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Nike Literature Review

Nike is an athletic company that was established in 1972 and dominating the industry ever since. Bill Bowerman was the head track and field coach for the University of Oregon when Phil Knight joined the team as a middle-distance runner in 1955. Not soon after Knight graduated from Stanford University with an MBA in finance, the two decided to became partners. When Knight and Bowerman started Nike, their vision was to provide an exceptional running shoe to athletes all over the country. But before it became the Nike known worldwide today, it started as Blue Ribbon Sports. The business consisted of selling the shoes out of the trunk of Knight's green Plymouth Valiant, while Bowerman tackled the shoe engineering aspect to make the shoes more functional and lighter. Needing more assistance, Jeff Johnson was the first hired full-time employee for Blue Ribbon Sports. The majority of the marketing elements were created by him and the name of the company, Nike, was discovered by him in 1971. Later the company transitioned from selling another company's footwear to designing manufacturing them their selves. The company made its debut in 1972 at the US Track and Field Trials, adding innovation to the running shoe with a lighter, more function design and the iconic "swoosh." Nike has been running with it ever since (Nike Inc.) Now it is a thriving worldwide business that not only provides athletic shoes but apparel and other components for various sports. They continue to find new ways of marketing themselves and broaden the options they offer the consumers. The next frontier they have embarked on is the concern for the environment, creating the Nike segment "Nike Better World." Nike keeps the same stylish and highly functional elements but reduces their carbon footprint on this planet (Nike Better World).

The commitment to making Nike more sustainable has expanded exponentially in the past five years from simply counteracting criticism to innovating the way they conduct business

and manufacture their products. In an article from the Wall Street Journal published in 2009, the author is skeptical of Apple and Nike's decision for their resignation from the U.S Chamber of Commerce board. Both companies claim that the board needs to alter its views and approach to climate change. The Boxer-Kerry bill, which will charge per carbon emission, will arguably not affect Nike because their manufacturing is mainly outsourced to approximately 700 factories in other countries across the globe. Satire is detected when the author of this article addresses the issue by stating "green virtue is easier when someone else is paying for it." In an attempt to counteract the assumed loop hole Nike has an additional step which will be taken to set in motion a bill that will issue a carbon tariff on products produced in China and Vietnam that are sold in the U.S. In hopes of avoiding a significant amount of taxation, Nike is also continuing to reduce their carbon footprint based solely on the principle of becoming an eco-friendly brand in the athletic apparel industry. Some of the top brands in any industry to go green are Whole Foods Market, Apple, Dove, Walt Disney, Burt's Bees, and SC Johnson (Swallow 2). With this small list compiled, one has to notice the absence of athletic apparel. Nike has the chance and is in an advantageous position to take the lead over other companies such as Adidas, Puma, and Under Armour.

A plethora of approaches have been made to address the issue of sustainability and it has strayed away from becoming a target to more of an approach that endlessly needs to be reevaluated (Fromartz). For Nike, redesigning the athletic shoe itself and making it more sustainable instead of simply cutting back on particular manufacturing activities became the concentration for being eco-friendly. The article then proceeds to note that Nike's challenge is to deviate from "compliance" and be avant-garde in the athletic apparel industry. Discovering that the production process took three shoes worth of material to complete only two jolted the

corporate offices. Waste of that material resulted in an annual loss of $700 million and extensive contribution to their carbon footprint. From that point on Nike established goals for the long run, setting a focal point of 2020. Setting these goals will prove beneficial only if substantial improvement is seen across the board. As of 2009, 15% of their products are considered "cutting edge" and they are striving to convert all shoes to this design by 2011, all clothing by 2015, and accessories by 2020. Change is constant and one thing that Nike does well in their journey to sustainability is provide figures for the general public to exam. Some figures provided by their annual report are the products have reduced waste by 67%; energy use was cut by 37% and solvent use declined by 80%. The figures are in comparison to other Nike products that have not implemented the new production methods.

With other companies Nike could be more active in their pursuit to spread the technology they have, and not only being able to spread it is enough but actually making sure it gets done. In their effort Nike also teamed up with the World Wildlife Fund to make strides toward cutting carbon emissions. Spokesman for Nike, Joanie Komlos stated in an interview with In Business "we are taking the necessary measures to ensure our footprint has a minimal impact." One of the more elaborate ways that the company has make an impact is their partnership with Delta Air Lines in a program that they both donated portions of the ticket price to offset emissions.

An important element that Nike brought into their changes was re-evaluating their standards from relevant information. "We need to deliver innovations that rapidly evolve the way things are done at Nike, in our industry and throughout business," Mark Parker quoted in an interview given to Business Wire. It is an acknowledgment of the forever changing market and with that comes the implementation of a new factory rating system. In the article it provides the main criteria for which the factories will be rated such as total performance, measures of quality,

cost, and environmental performance. Goals that were reached in recent years are carbon emissions were reduced by 6% from 08-11 and 97% of Nike footwear has reached baseline level or better for "Considered" Index. Some goals that they have set for the coming years are that by the end of 2015 there will be a 20% reduction of carbon emissions per unit in footwear manufacturing and that they will achieve zero discharge of hazardous chemicals for their entire product line by 2020. These are critical and bold standards to meet.

