al., 2016). Mothers who have HCV are significantly more likely to have opioid use disorder (Chapell, 2018). There are no preventative actions that mothers can take to guarantee their child will not contract HCV from them (Koneru et al., 2016). In a study that included many Appalachian states, including Kentucky, addiction treatment providers were less likely to treat a woman if she was pregnant (Galvin, 2020). HCV positive pregnancies have higher rates of perinatal mortality, congenital malformations, low birth weight, and preterm deliveries (Safir, 2010). Mothers who are infected with HCV also are not approved to start treatment during their pregnancy or while they are breast feeding (Kushner, 2018).

Screening and informing all pregnant women (considered "high" risk or not) is crucial so that women can know the risks of their own pregnancy and that they can test their child once it is born (Waruingi et al., 2016). Many providers only test those they deem to be at-risk, but the American Association for the Study of Liver Diseases and the Infectious Diseases Society of America suggest all pregnant women should be tested for HCV (Schillie et al., 2018).

HCV can be prevented if functioning syringe exchange programs and opioid substitution therapy is implemented in communities and IDU take part in the programs (Martin N.K., & Marquez L.K., 2017). These programs work to help slow the spread of HCV but could improve by connecting individuals with HCV care since direct acting antiviral treatment can cure greater than 90% of individuals (Martin N.K., & Marquez L.K., 2017).

These articles and studies show that HCV incidence has been increasing for approximately the last decade and that women are a population that is greatly affected. Because of the adverse health effects caused by HCV on women and their children, it is greatly important to know who is affected and the amount of IDU and incarceration related to infection.

Method

The following study is a descriptive, cross-sectional analysis of secondary data regarding the prevalence of HCV and its major risk factors in Kentucky. The purpose of this study was to determine how many perinatal HCV cases there are in Kentucky, how many newly reported cases in each region (Barren River, Big Sandy, Bluegrass, Buffalo Trace, Cumberland Valley, Fivco, Gateway, Green River, Kentucky River, KIPDA, Lake Cumberland, Lincoln Trail, Northern Kentucky, Pennyrile, and Purchase), and the reported IDU and incarceration in this population and in their respective regions. By comparing rates of perinatal HCV in regions have statistically different reports of incarceration and IDU, this study may determine the regions that need HCV intervention the most.

Data Collection

Local health departments sent faxes of current cases of perinatal HCV to the Kentucky Department for Public Health (KDPH) Viral Hepatitis Surveillance division consisting of Epidemiology 394 (EPID 394) form. EPID 394 forms report perinatal HCV cases as they are recorded. These cases may have been reported at doctor's appointments before/during the pregnancy or recorded at birth. Once this data reaches the KDPH, it is entered into the Kentucky online gateway by the Kentucky Viral Hepatitis division. Collection of this data has been required since 2016, this study will only include information collected for a three-year period January 2016 through December 2018. Data from 1,175 adult women between the ages of 15 and 49 were included in this study. Only females who were pregnant or recently pregnant, Kentucky residents, between the ages of 15 and 49 at the time of the report and reported to the Kentucky Department for Public Health (KDPH) Viral Hepatitis Division for positive HCV will be included in data analysis.

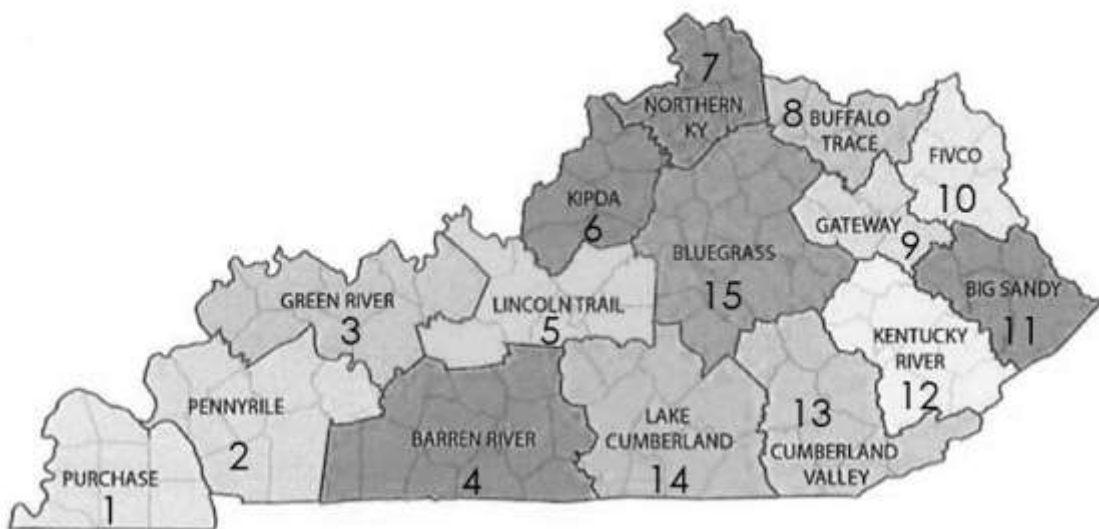
If data (such as age or county of residence) were missing, those participants were excluded from the study. In 2016 there were 564 reported cases and 508 (90.01%) were used in this study after those with missing information was removed. In 2017, there were 713 cases reported but only 370 (51.9%) were usable cases. In 2018, there were 297 (49.5%) usable cases out of 600 reported cases for a total of 1,175 cases used for this study. Variables Included in this study were HCV status, reported incarceration, IDU, and demographic factors. As shown in Table 1, the counties used in this study were divided into the 15 Area Development Districts. Districts 8-13 indicate the eastern Kentucky, Region 5, 14, and 15 are categorized as central. Region 6 and 7 are northern and Region 1-4 are western. Figure 1 displays a map of the Area Development Districts.

Table 1. Area Development Districts

15 Area Development Districts	Counties
Barren River	Logan, Simpson, Butler, Warren, Edmonson, Hart, Barren, Allen, Metcalfe, and Monroe.
Big Sandy	Johnson, Magoffin, Martin, Floyd, and Pike.
Bluegrass	Anderson, Franklin, Woodford, Mercer, Boyle, Lincoln, Garrard, Jessamine, Fayette, Scott, Harrison, Bourbon, Nicholas, Clark, Madison, Powell, and Estill.

Buffalo Trace	Bracken, Mason, Robertson, Fleming, and Lewis.
Cumberland Valley	Jackson, Rockcastle, Laurel, Clay, Knox, Whitley, Bell, and Harlan.
Fivco	Greenup, Boyd, Carter, Elliott, and Lawrence.
Gateway	Rowan, Bath, Montgomery, Menifee, and Morgan.
Green River	Union, Henderson, Webster, McLean, Daviess, Ohio, and Hancock.
Kentucky River	Wolfe, Owsley, Lee, Breathitt, Leslie, Perry, Knott, and Letcher.
KIPDA (Kentuckiana Regional Planning & Development Agency)	Bullitt, Henry, Jefferson, Oldham, Shelby, Spencer, and Trimble.
Lake Cumberland	Taylor, Adair, Green, Casey, Russell, Pulaski, Clinton, Cumberland, Wayne, and McCreary.
Lincoln Trail	Breckinridge, Meade, Grayson, Hardin, LaRue, Nelson, Washington, and Marion.
Northern Kentucky	Boone, Kenton, Campbell, Carroll, Gallatin, Owen, Grant, and Pendleton.
Pennyrile	Livingston, Crittenden, Lyon, Caldwell, Hopkins, Muhlenberg, Trigg, Christian, and Todd.
Purchase	Ballard, Carlisle, Hickman, Fulton, McCracken, Graves, Marshall, and Calloway.

Figure 1. Map of Area Development Districts



Results

This data set (KDPH HCV tracker) was used to sort positive perinatal cases and reports of IDU or incarceration for women living in one of the fifteen regions in Kentucky. Descriptive statistics such as means, ranges, and percentages were used to summarize the population characteristics. Z scores and p values were used to show how HCV rates have changed in the past three years, which regions have greater HCV rates, and if the differences are significant.

HCV rates were created for each region from the number of cases that could be used in this study and the population of WCBA (ages 15-49) per 100,000. Each region was then compared to the others to determine significant differences using a proportional z-score and p-values, with significant values at $p < .05$. To determine if IDU and incarceration rates had significant differences between regions, a Pearson Chi Square was used.

The number of all reported perinatal HCV cases in Kentucky in comparison to the cases that were able to be included in this study increased as time passed. It is obvious there are many more cases reported than were able to be included in this study. If the cases that had to be excluded had been adequately filled out, this study may have had more accurate results. Table 2 shows numbers of reported and usable cases.

Table 2. Reported Cases of Perinatal HCV in Kentucky

Reported Cases of Perinatal HCV in Kentucky						
	All Newly Reported Cases			Usable Reported Cases		
Year	2016	2017	2018	2016	2017	2018
# of Reported cases	564	713	600	508	370	297
Rate of cases per 100,000	56.3	71.1	60.0	50.7	36.9	29.7

Table 3 shows how many participants were in each age group for each year. Almost 95% of participants were between the ages of 20-34. This demonstrating that this age group is at a higher risk for diagnosed perinatal HCV.

Table 3. Perinatal HCV Age Frequency for 2016, 2017, and 2018 in Kentucky

Perinatal HCV Age Frequency for 2016, 2017, and 2018			
Age Range	2016 Participants	2017 Participants	2018 Participants
15-19	5	6	1
20-24	130	67	43
25-29	197	172	129
30-34	124	79	78
35-39	45	44	37
40-44	7	3	8
45-49	1	0	1
Total	509	371	296

Regarding race, over 90% of the participants in this study were white, which is similar to the demographics of Kentucky as a whole see Table 4.

Table 4. Participant Race Frequency 2016, 2017, 2018

Participant Race Frequency 2016,2017,2018			
Race	2016 Participants	2017 Participants	2018 Participants
Missing data	23	19	11
A	1	1	0
AI	0	1	0
B	4	5	16
PI	0	0	1
O	1	2	0
U	41	2	0
W	439	341	269
Total:	509	371	297

Table 5 displays the number of women with perinatal HCV that live in each region. Each region had at least one case between the years of 2016 and 2018. In 2016, the Eastern regions started with the highest number of cases, with 210 being reported. In 2017 and 2018 the eastern region was taken over by the Northern regions. Eastern regions had 75 cases reported in 2017 and 41 in 2018. The northern region had 235 perinatal HCV cases reported in 2017 and 183 reported in 2018. Eastern and Northern regions reported cases remained higher than the Western region all three years and higher than the Central region reports for the most part. In 2016, the Western region had 25 cases and the Central region had 98 cases. In 2017, the Western region had 4 cases and the central region had 58. In 2018 the Western region had 10 reported cases and the Central region had 63.

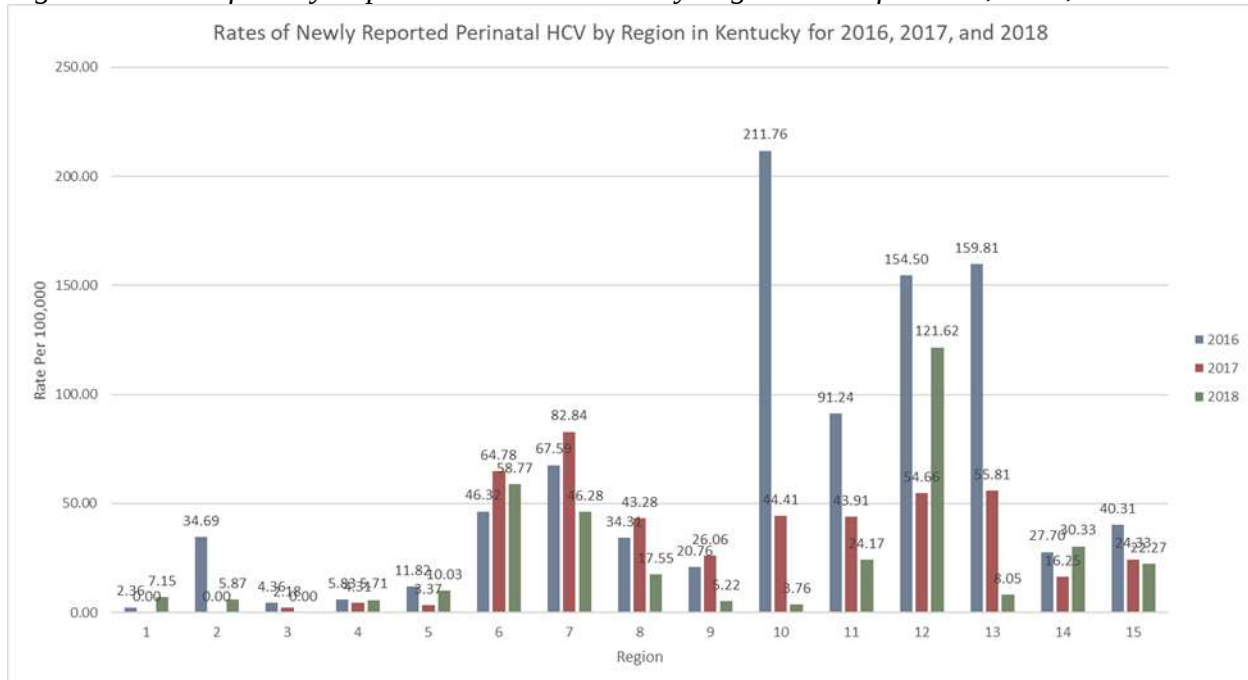
Table 5. Participant Region of Residence Frequency for 2016, 2017, and 2018

Region	2016 Participants	2017 Participants	2018 Participants
Purchase (1)	1	0	3
Pennyrile (2)	18	0	3
Green River (3)	2	1	0
Barren River (4)	4	3	4
Lincoln Trail (5)	7	2	6
KIPDA (6)	106	149	135
Northern Kentucky (7)	70	86	48
Buffalo Trace (8)	4	5	2
Gateway (9)	4	5	1
Fivco (10)	58	12	1
Big Sandy (11)	28	13	7
Kentucky River (12)	35	12	26
Cumberland Valley (13)	81	28	4
Lake Cumberland (14)	12	7	13

Bluegrass (15)	79	48	44
Total	509	371	297

Figure 2 displays the difference between rates in each region, per year. The calculated rates have decreased drastically between the years of 2016 and 2018 because of removed cases but were not significantly different ($p > .05$) when all reported cases were considered.

Figure 2. Rates of Newly Reported Perinatal HCV by Region in KY for 2016, 2017, and 2018



Most of the counties in Eastern Kentucky had significantly higher rates of perinatal HCV than any other region in 2016. In 2017, the counties in the Northern region had an increase in cases and the region surpassed the Eastern Region in rates of newly reported perinatal HCV. In 2018, the Northern region rates remained higher than most other Eastern region rates. Region 12 was the only Eastern region to have perinatal HCV rates greater than those in region 6 and 7. Table 6 shows if there was a significant difference between newly reported cases of perinatal HCV in Kentucky each year. If only included cases are analyzed, then the results show that perinatal HCV has been significantly decreasing every year since 2016. But if all cases are included there is no significant difference between 2016 and 2018, demonstrating that there is a continuing issue with perinatal HCV in Kentucky. Table 7 shows the comparison of each region by year. The northern regions increased significantly, and although the eastern regions decreased significantly, their rates were still higher than those in central and western Kentucky.

Table 6. Significant Differences between Reported Cases and Year

All Cases	Included Cases
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2016 compared to 2017.	2016 Compared to 2018.	2017 Compared to 2018.	2016 compared to 2017	2016 compared to 2018	2017- compared to 2018
$z=4.1676$ $p<.00001^*$	$z=-1.0993$ $p=.27134$	$z=3.0696$ $p=.00214^*$	$z=4.661$ $p<.00001^*$	$z=7.4019$ $p<.00001^*$	$z=2.7915$, $p=.00528$

An * represents a significant value.