Technology has only propelled Nike forward. It has given them the ability to not only reduce waste but also use the waste in manufacturing processes (Edelson). Products can be continually reused, which in turn reduces waste and cost for new materials (Entertainment Weekly). With these innovations Nike has reduced waste by 17% and has thus far recycled 18 million pairs of shoes. This practice is under personal scrutiny because there is no formal way for the public to send their shoes to Nike if they wished for them to be recycled instead of thrown away. In products outsourced to Japan, plastic bottles were melted down from landfills to create their new Soccer jerseys for 2010 (ENTWK). This process in turn saved 13 million plastic bottles from being dumped into landfills across Asia. These products still offer the innovative and functional design of Nike products but with a more positive impact on the planet.

Where a problem arises is in Nike's ability to market their sustainability concept to the younger market. An article from the Park Howell blog it shows the concerns of younger consumers and how they are less responsive to the idea of sustainability. The issue is that their understanding of the concept is lacking and they would rather strive for a "better world." Nike needs to find a way to not only market to the up and coming segment but to also motivate them to want to be a part of a company in its attempt to change the world.

Nike has developed a campaign titled "Nike Better World" where they are taking the country on a journey to a better world. They do this by using recycled materials and eco-friendly methods of production. They have soccer jerseys made out of eight plastic bottles. They retain the functional design while reducing the amount of plastic in landfills. Their efforts extend into all sports with the Nike 6.0 Board shorts being made out of 84% recycled polyester. This makes them light weight and durable. For all the basketball fans who wish to go green, they have Nike Zoom and Flywire with 100% green rubber outsole which also eliminates the majority of toxic compounds. Nike also breaks into the standard workout gear articles by engineering their Legend Pant to save up to 10 plastic bottles. Not only do their clothes break barriers on the going green campaign, but the package they come in does as well. Their shoe boxes are now made out of 100% recycled cardboard and have 23% less material than before. By changing this one thing 200,000 trees are saved annually (Nike Better World).

Nike is leading the world in eco-friendly products and does not keep the secret to themselves. They are so dedicated to saving the planet that they are part of a coalition that allows the sharing of ideas and the exchange of ways to help the environment. This means that the technology they use, they give to other companies so they can also be as efficient in their production of products and/or services.

In terms of a research project I am to focus on the gaps in their environmental technologies and see what more they can do. Also, I want to compare and contrast the difference in the way Nike goes about being green and other athletic clothing companies. Idea for gaps are there are ways to get the customers more involved in going green instead of having them just simply buy the products. Philip Kotler, the author of Marketing 3.0, give specific accounts in this book on the momentum shift of the industry towards more social responsibility. He explores the

ideas of how to market the ideas to shareholders. It explains that the capital market is moving to sustainability in corporations and the idea is to get them on board with what the new cultural norm will be and that it is necessary for survival (Kotler 104). Subsequent chapters put these notions into practice and show the directional change towards consumer favorable actions (Kotler 121). These changes are seen in increased philanthropy to organizations close to customer interests, and by doing so it presents the company with the platform that they are helping others as well as their consumers (Kotler 125). The most important idea that Kotler discusses is the different roles that companies can take to infiltrate this mindset into their practice. Companies can either be an innovator, a propagator, or an investor (Kotler 161). "Both investors and propagators promote the environmental cause through their business processes, whereas innovators produce products that are environmentally friendly (Kotler 161)."

To comply with Kotler's ideas Nike could implement a recycle location for old shoes and other gear. With this they can give their customers an incentive like a $20 credit or have it based on the amount of products they brought in. The idea of credit can even be removed; with the right marketing the idea is to get people to have to the desire to help rather than simply doing it to get a reward.

Nike also needs to adjust their marketing strategy to target the audience they are actually seeking. They want to gain young athletes that have the drive to not only improve in their athletic pursuits but to also engage in being environmentally active. A new campaign should be focused more on the notion that their clothes are more eco-friendly and reduce waste rather than their current approach. Where the gap may be is between the information given and how effective the audience is absorbing that information. The question is if they are getting enough information and if they understand the information that's been given. The fact that their products are green is

important and many consumers are not aware of this fact. The marketing should gear towards informing the consumer, rather than telling them of what is right and what is wrong. Communication of facts and figures is revealing itself as the main problem for lack of brand acknowledgment.

Data Analysis

Method:

The short 11 question survey was distributed using a Facebook "like" page to approximately 1,500 people. Participation was voluntary, and as of yet 34 people have responded to the survey. The results of the survey will be analyzed and presented in this paper. With this information, it may be possible to find the gap between companies focused on sustainability, social and environmental responsibility.

Results:

Of the respondents, twenty-two (22) of them were between the ages 18 and 24; six were 25 to 29, and another six from 30 and on.