Table 7. Yearly Newly Reported Perinatal HCV Rates Significant Comparisons by Region 2016-2018

Yearly Newly Reported Perinatal HCV Rates Significant Comparisons by Region 2016-2018			
2016-2017 Regional Comparison		2016-2018 Regional Comparison	2017-2018 Regional Comparison
1	x	$z=-1.0082$, $p=.3125$	x
2	x	$z=3.2391$, $p=.0012$	x
3	$z=-0.5748$, $p=.56868$	x	x
4	$z=0.3948$, $p=.69654$	$z=0.027$, $p=.97606$	$z=-0.3696$, $p=.71138$
5	$z=1.6686$, $p=.09492$	$z=0.2962$, $p=.76418$	$z=-1.4013$, $p=.16152$
6	$z=-2.6531$, $p=.00804$	$z=-1.8399$, $p=.06576$	$z=0.8194$, $p=.41222$
7	$z=-1.2667$, $p=.20408$	$z=2.0337$, $p=.04236$	$z=3.2784$, $p=.00104$
8	$z=-0.3467$, $p=.72634$	$z=0.7889$, $p=.42952$	$z=1.1159$, $p=.26272$
9	$z=-0.3399$, $p=.72786$	$z=1.3343$, $p=.18352$	$z=1.6303$, $p=.1031$
10	$z=5.4449$, $p<.00001$	$z=7.3106$, $p<.00001$	$z=3.0218$, $p=.00252$
11	$z=2.2289$, $p=.02574$	$z=3.3811$, $p=.00072$	$z=1.2928$, $p=.19706$
12	$z=3.2497$, $p=.00116$	$z=0.9272$, $p=.35238$	$z=-2.3544$, $p=.01878$
13	$z=5.0257$, $p<.00001$	$z=8.2634$, $p<.00001$	$z=4.2157$, $p<.00001$
14	$z=1.1348$, $p=.25848$	$z=-0.2266$, $p=.8181$	$z=4.2157$, $p<.00001$
15	$z=2.7886$, $p=.00528$	$z=3.2018$, $p=.00138$	$z=0.4246$, $p=.67448$

An X represents data that could not be compared because there were no reported cases.

IDU

The rates of reported IDU typically follow the same trends as reported cases of perinatal HCV, although it is likely there are more cases of IDU than reported. Table 8 displays reported case of IDU per region for 2016, 2017, and 2018, respectively. When comparing reported cases of IDU between regions, the trend remains the same as other results from this study. Most Eastern Kentucky counties start off as significantly higher than all other regions, but then Northern Kentucky regions take over as the leaders in reported IDU. Eastern and Northern Kentucky have few significant differences, while these regions are typically significantly different from the Western and Central region.

Table 8. Reported IV Drug Use by Region 2016

2016					2017			2018		
		IV Drug Use		Total	IV Drug Use		Total	IV Drug Use		Total
		No/Unknown	Yes		No/Unknown			No/Unknown		
Region	1	0	1	1				1	2	3
	2	14	4	18				3	0	3
	3	1	1	2	1	0	1			
	4	1	3	4	3	0	3	3	1	4
	5	2	5	7	0	2	2	3	3	6
	6	42	64	106	40	109	149	44	91	135

	7	38	32	70	60	26	86	27	21	48
	8	3	1	4	2	3	5	1	1	2
	9	3	1	4	5	0	5	0	1	1
	10	47	11	58	11	1	12	1	0	1
	11	22	6	28	10	3	13	6	1	7
	12	23	12	35	11	1	12	20	6	26
	13	60	21	81	15	13	28	4	0	4
	14	3	9	12	1	6	7	10	3	13
	15	29	50	79	24	24	48	26	18	44
Total		288	221	509	183	188	371	149	148	297

Incarceration

Table 9 shows the number of participants who were reported to be incarcerated at some point in their life. Because of a lack of reporting, no real conclusions can be made from this data, although region 6 continuously had the highest reports of incarceration.

Table 9. Reported Incarceration among Newly Reported Perinatal HCV Cases in Kentucky

Region	2016		2017		2018	
	No/Unknown	Yes	No/Unknown	Yes	No/Unknown	Yes
1	1	0	0	0	3	0
2	18	0	0	0	3	0
3	2	0	1	0	0	0
4	4	0	3	0	4	0
5	7	0	2	0	6	0
6	104	2	145	4	127	8
7	69	1	84	2	46	2
8	4	0	5	0	2	0
9	4	0	5	0	1	0
10	58	0	11	1	1	0
11	27	1	13	0	7	0
12	35	0	12	0	26	0
13	81	0	28	0	4	0
14	12	0	7	0	11	2
15	78	1	46	2	39	5
Total	504	5	362	9	280	17

Discussion, Conclusion, and Future Research

All reported cases in this three-year period are important, but 702 reports had to be removed because they lacked details for inclusion in this study. If the case had an unknown residence or age, they were

removed, and this condensed the data considerably. Because of this removal of cases, rates of perinatal HCV are most likely much higher than this study reports.

Rates of perinatal HCV are affected by the population they are compared to. Because there is no specific data on the population of women between the ages of 15 and 49 who are at risk for perinatal HCV, the estimates of the total female population in Kentucky within WCBA age range were used in this study. Because the actual population at risk is smaller than the entire population of females between 15 and 49, these rates will be smaller than what is actually occurring in Kentucky. These rates are not exact, but they show general trends that can allow health professionals to implement interventions where they are needed most to make an impact on suffering Kentucky communities.

The participants in this study were approximately 90% white throughout 2016-2018 and the greatest number of those affected were found in the age groups of 20-34, with those between the ages of 25-29 having the highest number of reported cases. The highest rates in Kentucky were in the Eastern regions 10, 11, 12, and 13 in 2016, with 10 being the highest. In 2017, the rates in regions 10-15 decreased, and regions 6 and 7 increased to become the top two highest rates. Regions 8 and 9 also increased. This shows a shift of reported cases closer to the center of Kentucky and in the Northern part of the state. Despite this shift, eastern regions 12, 13, and 14 had the next highest rates of newly reported cases, after regions 6 and 7. In 2018, region 12 took over as the region with the highest rate of reported perinatal HCV cases, with regions 6 and 7 remaining in the top 5. Region 12's rate was over twice the rate of region 6, which was the second highest rate in Kentucky. Eastern regions 13 and 14 were also right behind the top highest rates. Throughout all three years, Western regions rates generally remained significantly lower than those in Northern and Eastern Kentucky, although they did increase overall. This shows that the Eastern regions of 8-15, as well as the Northern Kentucky regions of 6 and 7 have the greatest need for intervention in those communities.

Although newly reported perinatal HCV cases did not continuously increase between 2016 and 2018, the rates did not significantly ($p>0.05$) change when looking at all reported cases. When looking at only included cases, there was a significant ($p<0.05$) decrease of reported perinatal HCV cases were reported. This is a problem because all reported cases can be assumed to be a positive perinatal case, as negative results are not required to be reported. Cases with little demographic information are assumed to be from women of childbearing age that were treated in Kentucky facilities, but without a definite response on how old the participant is or where they are from, it is impossible to tell the age or county of residence. This led to their exclusion so overreported and inaccurate regional results would be avoided. Perinatal HCV is a continuing health and public health issue in Kentucky, but understanding the prevalence is difficult due to inaccurate data reporting.

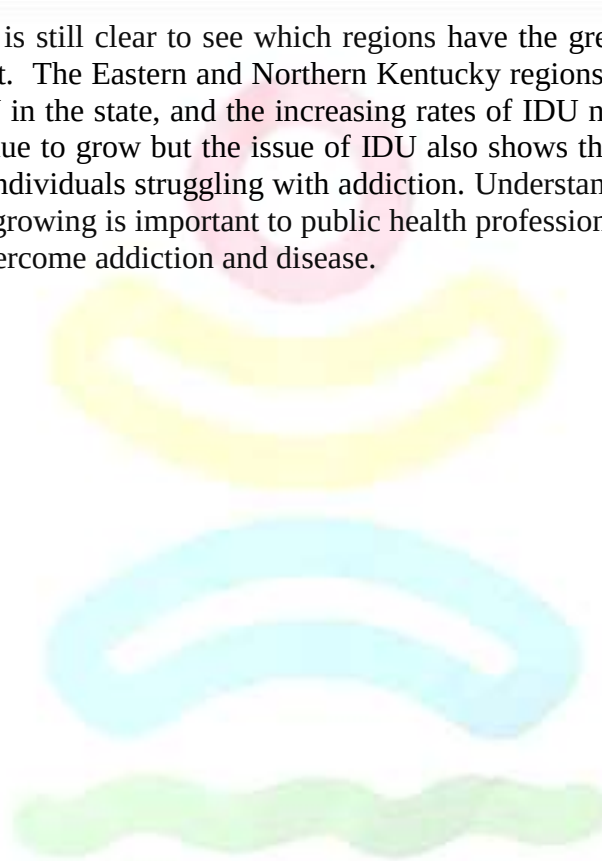
Reported IDU was highest in region 13 in 2016. In 2017, region 7 became the highest. Then in 2018, the highest reported IDU was in region 6. This shows a shift in changes of IDU from Eastern Kentucky to Northern Kentucky. This could be because of reporting increases across the state, or a growth of environmental issues related to access to care, mental health, and drug related stigma in these regions.

Reported incarceration increased between 2016 and 2018, but almost all reports either had missing data or were marked as "Unknown", so it was not possible to effectively describe regional differences to direct intervention methods. Without adequate reporting from health providers, no solid

conclusions can be made, except that accurate reporting should be made a higher priority by providers.

The missing information is a recurring issue in reporting infectious diseases and can leave public health professionals struggling to make accurate conclusions and implement interventions to increase the wellness of communities. Leaving blanks on forms can be due to the busyness of the provider location, lack of knowledge about necessary reporting information, and stigma surrounding incarceration and IDU. By having trainings on how to fill out such forms correctly and having an onsite monitor to check forms that will be faxed to the state health department, more accurate research can be conducted, and better conclusions can be made.

Even with missing data it is still clear to see which regions have the greatest need for prevention, intervention, and treatment. The Eastern and Northern Kentucky regions are the most significantly affected by perinatal HCV in the state, and the increasing rates of IDU not only explain why HCV cases in these areas continue to grow but the issue of IDU also shows that the communities within these regions have many individuals struggling with addiction. Understanding where the problem is and where the problem is growing is important to public health professionals to ensure that they can help their communities overcome addiction and disease.



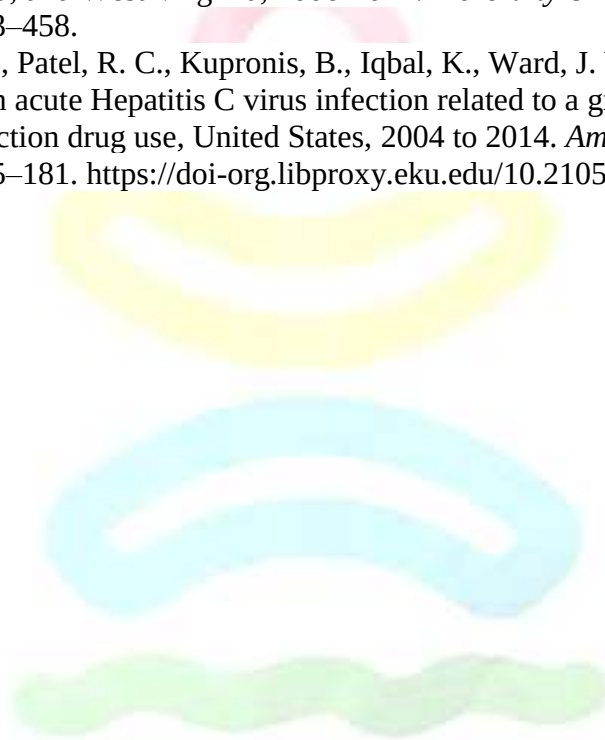
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A Review of Qualitative Research in Sport Management: Utilizing a Descriptive Case Study Design

Paula A. Upright, Western Kentucky University (paula.upright@wku.edu)

Stacey A. Forsythe, Western Kentucky University

Abstract

Qualitative research is prevalent within educational and management research, yet the methodology remains varied across disciplines. The purpose of this paper is to review landmark qualitative research techniques, most specifically the descriptive case study, for use in sport management research. The authors discussed practical application and usefulness of case study research design by addressing its unique data collection process and criteria for maintaining a high level of research quality. The data triangulation and the inductive approach for the qualitative data analysis can further help researchers discover in-depth information, which quantitative analysis may not be able to offer. The use of qualitative methodologies, specifically in-depth case studies in sport and recreational contexts may prove difficult, yet it can provide a unique insight into these growing areas of educational and business interests. Using a variety of methodologies, including qualitative designs, can contribute to the knowledge base in sport research and practice.

Key Words: Qualitative Research, Case Study, Sport Studies, Data Triangulation

Introduction

Sport management is a broad and relevantly young discipline that is growing and changing rapidly. There is a need for academics and practitioners to conduct research in a variety of areas all across sport to support this growth. Research in sport is valuable to many stakeholders including, but not limited to professors, students, coaches, governing bodies, administrators and parents of participants. The purpose of this paper is to review qualitative research techniques, most specifically the descriptive case study, for use in sport management research. Much of the sport and recreation research focus is quantitative and economic in nature, and the use of methodological innovation in research and in reporting research has been relatively scarce (Rinehart, 2005). However, many sport management topics require an in-depth examination; therefore, the case study method can prove valuable in this setting. Qualitative research can be intimidating, it can be a long process to develop, the researcher needs unique access to the subjects, and analysis will be subjective and require hours of reflection. This paper reviews basic design, data collection and analysis of case study research. The world of sport is vast and diverse, with the academic discipline of sport studies growing across the United States and internationally. It is important that sport researches be open to all areas of research and methodologies. An open-minded approach to research design and methods builds the knowledge base and adds depth and scope to the body of research in sport.

The characteristics of qualitative research include eliciting understanding and meaning, and utilizing the researcher as the primary instrument. Qualitative research also utilizes fieldwork, an inductive orientation to analysis, and richly descriptive findings (Merriam, 1998). They tend to incorporate emerging methods, open-ended questions, data in forms of interviews, observations, and documents,

text or image analysis and concluding themes, patterns or interpretations (Andrew, Penderson, & McEvoy, 2018). Simply stated, qualitative research answers questions differently than traditional quantitative research.

A case study is one of the most commonly used methods in qualitative educational research. Even though it is common, the methods for doing so are not consistent among researchers. Merriam (1998) defines a qualitative case study as an intensive, holistic description and analysis of a bounded phenomenon such as a program, an institution, a person, process or a social unit. According to Schramm (1971), the essence of a case study is the illumination of the why, how and results of a decision or set of decisions. Furthermore, a case study is used to gain an in-depth understanding of the situation and meaning for those involved, they are interested in process rather than outcomes, in context rather than specifics and in discovery rather than confirmation (Merriam, 1998; Patton 2002).

Case study research can help sport management scholars develop and test theories and sport marketing practitioners develop best practices in areas such as consumer behavior, sport leagues, sport retailers, gambling, governing bodies, sport events, facilities, cities, sporting goods, teams, clubs, and online activities. Apparently, the prominent journal in the sport management field, the *Journal of Sport Management*, published case study research annually on a variety of topics such as, sport policy, sport development, sport marketing, decision making in sport, sport participation, organizational change, sport communication, image management, gender issues, and strategic management (Andrew et al., 2018).