One of the questions was to understand the decision making process of why they chose that particular brand, 65.6% based it on style and 21.9% chose functionality. Only 3.1% chose a brand because of their involvement in society. To find where brand loyalties and 71.9% claimed Nike, while both Adidas and Under Armor had 12.5%.

The number for social responsibility was low; however, 58.8% said that if they were given more information on what the company was doing in regards to social responsibility they might switch to that company. This question was asked to determine what factors effected the decision making process. When asked if they would switch loyalties to a company that was more socially involved, 26.5% said yes they would switch. When asked if they would pay more for a

brand that was more socially responsible, 50% claimed that they would pay more and 38.2%

would request more information before making a switch. These numbers indicate that there isn't

enough information out there on companies' efforts towards making their brand more

sustainable. The larger question might be is there information available but not easily accessible.

Respondents were asked if companies should make information on their sustainability efforts

more readily available and 73.5% responded yes.

Different terms were presented to the respondents and they were asked to indicate which

one they related to more; "Better World" claimed the top spot for the consumer friendly term and

Social Responsibility came in second with 27.3%. "Better World" is the term used by Nike for

their sustainability division, and the results indicate that they are having success in making their

name easy for the population to understand. It is important that terminology does not send the

wrong message to consumers. Following that question, it was asked if companies should focus

on one specific issue or have a broad spectrum; 58.8% wanted to see companies have a balance

between the two and 11.6% want companies to have a broad spectrum. With having a balance or

broad spectrum for social and environmental issues companies can reach more consumers.

Of the respondents that answered the question "how important are the efforts a company

makes towards a better world toward your buying decision," 64.7% said that the efforts were

only slightly important, 17.6% said it was not important at all, and 11.8% claimed it was very

important. The level of importance varies but the majorities still have social responsibility as a

factor on decision making.

A company's reputation would positively increase in the eyes of 82.4% of respondents if

they knew what the company was doing for the environment and social causes. Respondents who

were asked if their brand loyalty would increase with more social efforts by the company, 47.1% answered positively, while 38.2% needed more information before making that decision.

Summary:

On several occasions more information was needed before many respondents would make definite decisions on where their loyalties would remain or change. Given the information, companies should participate more in social and environmental issues and make information on their efforts easily available for consumers. Terms surrounding the efforts of companies to become more involved in what their consumers want are sometimes confusing to consumers and can send the wrong message or the message can fall on deaf ears. The important thing for companies to do is send a clear message and allow consumers to gather appropriate information regarding the company's efforts toward sustainability. Further research can be done on terminology and see exactly what consumers are gathering from each term and how marketing can better define their terms.

Conclusion

Nike is continuing their innovative approach to apparel and athletics by leading the industry in various products ranging from shoes to calorie counting bands. As the movement for sustainability gains momentum and put the social responsibility on the larger companies, Nike embraced the idea. The research presents the strides they are making toward making the company more sustainable and getting their consumers involved.

There are areas that can be improved to reach more people, because a disconnect exists with lack of readily available information. While Nike has many programs and social media avenues dedicated to their "Better World" campaign, most of the information has to be researched in order for consumers to gather enough evidence to make an informed decision. In

today's society there is a dire need for instant gratification, and consumers want to be able to look at a product and get all the information they need. If they do not know the information is available, they are less likely to go search for it, in my opinion.

Suggestions are for Nike to make more information available on their apparel tags. Information should not clutter the tag but be enough to catch the attention of the consumer and provide enough information for them to make a buying decision. A collection for their sustainable products can be released together in similar fashion of their other subsets. As this occurs Nike can let it be known that all of their products are in transition to the more sustainable methods of production.

Recycling is a major aspect of the sustainability movement and while Nike provides recycling bins to drop off their old shoes at their outlet stores, not all outlet malls are in a reasonable distance of consumers. A simple solution to this problem would be to partner up with retailers that sell their products such as, Dick's Sporting Goods, Footlocker, and Finish Line. Setting up drop off boxes for old shoes in these locations would increase the number of shoes that come back to the company for reuse, and it gives a quick visual along with instant recognition that the company is progressing.

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Utilization of Hands-On Activities to Promote Participation in STEM Fields

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The secondary school level is a critical juncture at which many underrepresented minorities exit the STEM pipeline due to barriers such as lack of interest, self-efficacy, and knowledge of and preparation for STEM careers. Imagination Camp, an initiative the Virginia Tech Center for the Enhancement of Engineering Diversity (CEED) hosts for rising 7th and 8th graders, aims to increase diversity in engineering by helping underrepresented minorities overcome those barriers. Imagination Camp participants tour Virginia Tech's engineering laboratories, meet faculty, attend lectures and participate in hands-on activities facilitated by faculty, undergraduate and graduate students. In the following paper, the effectiveness of hands-on activities facilitated by undergraduate students in the Virginia Tech **St**ream **R**estoration, **E**ducation, and **M**anagement Experience for Undergraduates (StREAM REU) were assessed using a retrospective post-then-pre survey that measured change in awareness, content knowledge, interest in science, self-efficacy, and career knowledge. A majority (93%) of the students reported change after participation in the program. Workshop assessment showed statistically significant increases in attitudes that may help participants continue along the STEM pipeline. The evaluation also includes recommendations to improve pedagogy of the Imagination Camp program.