Regardless of varying methods, description is a key component of case study research. Descriptive research of social or natural phenomena may include form, structure, activity, change and relationship to other similar phenomena (Gall et al., 1996). According to McMillan and Schumacher (1993), descriptive studies can greatly increase the knowledge about educational settings. According to Patton (1985), “Qualitative research is an effort to understand situations in their uniqueness as part of a particular context and the interactions there. This understanding is an end in itself, so that it is not attempting to predict what may happen in the future necessarily, but to understand the nature of that setting, what it means for participants to be in that setting, what their lives are like, what’s going on for them, what their meanings are, what the world looks like in that particular setting and the analysis to be able to communicate that faithfully to others who are interested in that setting. The analysis strives for depth of understanding (p. 1).”

Data Collection Process in Case Study Research

As stated earlier, qualitative research involves the search for understanding and meaning. Case study research does not provide a cause and effect relationship; the focus is toward personal interpretation and holistic treatment of the phenomena (Stake, 1995). The collection of data in qualitative research must involve multiple sources (Yin, 2018). Sources most commonly include document mining, interviews, observation, and participant observation. Wolcott (1999) described such fieldwork as experiencing, enquiring and examining.

Creswell (1998) suggested that document mining includes the use of archival records such as departmental memos, letters, brochures, meeting minutes and proposals. Documents may also include

newspaper articles, organizational correspondence, strategic plans and other communications. According to Yin (2018), the most important use of these documents is to corroborate and augment evidence from the other sources. Documents are objective sources of data and they exist independently of a research agenda and are unaffected by the process (Merriam, 1998). Documents may also serve as records of activity that the researcher could not observe directly (Stake, 1995).

According to Gillman (2000), the interview is the most difficult phase of data collection but the richest source of information in case study research. The qualitative research interview seeks to describe the meanings of central themes in the life of the subjects, while the main task is to understand the meaning of what the interviewees say (Kvale, 1996). Interviews are particularly useful for getting the story behind an experience while pursuing in-depth information around the topic (McNamara, 1999). The aim is for the interviewer to put the person at ease. Conducting a good interview is like participating in a good conversation by listening intently and asking questions that focus on examples and feelings (Eisner, 1998).

A purposive sample allows the researcher to select interviewees who would most help answer the research questions in the study (Erlandson et al., 1993). Purposeful sampling assumes the researcher selects a sample from which the most can be learned (Merriam, 1998). The interviews allow the participants to share first-hand knowledge and their lived experiences (Bogdan & Bilken, 2003). Question development is also an important consideration. The interview questions should be developed with help from experts in the field and should always focus on the purpose of the study. It is important to be disciplined and consistent when asking questions. Asking the same questions of each interviewee enables better analysis.

Observation should take place in a natural setting and represent a firsthand encounter with the phenomenon of interest (Merriam, 1998). Direct observations should focus on the physical setting, the participants, activities, subtle factors, conversations and researcher behavior (Bogdan & Bilken, 1992; Borg & Gall, 1989; Patton, 1990; Taylor & Bogdan, 1984). It is important to remember to observe one's own feelings and biases during this time. Descriptive field notes should be recorded as soon as possible after the observation, if not during. Participant observation involves the researcher actually participating in the case study situation (Yin, 2018). This technique allows for inside access to the phenomenon under study. A detailed journal helps the participant observer record data and reduces researcher bias. The sport culture tends to be private and closed to outsiders. Participating as a researcher in a sport context may prove difficult, but can provide unique insight otherwise unattainable.

Data Quality of Case Study Research

Validity and reliability must be addressed throughout conception, collection, analysis and the discussion of any research project (Merriam, 1998). Yin (2018) agrees that reliability and validity deserves attention throughout a case study and not simply during design. When understanding of new information or knowledge is the primary rationale for the investigation, as in case study research, the criteria for this judgment will be different from quantitative designs (Merriam, 1998). Connelly and Clandinin (1990) suggest that these criteria are still under development in the research community. According to Erlandson et al. (1993), the quality or

trustworthiness of qualitative research is determined through credibility, transferability, dependability and confirmability. Table 1, based on Lincoln and Guba (1985), explains how these issues might be addressed.

Table 1. Establishing Trustworthiness

Criterion	Term	Techniques
Truth Value	Credibility	Prolonged Engagement Triangulation Peer Debriefing Member Checks Reflexive Journal
Applicability	Transferability	Thick Description Purposive Sampling Reflexive Journal
Consistency	Dependability	Audit Trail/Database Reflexive Journal
Neutrality	Confirmability	Audit Trail/Database Reflexive Journal

Prolonged time in the field, triangulation, peer debriefing and member checks, can provide credibility to a case study. The time the researcher spends in the field will vary, but it may be months or years. Triangulation, the use of multiple data sources, confirms emerging findings and provides a holistic understanding of the situation (Mathison, 1988). Peer debriefing involves consulting professionals outside of the context with a general understanding of all procedures to review ideas and concerns of the study (Erlandson et al., 1993). Member checks involve interviewees reviewing transcripts for accuracy after the interview.

Thick description and purposive sampling provide transferability or applicability to the case study. Thick, rich description of the phenomenon provides the foundation for qualitative analysis and reporting (Patton, 2002). Thick description allows readers to determine how transferable, rather than generalizable, the case may be (Merriam, 1998). Thick description allows the researcher to share the meaning of the situation with the reader (Bogdan & Biklen, 2003). As stated earlier, a purposive sample involves a sample of those who can provide the most accurate and in-depth information.

The case study database or the audit trail is the compilation of interviews transcripts, observations, journal reflections and mined documents. This separate compilation of all information is different from the narrative and increases the dependability and confirmability of the study. The reflexive journal maintains a record of observations, thoughts and feelings of the researcher regarding the case. The journal provides an avenue to address possible biases. The journal lends support to all areas of the research quality. In summary, case study research must maintain a detailed chain of evidence providing a system of checks and balances.

Case Analysis of Case Study Research

During the analysis stage, case study research are qualitative, and quantitative methods are vastly different (Stake, 1995). Qualitative data analysis is a process of bringing order and meaning; it is messy, ambiguous, time consuming and creative (Marshall & Rossman, 1989). In qualitative research, such as in the case study, data analysis begins with data collection. The collection and analysis of data go hand-in-hand as theories and themes emerge during the study (Erlandson et al., 1993). There are no formulas or rules for the analysis of qualitative data; each study is unique and therefore each analysis will be unique and up to the analyst (Patton, 2002). Patton (2002) states, “The case study is a readable, descriptive picture or story about a person, program, organization, making accessible to the reader all the information necessary to understand the case in all its uniqueness” (p. 197).

Data analysis often employs an inductive process of comparing and coding the data. The constant-comparative method (CCM) as developed by Glaser and Strauss (1967) is a method for developing themes grounded in the data. The findings emerge from data. Using comparison, the researcher is able to make conclusions by categorizing, coding and connecting categories (Boeije, 2002). Themes grounded in the data represent the conclusions and answers to the research questions. This coding process takes place in three steps of open, axial and selective coding, involving a line-by-line analysis of the interview data to generate and formulate categories that develop to a point of saturation. Open coding organizes interview data into relevant categories. The aim of open coding was is to interpret the message of a single interview in the context of the purpose of the research. Axial coding connects the relationships and similarities among all the interviews and other data sources to the central questions of the study. The final step of selective coding identifies recurring themes or patterns that serve as answers to the research questions. Comparing and coding is a funneling process used to answer research questions. Data are compressed and linked together in a description that conveys meaning and addresses the research questions.

Conclusions

Andrew et al., (2020) suggest that case study research can help sport management scholars develop and test theories and sport marketing practitioners develop best practices in areas such as consumer behavior, sport leagues, sport retailers, gambling, governing bodies, sport events, facilities, cities, sporting goods, teams, clubs, and online activities. The case study method is appropriate and can advance knowledge in the field of sport management. The in-depth analysis allows for a deeper understanding of complicated organizations and issues often seen at the various settings in the world of sport.