Introduction

Since the launch of Sputnik in 1957, there has been a national effort to improve education in science, technology, engineering, and math (STEM) fields. The effort was made in hope of increasing the STEM workforce and enhancing the United States' economy. More than five decades have passed since the launching of Sputnik, and STEM education is more important now than ever.

Currently, American students are being outperformed by international students (Lee, 2010). In an international education assessment administered in 63 countries, American students consistently ranked lower than China, Korea, Finland, and a host of other countries in math, reading, and science. In those subjects American students respectively ranked 31st, 17th, and 23rd (Lee, 2010). In 2010, President Obama reiterated the importance of STEM disciplines when he stated, "our nation's success depends on strengthening America's role as the world's engine of discovery and innovation" (Sabochik, 2010). Although there have been many outreach initiatives to increase STEM participation, the United States is not from remaining as innovative and competitive as it was in the past.

Despite past efforts, there is a lack of diversity in STEM disciplines that thwarts true innovation. When diverse people come together to solve problems, they utilize their different backgrounds, cultures, and experiences together to form creative and innovative solutions. Despite the known benefits of diversity, women and minorities remain grossly underrepresented in the STEM fields. This underrepresentation is the result of girls and minorities exiting the STEM pipeline as they progress through the U.S. education system.

The demographics of the US are rapidly changing. According to the U.S. Census Bureau, in 2011 minorities accounted for more than half of the population of children less than one year of age (U.S. Census Bureau, 2012). It will be these children who attend school, graduate from college, and begin to fill the void in STEM fields as older white men, who currently represent the majority of the STEM labor force, retire (George & Neale, 2001). Unfortunately, minorities are underrepresented in STEM fields. Approximately 70% of the STEM workforce are Non-Hispanic whites (I Seek Solutions, 2011). It is

imperative that outreach initiatives assist underrepresented populations as they pursue futures in STEM disciplines.

The U.S. economy relies heavily on STEM jobs. According to the Economics & Statistics Administration, 1 in 18 workers are employed in STEM fields and occupations in these fields are projected to grow at a rate of 17 % (STEM: Good Jobs Now and For the Future, 2011). Guest workers are currently filling the gap that is left due to underrepresentation of minorities and women in STEM careers (George & Neale, 2001). The guest workers are able to easily fill the gap due to a shortage of STEM degreed minorities and women.

The retention rate of African Americans, Native Americans, and Hispanics pursuing STEM degrees in college is less than 50 % (Nestor-Baker & Kerka, 2009). This is the result of minority students facing barriers that include low quality secondary education, anti-intellectual peer pressure, low confidence, lack of role models, and lack of access to quality career preparation (Culotta, 1992). Recently there have been initiatives that have worked and are working toward increasing participation of underrepresented minorities in STEM fields by helping underrepresented minorities overcome those barriers.

Past research has shown that many minority and female students lose interest in science at the middle school level (Culotta, 1992). For this reason many initiatives have been created to target students at this age range. Preparation for participation in the STEM fields must begin at the middle school level. At this stage students must begin to choose math and science courses as they progress from one grade to another. Many initiatives are working with middle school and high school students to increase their interest in STEM fields, introduce underrepresented students to successful underrepresented scientists who can act as role models and mentors, provide knowledge for educational and career preparation, and create peer networks among underrepresented students interested in STEM fields (Culotta, 1992). If students participate in engaging, hands-on activities then they will develop more positive attitudes toward awareness that they affect their water quality, science based content knowledge, interest in science, self-efficacy, and biological systems engineering careers.

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Examples of such programs exist at many universities. For example, The Center for the Enrichment of Engineering Diversity (CEED) was created at Virginia Tech in 1992. CEED aims

1. "to increase the diversity of students who apply to, enroll, and graduate from the College of Engineering;

2. "to increase the awareness of engineering and other technical fields as an exciting and rewarding career path to a diverse population;

3. "to provide academic, professional, and personal support programs;

4. "to provide support to student organizations that support our mission; and

5. "to foster collaboration between the Center for the Enhancement of Engineering Diversity, the University, industry, and the local community to support our mission" (College of Engineering, 2012).

CEED accomplishes their goals at the secondary and post-secondary level by hosting pre-college programs at the K-12 level and undergraduate level. Imagination Camp is an example of a pre-college program that CEED hosts for 7th and 8th graders in the Roanoke, VA and Montgomery County, VA areas.

During the annual summer program, Imagination Camp participants spend five weekdays at Virginia Tech. They attend large group and small group activities. The activities include attending lectures taught by faculty, touring research labs, and participating in hands-on activities facilitated by faculty, undergraduate and graduate students. The purpose of this study is to understand the effects hands-on activities had on Imagination Camp participants' attitudes in the following constructs: awareness, content knowledge, interest in science, self-efficacy, and career knowledge. Attaining a better understanding of the effects could assist CEED in promoting participation of underrepresented minorities in engineering and improve Imagination Camp's pedagogy. If students participate in engaging, hands-on activities then they will develop more positive attitudes toward awareness that they affect their water quality, science based content knowledge, interest in science, self-efficacy, and biological systems engineering careers.

Methods

Interns participating in the Virginia Tech StREAM REU developed and facilitated three independent1-hour workshops for Imagination Camp participants. Workshops were held in the

undergraduate teaching lab in the Biological Systems Engineering department at Virginia Tech. The objective of the workshops was to introduce Imagination camp participants to basic hydrology content through engaging activities.

Workshop 1 was held on July 23, 2012 and had 21 participants. There were 15 participants that consented to completing the survey, including 2 females and 13 males. 20 % of the respondents were ethnic minorities. Workshop 2 was held on July 24, 2012, and had 19 participants. There were 15 participants that consented to completing the survey, including 5 females and 10 males. 40% of the respondents were ethnic minorities. Workshop 3 was held on July 25, 2012. Participants from Workshop 1 participated in Workshop 3.

Workshop 1 modeled their workshop after Living with the Trinity's Water Quality lesson plan (2012). The interns modified the lesson plan by having students conduct pH and conductivity tests. The interns created five water quality testing stations. At each station was an unknown liquid sample. Prior to visiting the stations, students hypothesized which sample they believed to be water. They recorded their hypothesis on a data collection sheet. Participants were then placed into 5 groups. While in groups, participants rotated to each water quality testing station. At each station, students recorded descriptive observations of the samples and results from temperature, pH, and conductivity tests. Based on their observations and test results, participants determined if they accepted their hypotheses. As a group, participants reflected on the testing process and discussed their hypotheses and rationale for accepting or rejecting their hypotheses.

Groundwater Quality and natural filtration systems was the topic of Workshop 2. Interns from Workshop 2 facilitated a discussion on drinking water sources and their filtration processes. Then individual participants built mini aquifers using a variety of materials that included gravel, sand, mulch, and top soil. Next students worked in mixed ability groups to build larger aquifers. Teams were charged with building the aquifer that could filter the most glitter water. After teams tested their larger aquifer, interns from Workshop 2 facilitated a reflection discussion where students stated what they thought they

did correctly and mistakes they had made when building their team aquifer. The United States Environmental Protection Agency has a comparable lesson plan on their website (2012).

Workshop 3 was about "Wacky Watersheds" (University of Maryland: Center for Environmental Science Horn Point Laboratory, 2012). Participants viewed a PowerPoint about watersheds and water pollution. Interns facilitated a discussion about watersheds. Then in teams of two, participants used tin foil pans, rocks, and aluminum foil to create a watershed. Cups were used to elevate the watersheds. As a team participants demarcated drainage flows on the aluminum foil. Using a water bottle, rainfall was simulated. The participants then dispersed chocolate sprinkles and Kool-aid powder throughout the watershed to simulate pollution. Rainfall was simulated again to show how pollution moves through a watershed. Participants reflected on their observations. The workshop ended with a discussion of stream restoration.

To determine whether participants experienced changes in their attitudes, the researcher developed a retrospective post-then-pre survey (Table A1). The survey utilized a 5-point Likert scale that ranged from strongly agree (5) to strongly disagree (1). A retrospective post-then-pre survey is advantageous for this study because it can be administered in one sitting. The duration of the workshops was 1 hour; therefore, administering a pre-assessment and post-assessment would have been detrimental to the effectiveness of the workshops. Retrospective post-then-pre surveys also minimize response-shift bias by not introducing information that may not be understood prior to the program.The survey was designed to measure changes in the following constructs: awareness, content knowledge, interest in science, self-efficacy, and career knowledge.

Prior to working with the students, the researcher completed training in human subjects protection through the Virginia Tech Institutional Review Board (IRB). The researcher was added as a co-investigator to an existing CEED research project. A research protocol was then submitted to and approved by the IRB. Prior to the survey being administered, the survey had to be approved by the IRB.

Multiple items were developed for each construct to make the survey more reliable. Construct items were developed by the researcher. Because of this, survey results can't be compared to existing

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research. Surveys were administered at the end of Workshops 1 and 2. Because Workshops 1 and 3 were attended by the same camp participants, only two workshops were assessed. The instrument that was developed was limited to 14 items because the survey needed to be user friendly and had to be completed in a relatively short time frame (5-10 minutes). The IRB has to approve any changes to the research protocol. This prevented the content knowledge construct items from being tailored to each workshop.

Results and Discussion

There was an overall response rate of 75%. At the first workshop, 15 students participated. An additional 15 participants participated at the second workshop. Participants provided written consent. In both workshops, 15 participants completed the survey. Paired t-tests were conducted to investigate changes in attitudes of Imagination Camp participants after participating in the hands-on activities that were facilitated by undergraduates. Analysis revealed statistically significant increases on items 1-13 in the retrospective post-then-pre survey (Table A2). For item #3, the post and pre values were swapped to indicate a positive change during analysis.