Other qualitative methods are also appropriate and use many of these techniques. Conducting qualitative research takes patience and practice as it is difficult and challenging. However, within youth, interscholastic, collegiate, professional and international levels of sport, there are many interesting stories to be told. Using a variety of methodologies can contribute to the knowledge base. Various factors, such as increasing levels of participation, current public interest, controversies, corruption, and monetary considerations in the field of sport may also drive qualitative forms of research. A deeper understanding of these and other sport management issues certainly warrants further and varied research in this dynamic field.

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Difference is Not Monolithic: Confronting Values and Beliefs Related to Cultural Competence

Carol O'Neal, University of Louisville

Shelley Thomas, University of Louisville

Cheryl Kolander, University of Louisville

Patricia Gleich, University of West Florida

Abstract

Cultural competence is an ever-increasing health literacy skill needed by community health educators when interacting with clients in a global environment. Educators need cultural competence as they select, design, implement and evaluate health promotion programs. Our purpose is to present a classroom activity (**Complicating our Assumptions**) for development of cultural competence among health education students to stimulate their effectiveness as community health educators. **Complicating our Assumptions** includes experiential activities designed to reveal unconscious bias that can reduce the hidden (or unconscious) power students' beliefs and values may have in interactions with 'different' others. Students learn how their perceptions of others have often been shaped within the context and structure of their particular culture.

Keywords: cultural competence, experiential learning, teaching strategy, cultural diversity

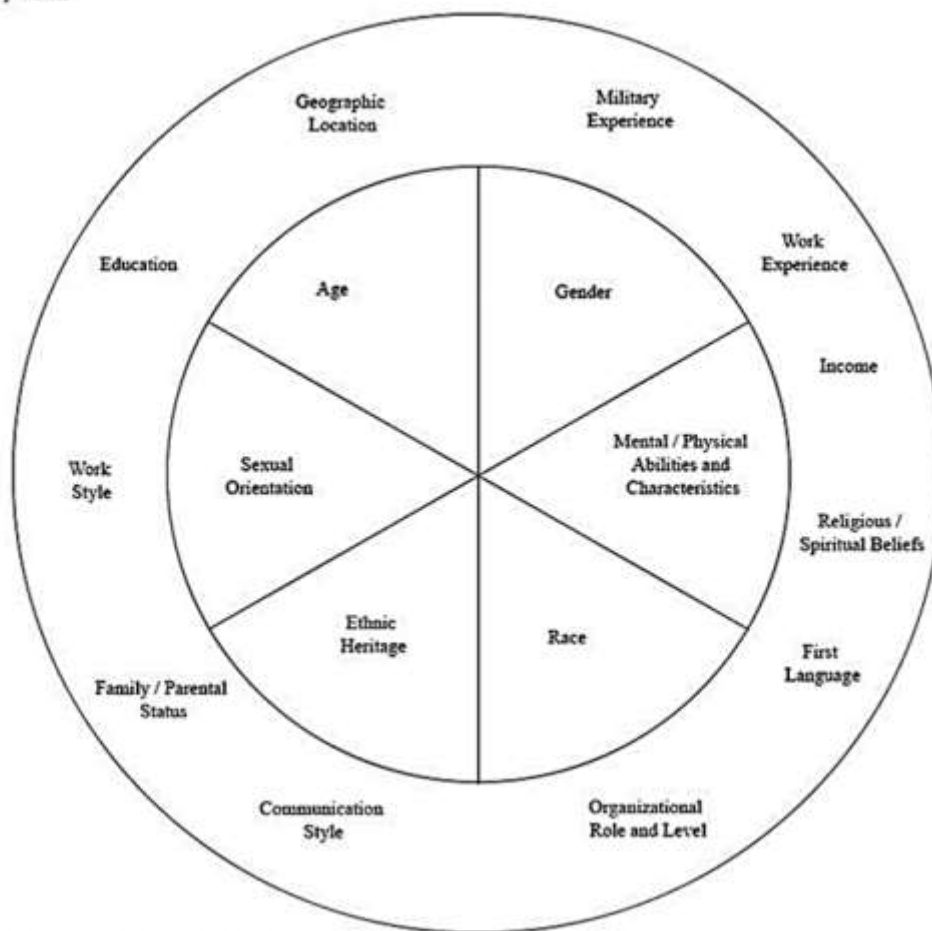
Introduction

Effective community health educators have a strong awareness of the culturally anchored characteristics and practices within the groups with which they work. They understand the connection between culture and health literacy and recognize how the biases and prejudices they have learned influence the way they may view 'different' others as they interact (Marcelin et al., 2019). Continuing news accounts from the Black Lives Matter Global Network, as well as anti-Asian and anti-Semitic incidents and events across the country and the world, describe racist policies and practices in policing and acts of discrimination and violence toward individuals and communities. These events, along with the range of the public's reactions, reinforce the findings of implicit bias research with the serious consequences of actions that can stem from unconscious bias, labeling and stereotyping (Ray, 2015; Weir, 2016). These situations may be exacerbated by perceptions gained from social isolationism, the result of community health educators working within environments and communities that differ from their own (Wilson, 2011). Assumptions made about those from culture groups different from one's own may well influence the views of health literacy and best practices. Experiential activities that require participants to confront their beliefs about diverse people can engage students in examining their unconscious or implicit biases, values and beliefs toward different cultures, and prompt them to examine systemic oppression and complicating factors that shape assumptions (Baily et al., 2014). As students increase their understanding of how their unconsciously held biases form their views of others and their actions toward and expectations of others, they can connect perceptions to their effectiveness as community health educators.

Primary and Secondary Dimensions of Cultural Diversity

One's culture is shaped by exposure to and interaction with the social and demographic attributes and characteristics that culture groups hold in common. Individuals who are members of majority cultures often view and describe their culture as 'normal' and without being aware that normalization of their own culture may lead to viewing other cultures and the elements of those cultures as less valuable or correct than their own (Andersen & Taylor, 2015). An effective way of helping students identify elements of their own culture and understand the role of culture in shaping attitudes and beliefs (the symbolic aspect of their culture) is to use the diversity wheel first delineated by Loden & Rosener (1991) and later modified by Loden (1996) to explore the dimensions of culture. (See Figure 1). The original wheel continues to evolve, reflecting the fluid nature of culture and diversity in a pluralistic, 21st century society. Primary (or core) dimensions of diversity are demographic characteristics that include age, ethnic heritage, gender, mental and physical ability, race, and sexual orientation. Primary dimensions of culture (diversity) exert a powerful, sustained influence on our lived experiences, values, beliefs, assumptions and expectations.

Figure 1. Diversity Wheel



Adapted from: Loden and Rosener (1991) and Loden (1996)

Secondary dimensions of diversity are more mutable, acquired, and can include roles within our

control or on status attributed to us. These dimensions include educational achievement level, geographical location, income, marital status, military experience, parental status, religious adherence, and work - both position and experience. Loden (2010) revised secondary dimensions to include other social characteristics - first language, family status, work style, communication style and political beliefs. Both primary and secondary dimensions can contribute to the way society classifies individuals, often through their group membership label, and provide a surface view of how society is stratified (Johnson, 2006).

An exploration of the multiple dimensions of diversity provides an image of the complexity of each individual, and makes identifying individuals by a single dimension of their cultural makeup more difficult. The depictions of these multiple dimensions on a diversity wheel can be explored in many ways through experiential classroom activities. These dimensions help students understand how their beliefs and values affect both their approach to others and their effectiveness in working with them.