Change scores were also calculated by subtracting pre-assessment scores from post-assessment score for each item. The results from the change scores were used to assess changes in attitudes for each construct (Figure A1). Item change scores ranged from -2 to 4. Mean overall construct changes ranged from 0.408 to 0.65.These findings indicate that participants increased their positive attitudes toward awareness, content knowledge, interest in science, self-efficacy, and career knowledge. The greatest changes occurred in the awareness construct (mean change = 0.533).

Participants of Imagination Camp expected to learn about engineering and the workshops were designed to introduce them to biological systems engineering. Biological systems engineering is a discipline that applies engineering principles to natural processes. The workshops focused on hydrology. This may explain low increases in interest and career knowledge, as interest in nature may have been extremely low.

Mean change scores were higher for Workshop 2 than Workshop 1. Overall, the differences between the means were statistically significant (p=0.026). Differences in the results of Group 1 and

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Group 2 can be attributed to differences in the backgrounds of the interns which affected how they facilitated the workshops. An intern in Group 2 is pursuing an education minor and has worked in her community teaching science activities to students in primary and secondary schools. Her background helped Group 2 create a more inclusive, formal learning environment than Group 1. Group 2 created an inclusive learning environment by asking all participants to respond to questions asked of the group. Interns also made an effort to specifically ask students who withheld responses. Group 2 created a more formal learning environment by using a lesson plan to guide the flow of the workshop.

Time detrimentally affected the results. Time disallowed for the survey to be administered to a focus group. This prevented the survey from being tested for design flaws. For example, item #11, an item developed to assess self-efficacy was too narrow in its focus. After completing the survey, several participants stated that they chose strongly disagree for both the post and pre assessment because they didn't have siblings or felt that their siblings would ignore them. The item would have been better if it read, "I could teach science facts to my friends." Time acted as another limitation because the duration of the workshops was 1 hour. Changes in attitudes toward awareness and content knowledge could change with an hour-long workshop, but it would be unreasonable to expect a large change in interest in science or interest in BSE career knowledge as a result of participating in an hour-long workshop.

Conclusion

Hands-on activities can be used to promote participation in STEM fields. Overall 93% of the participants reported a positive increase in their attitudes after participating in the hands-on activities that were facilitated by VT's StREAM REU interns. Although this study cannot predict whether Imagination Camp participants pursue STEM careers in the future, their increase in positive attitudes could serve as a precursor to future STEM participation.

Further research could be done to determine the effects each workshop had on the students. Had Groups 1-3, been able to facilitate multiple workshops to different Imagination Camp participants, a study could have been done to determine which workshops were more effective at increasing positive attitudes.

A follow-up study is warranted to determine if participation in the workshops made an impact on participants' choices concerning future coursework, post secondary education, and career goals.

Acknowledgements

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Appendix A

Table A 1 Survey instrument

After Participating					Please read the statement in the center section below. In the left column circle the number that describes your viewpoint **NOW** that you have finished the workshop. Then in the right column circle the number that describes your opinion **BEFORE** this workshop.	Before Participating				
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5	4	3	2	1	Things I do everyday affect the streams in my neighborhood.	5	4	3	2	1
5	4	3	2	1	The health of the streams in my neighborhood affects the water I drink.	5	4	3	2	1
5	4	3	2	1	I can tell how healthy water is by how it looks.	5	4	3	2	1
5	4	3	2	1	Water is filtered as it moves through the soil.	5	4	3	2	1
5	4	3	2	1	Science is fun.	5	4	3	2	1
5	4	3	2	1	I like conducting science experiments.	5	4	3	2	1
5	4	3	2	1	I am interested in learning more about water quality.	5	4	3	2	1
5	4	3	2	1	I am interested in participating in another science camp.	5	4	3	2	1
5	4	3	2	1	I can make good grades in science.	5	4	3	2	1
5	4	3	2	1	I could be a good scientist.	5	4	3	2	1
5	4	3	2	1	I could teach science facts to my siblings.	5	4	3	2	1
5	4	3	2	1	I could use science facts in the real world.	5	4	3	2	1
5	4	3	2	1	I am interested in protecting streams in my neighborhood.	5	4	3	2	1
5	4	3	2	1	I am interested in teaching people about streams.	5	4	3	2	1

Table A 2 Mean and standard deviation of survey responses for both workshops

Survey Items	After		Before		t
	Mean	SD	Mean	SD	
Things I do everyday affect the streams in my neighborhood.	4.0	1.0	3.3	1.1	<0.001
The health of the streams in my neighborhood affects the water I drink.	4.2	1.1	3.6	1.2	<0.001
I can tell how healthy water is by how it looks.	3.1	1.2	2.4	1.3	0.011
Water is filtered as it moves through the soil.	3.3	1.1	2.9	0.9	0.003
Science is fun.	4.1	0.8	3.4	1.0	<0.001
I like conducting science experiments.	4.2	1.0	3.7	1.2	0.001
I am interested in learning more about water quality.	3.4	1.1	2.8	1.2	<0.001
I am interested in participating in another science camp.	3.8	1.0	3.4	1.2	0.001
I can make good grades in science.	4.6	0.8	4.2	0.9	0.008
I could be a good scientist.	3.5	1.0	3.2	1.2	0.030
I could teach science facts to my siblings.	3.2	1.1	2.8	1.3	0.005
I could use science facts in the real world.	4.1	0.9	3.6	1.0	<0.001
I am interested in protecting streams in my neighborhood.	3.7	1.0	3.0	1.1	<0.001
I am interested in teaching people about streams.	2.9	1.0	2.8	1.1	0.085

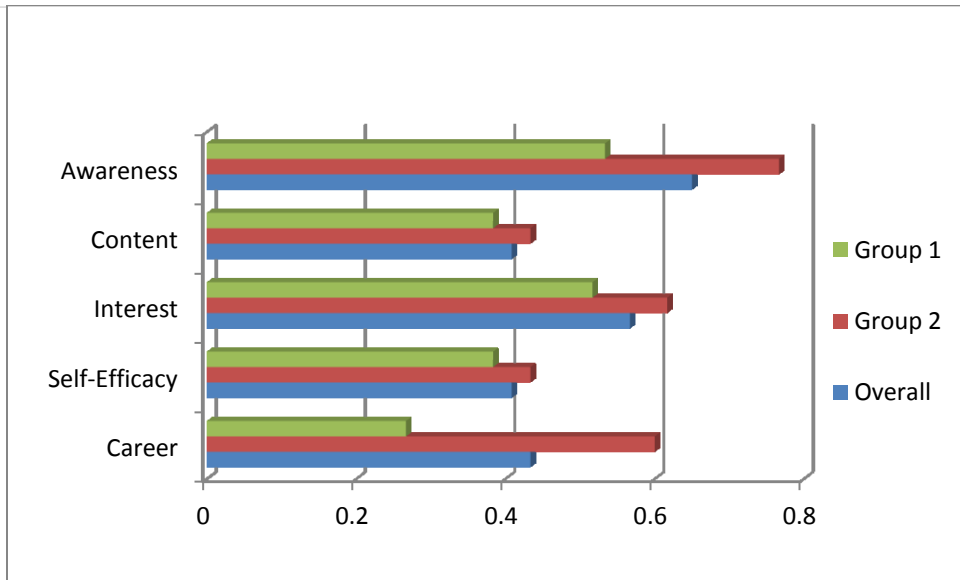**Table A 3 Average change per construct**

Immune Cell Localization in the Genital Tract Regions of Cold-Stressed Mice during Chlamydia trachomatis Infection

By

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Abstract

Stress has been associated with lowering secretion of cytokine/chemokine proteins, as well as increasing infection severity in *Chlamydia trachomatis* infected mice. However, the effect of stress on *Chlamydia*-infected mice on the localization of immune cells in the genital tract is not well-defined. The purpose of this study was to determine the distribution of immune cells in the cervix, uterus and oviduct of cold-stressed compared to non-stressed *Chlamydia*-infected mice. The tested hypothesis was that cold-induced stress leads to the differential distribution and functions of cytokines and immune cells in the regions of the genital tract of a mouse model. Parameters analyzed included the localization of immune cells, chemokine expression, and infection severity in the genital tract. Cold-stressed and non-stressed mice were infected intravaginally with *IFU of C.trachomatis*; after 7 days, genital tracts were collected and homogenized for flow cytometry, *C. trachomatis* isolation, and cytokine ELISA analysis. Cells were harvested by collagenase Type 1 treatment of the genital tract of infected mice. Fluorescein-labeled monoclonal antibodies directed against murine CD3, CD4, CD8, CD54 (ICAM-I), CD71, CD 102 (ICAM-2), MadCAM-I, and NK were used to identify the cell surface markers in the genital tract of mice. The number of immune cells in stressed mice was reduced; however, no statistically significant difference between stressed and non-stressed was recorded. Increased infiltration of leukocytes into the genital tract of stressed or non-stressed infected mice was obtained. Flow cytometry analysis exhibited a marked increase in uterine CD3e and CD4 immune cell surface markers of stressed mice and a marginal decrease in stressed mice oviducts. Cells expressing the innate markers Gr-1 and CD11c were less detected in the genital tract, suggesting less activity of innate immunity 8-10 day after infection. ELISA analysis illustrated a decrease of TNF-α production in the oviducts of stressed mice compared with non-stressed, while Interleukin-6, Interferon-γ, and TNF-α production was increased in the uterus of stress models. Fluorescent microscopy analysis showed an indicative increase in IFU *Chlamydia* counts in stressed samples. Our data indicates that there is a differential distribution of immune cells in the regions of the genital tract with distinct

functions that may have protective or adverse effects during *Chlamydia*infection in the stress mouse model.