Robillard, Annang, & Buchanan (2015) describe the importance of discussion, or "talking about race" (p. 18), as a pedagogy for undergraduates to understand the role of race in preparation for their future as health professionals. Likewise, Batada (2018) advocates for contemplative pedagogies to "cultivate...open awareness, introspection, nonjudgement, and compassion" (p. 71). The authors recommend an experiential activity, **Complicating our Assumptions**, based on previous activities described by Berger (2004) and Robillard, Annang & Buchanan (2015). The notion of the "growing edge," (Berger, 2004) a space where students transform their thinking through perspective taking, deep thinking and reflection toward change, was added to the strategies described by Robillard, Annang, & Buchanan (2015), as well as drawing from the literature around prejudice reduction. Prejudice reduction is one of Banks' (2001) dimensions of multicultural education, a framework used in K-12 education and higher education (Cole & Zhou, 2014). Students can reduce the influence of their beliefs and values in their interactions with others they view as different from themselves as they bring their beliefs and values to consciousness, and understand the ways their own values and beliefs can influence their work.

Teaching Method: Complicating our Assumptions

Evidence-based outcome assessment of prejudice reduction techniques is often problematic, and attitude change is at best difficult to measure. An exhaustive meta-analysis of prejudice reduction outcome research found that cooperative education (cooperative learning) and discussion appear to be among the most effective techniques for initiating attitude change (Paluck & Green, 2009). More recent work, considering a range of interventions intended to reduce implicit racial preferences, found that providing individuals strategies to reduce their implicit biases were effective (Lai, et al., 2014). Lai, et al. (2014) reported that the most potent interventions were ones that invoked high self-involvement. We posit that an experiential application of this approach is useful in the health educator classroom, with a goal of increasing self-awareness to reduce bias and prejudice. In the **Complicating our Assumptions** activity, students are challenged to identify and discuss how their held values, beliefs, and assumptions, of 'different' others shape and influence how they view not only their health literacy and practices, but the overall strengths and weaknesses of others. This activity may be introduced, much like similar activities in other fields, to prepare health educators to work directly and authentically with those from different cultures and backgrounds.

Community health educators often work in settings representative of cultures different from their own. They may have preconceptions about health literacy and practices that are based on unconscious assumptions they have made about the group (Marcelin et al., 2019). While they may not have extensive cross-cultural knowledge, they can be motivated to develop techniques to learn about and from other cultures. Understanding the importance of culture in shaping one's lived experiences, and views of one's assets and one's approach to problem solving is important. Educators can use this knowledge to work with their target populations from a place of understanding and respect.

The information provided combined with the reflective exercise we describe addresses a 2020 health education/promotion sub-competency related to planning and implementing health education and promotion programs: 2.3.4 Adopt, adapt, and/or develop tailored intervention(s) for priority population(s) to achieve desired outcomes [National Commission for Health Education Credentialing (NCHEC), 2020]. Cultural competence, generally defined as the ability to understand one's own cultural identity and experiences along with those of others as well as build upon these in learning situations, is not synonymous with cultural diversity. Cultural diversity is commonly thought of as difference among individuals. Thus, understanding and appreciating cultural diversity is considered a component of cultural competence.

Complicating our Assumptions is an exercise that allows students to briefly study the primary and secondary dimensions of cultural diversity, to reflect on their assumptions about the identities of someone different from themselves and to re-examine the assumptions held about others in order to challenge and complicate assumptions while constructing deeper understandings about the complex lives of others. In addition, students have the opportunity to discuss the ways limited views of others can influence their future work. **Complicating our Assumptions** will provide the opportunity to identify the dimensions of culture that could challenge assumptions of health literacy and practices; articulate the ways that strengths can be mobilized to address health status improvement; and explain how their held attitudes and beliefs about others may interfere in their profession.

Experiential Learning and the Growing Edge

Complicating our Assumptions addresses the characteristics of experimental learning described by Chapman, McPhee & Proudman (1995), (i.e., Mixture of content and process; Engagement in purposeful endeavors; Encouraging the big picture perspective) pushing students to the "growing edge" (Berger, 2004). Drawing from Berger's (2004) work, in their own study, Baily, Stribling, & McGowan (2014) brought teachers "to the edge" (p. 336), using experiential learning to bridge their own experiences with those of their diverse students. By engaging in a recurrent process that challenged and scaffolded from their preexisting ideas, teachers continuously considered alternatives to students' experiences and perspectives.

Instructions prior to the exercise

The instructor conducting this exercise should be aware that discussions around the topic of culture must be approached with a great deal of sensitivity and awareness that any classroom might hold identities that are not visible. Consider exploring resources such as

<https://nmaahc.si.edu/learn/talking-about-race> to prepare for classroom conversations, and include community building (or remind students of any previous work around community building) prior to the exercise (<https://nmaahc.si.edu/learn/talking-about-race/topics/community-building>). Care must be exercised in discussions and students participating should discuss rules for respectful classroom discussion of sensitive content as described in <https://crlt.umich.edu/tstrategies/tshctd>.

Instructions for the exercise

The following sequence is suggested for this experiential lesson:

Step 1. The instructor asks students to address the questions below to frame the discussion about primary and secondary dimensions of diversity, and then shares the diversity wheel (figure 1) with them.

- 1) What is culture, how do we define it generally?
- 2) How might we describe our own culture and how/from whom did we learn about it?
- 3) What are some elements of other cultures we have observed or expect to differ from our own?
- 4) What are some of the biological and environmental/cultural differences that separate human beings from one another?

An instructor may choose to discuss diversity concepts with students before moving on to the classroom activity. We highly recommend instructors be proactive by preparing them with information and resources to avoid students confirming assumptions or adopting negative beliefs during this exercise. Likewise, we recommend instructors prompt students to consider the systems of oppression and complicating factors that shape assumptions such as those about who is assertive vs. who is aggressive and which groups are assumed to be stronger or more athletic. Table 1 includes a non-exhaustive list of resources to that end.

Table. 1. Resources for Deeper Conversations about Systems of Oppression and Complicating Factors that Shape Assumptions

Resource	Description	Link
Learning for Justice	Range of resources for educators working across disciplines and with different audiences. Including lesson plans, discussion guides, webinars, and content addressing current issues of injustice and connecting these to relevant historical context.	https://www.learningforjustice.org/
The 1619 Project Lesson Plan exploring "The Idea of America" by Nikole Hannah-Jones	Nikole Hannah-Jones provides an expansive essay on why "black Americans, as much as those men cast in alabaster in the nation's capital, are this nation's true 'founding fathers.'" Her essay chronicles a history of policies enacted to profit from and disenfranchise black Americans, and the fight not only to claim black liberation, but also to make liberation possible for all Americans.	https://pulitzercenter.org/builder/lesson/lesson-plan-exploring-idea-america-nikole-hannah-jones-26503

The 1619 Project Reading Guide: Quotes, Key Terms, and Questions	Resources from a range of professionals addressing two fundamental questions 1. How do societal structures developed to support the enslavement of black people, and the anti-black racism that was cultivated in the U.S. to justify slavery, influence many aspects of modern laws, policies, systems, and culture? 2. How have resistance, innovation, and advocacy by black Americans over the course of American history contributed to the nation's wealth and the strengthening of its democracy?	https://pulitzercenter.org/builder/lesson/reading-guide-quotes-key-terms-and-questions-26504
40+ books for anti-racist teachers	Educator Joe Truss curated a list of books to intentionally center authors and people of color to dismantle the white supremacy culture.	https://culturallyresponsiveleadership.com/antiracistbooks/
Systems of Oppression	The National Museum of African American History and Cultural created a series of resources to engage users with different types of content and reflect on a range of questions and prompts.	https://nmaahc.si.edu/learn/talking-about-race/topics/social-identities-and-systems-oppression
Addressing Asian American stereotypes and prejudice	Understanding Our Perceptions of Asian Americans Countering Stereotypes About Asian Americans	https://asiasociety.org/education/understanding-our-perceptions-asian-americans https://www.apa.org/monitor/2019/12/countering-stereotypes
Addressing Semitic stereotypes and prejudice	Addressing Anti-Semitic Stereotypes and Prejudice	https://www.osce.org/files/f/documents/9/2/441098.pdf
United States Holocaust Memorial Museum	The purpose of the museum is to teach about the threat of hatred and why genocide must be prevented. In addition to historical content and artifacts, there are teaching resources and guidelines for framing lessons about the Holocaust.	https://www.ushmm.org/

Cultures are multi-dimensional, shaped by many different elements, and learning about cultures different from one's own is an ongoing process (Andersen & Taylor, 2015). It is important not to essentialize culture, or treat it as if it is a static description of individuals' characteristics (Gutiérrez & Rogoff, 2003). It is common to normalize our own culture and view other cultures as substandard, not simply as different (Andersen & Taylor, 2015). Deficit perspectives are views that individuals

and their cultural backgrounds are lacking, inadequate, or inferior. The consequences of deficit thinking include the reinforcement of stereotypes, blaming the victim, and the dismissal of structural explanations to understand individuals' experiences (Valencia, 1997, 2010; Nieto & Bode, 2018). For community health educators, recognizing and reframing deficit perspectives are important in order to effectively assess individual's health literacy, practices, and opportunities.

A discussion of person-first versus identity-first language should also be included with the exercise, because language use shapes how individuals think, feel and behave toward others (Crocker & Smith, 2019; Dunn & Andrews, 2015). The American Psychological Association (APA) Publication Manual recommends asking people how they wish to be referred to when possible. When individual's wishes are not known, the APA recommends using person-first language in order to reduce bias (Dunn & Andrews, 2015). That said, the deaf community has not chosen to embrace the notion of first-person language, but has embraced identity-first language. This approach uses the individual's disability as an integral part of the individual's identity (Dunn & Andrews, 2015). Peers et al. (2014) recommends keeping language in line with desires of individual or community being referenced.

Step 2. The instructor creates five posters to be hung at different locations as students enter the classroom. The posters are located with enough space for a group of students to gather and discuss the poster. Following are some sample labels:

- African American, cisgender, factory line supervisor who has a GED
- Physicist who is unemployed and experiencing quadriplegia
- Latinx merchant with limited English-language skills and legal citizenship status
- Lesbian who is working in a restaurant, living with two small children and her wife
- White cisgender male, who is recovering from a substance use disorder, living in his car

These descriptions of individuals have been adapted from an activity presented by the Kentuckiana Region of the National Conference of Christians & Jews (NCCJ, 1992). If other identity descriptions seem more appropriate for your students, modify the descriptions with attention to the points above around language use.

Step 3. The instructor asks students to read the descriptions on each of the posters and then stand by the poster that represents the person with whom they would find most challenging to work with and why. For example, after reflecting on their experiences, assumptions, and prejudices, students should consider identities such as race, ethnicity, language, gender identity and expression or intersections of these that make them apprehensive about working with another person. Once students have chosen a poster, ask the group to discuss why they chose this particular person. What are the strengths of this person? What would be difficult about being this person? On what would the person's health literacy level, health practices and opportunities be based? Have a spokesperson from the group share aloud their collective reasons behind their decision.

Step 4. After each group has shared responses, the instructor may ask the group clarifying questions, with the intent to push students to the "growing edge." Here are some examples:

- What race, gender, age, economic status and educational level did you assume and assign to the individual? On what did you base these assigned levels?
- How did these assigned characteristics influence your expectations for the individual?

- How do our own attitudes help us develop a positive or negative view (expectations/possible limitations) of another person?

These clarifying questions provide students with an opportunity to share their assumptions and complicate their understandings of diversity. For each person described above, what assumptions did the students make and how did those assumptions influence and mold their expectations for that person (or the group to which that person belongs)? For example, how did gender, educational level or economic status shape their expectations for this person? Facilitators should not use leading questions such as “did you assume the lesbian was a waitress?” vs “what position in the restaurant did you believe this person was?”

The authors also urge instructors to be proactive and prepare for managing “hot moments” and address situations when one student engages in “othering” or targeting another student. Resources such as those at <http://www.edchange.org/multicultural/activities/groundrules.html> and <https://crlt.umich.edu/tstrategies/tshctd> include tools for planning and managing conversations. As others have done before us, we recognize the evolving nature of language and use of terminology in describing people. Because language usage with respect to individuals and identities is ever-evolving, we recommend community health educators recognize first and foremost that they are discussing people. Inherent with fundamental respect for human beings, educators need to consider how they describe others, and the terms they use should reflect both current knowledge about accuracy and respect for individuals’ preferences. The National Association for Multicultural Education (NAME), as part of their mission to advance and advocate for social justice and equity, offers the following resources to support community health educators and others to make thoughtful, informed decisions about communication when working alongside communities (NAME, 2019a, 2019b, 2019c).

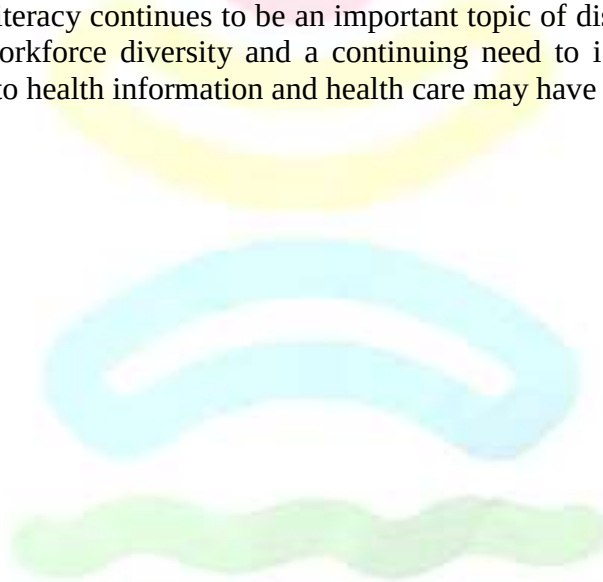
Points of Emphasis in Class Discussion

We also highlight some important points throughout class discussion. At times, our opinions about a person or group are based on a limited number of characteristics or on very limited exposure to people we view as different. When we focus on one or two characteristics, particularly if these are inaccurate stereotypes, we may create a strong negative (deficit perspective) opinion about a person or group that lacks depth of understanding. By exploring an individual’s or a group’s qualities more deeply or broadly, we may come to recognize some qualities of the person (group) that we appreciate (strength perspective). Every person (group) has strengths, experiences, or skills they are using or could use in their daily lives, for problem solving and for the benefit of others (NCCJ, 1992). As a community health educator, we seek out those positive experiences and skills that can help us build community and become the basis for our work. We focus on the strengths or funds of knowledge perspective as we increase health literacy and teach about proactive health practices. When we are compelled to position ourselves in another’s place, we cannot only explore the primary and secondary dimensions that we have unconsciously assigned to that person or group, but we also change the perspective from which we view these dimensions. We are encouraged to view the worth of that person or group differently, seeing assets and strengths where previously we did not. Often, without being aware, we make assumptions, develop expectations and set limits and make judgments on others, based on the group identity we attribute to them (Gleich, 2014). When our expectations and limitations for groups are generalized to individuals within a group, we are no longer seeing unique

individuals. Effective community health educators have brought to mind their preconceived ideas and recognize how their own biases and prejudices can influence their perceptions of others, creating barriers to effective communication and interactions. They are able to break down barriers and find the positive characteristics within individuals or groups. Their effectiveness in planning, implementing and evaluating health education/promotion programs may be determined by their insight into those biases and prejudices.

Conclusion

Community health educators need holistic health literacy (Rask et al., 2013-2014) to bring about a conscious awareness of their own beliefs and values in order to serve effectively community groups, especially those different from their own. As students participate in experiential activities, they can explore their biases and prejudices in a safe and nonjudgmental environment. In the words of Howard Ross (2020), specialist in the application of social science research, “If you are human, you are biased” (p.1). In sum, we all have biases, and once we recognize our patterns of thinking that develop into biases, we can do something about our behaviors, particularly as these affect work in community health. **Complicating our Assumptions** is an activity that could be used effectively with multiple groups and can be modified for high school students or workforce groups. Cultural competence as one component of health literacy continues to be an important topic of discussion as we experience greater community and workforce diversity and a continuing need to improve health literacy of individuals, whose access to health information and health care may have been very limited.



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