Background and Significance

Chlamydia trachomatis, a gram-negative, obligate intracellular bacterium, is the etiologic agent behind a growing infection in America. Chlamydia genital infection, according to the Center for Disease Control, is the most common bacterial sexually transmitted disease in the Unites States. Over 1.4 million cases were reported in 2011, but this is only half of the total infections estimated (US Centers for Disease Control, 2012). This may be because up to 70% of Chlamydia genital infections are asymptomatic. If left untreated, serious complications may occur. *C. trachomatis* infection is linked to scarring in the fallopian tubes, leading to Pelvic Inflammatory Disease (PID), infertility, or ectopic pregnancy. In men, swelling of the gonads (epidydimitis), sterility, or a rectal infection called proctitis may occur (Chlamydia, 2012).

When the body is introduced to a foreign antigen, it has many tools at its disposal to combat the antigen. In the case of an intracellular bacteria like *Chlamydia trachomatis*, infected epithelial cells from the lining of the genital tract may secrete proteins that regulate many aspects of the innate and adaptive immune responses (Abbas et al, 2012). These proteins, called cytokines and chemokines, act as messengers between infected cells, immune cells, and other cells to activate immune reactions. Measuring the levels of these cytokines and chemokines in response to the C. trachomatis infection may shed light between recruitment of leukocytes and the over-activity of the immune cells leading to fallopian scarring.

There have been many studies linking stress as a risk factor for immunosuppression and increased severity of infection (Sheridan et. Al, 1994). Stimulation of the hypothalamic-pituitary-adrenal (HPA) axis and Sympathetic Adrenal Medullary (SAM) Axis happens in response to psychological and physical stressors (Cohen et al, 2007). These pathways release stress hormones that assist our bodies in coping with these adverse environments. However, repeated or chronic stimulation of these pathways have been shown to have adverse effects on the immune system, effectively down-regulating immune response (Belay et al 2002).

It is important to study the distribution of immune cells, cytokine/chemokine levels, and infection rate to attempt to find a possible correlation to fallopian scarring. Additionally, since stress is implicated as a risk factor for various infections and its effect on Chlamydia genital infection is not well-defined, further investigation should be considered. A study to examine the effect of stress on Chlamydia infection severity, cytokine/chemokine production, and immune cell activity has been conducted in our laboratory. The purpose of this research was to establish an understanding of immune cell population in the genital tract of stressed and non-stressed mice during *C. trachomatis* infection. The hypothesis was that stress may affect the differential distribution of immune cells in regions of the genital tract in the mouse model. By determining the localization of these immune cells in the genital tract during Chlamydia infection, we can further our knowledge in understanding this infection and the spread of disease in the animal model and human subjects

Materials and Methods

Animals

Female BALB/c mice, age six to seven-weeks old, were purchased from Harlem-Sprague Daley (Indianapolis, IN). Mice were allotted seven days in the Bluefield State College Basic Science Building B206 laboratory vivarium to acclimate before experimentation began. All animal protocols and biosafety guidelines were approved by the Institutional Animal Care and Use Committee (IACUC) of BSC.

Cold water stressing protocol

Cold water stress was induced by placing mice in a shallow container filled with 4 cm of cold water (1 ± 0.5^OC) for 5 minutes daily for 24 days in primary (1^O) or 10 days during secondary (2^O) infection. The mice were allowed to move freely within the container. Cold-water stressing protocol was not administered to the non-stressed control mouse group.

Chlamydia inoculation protocol

Chlamydia trachomatis mouse pneumonitis biovar (MoPn) was acquired from the ATCC. Stock *C. trachomatis* culture contained 1×10^9 inclusion forming units per millilitre. 2.5 mg/mouse of Depo Provera was diluted in 100 µL of phosphate-buffered saline (PBS) and

administered subcutaneously to mice seven to ten days prior to infection to ensure regulation and synchronization of the mice's menstrual cycles. Post-completion of stress intervals, mice were individually infected with a working solution of 10^7 IFU/mL of *C. trachomatis* in 30 μl of PBS while under ketamine/xylazine-induced anaesthesia.

Cell lines

McCoy mouse fibroblasts were obtained from American Type Culture Collection (ATCC, Manassas, VA) and cultured in 75cm² tissue culture flasks containing high glucose Dulbecco's Modified Eagles Medium (DMEM) supplemented with 10% fetal bovine serum, Penicillin-Streptomycin Solution, and Amphotericin-B to ensure efficient and pure growth. McCoy cell cultures were incubated at 37ºC with 5% CO_2 supply until monolayers reached 80-90% confluence.

Vaginal Swabbing and Isolation Protocol

Mice were vaginally swabbed in 3-day intervals, and swabs were stored at -80ºC in 15mL centrifuge tubes with 2mL of transport medium for *C. trachomatis* isolation at a later time. Once thawed, 1mL of cyclohexamide complete DMEM was added to the transport medium, and the tubes were vortexed. Ninty six-well tissue culture plates were seeded with McCoy cell monolayers, and 200mL of the swab solution was added. Plates were incubated at 32ºC at 5% CO_2 for 24 hours. After 24 hours, infected McCoy cell cultures were stained via direct fluorescent anti-*Chlamydia* antibody and viewed under a fluorescent microscope. Ten fields per well were counted, and the *Chlamydia* IFU/mL present in the vaginal swabs was calculated after finding the mean number of inclusion bodies per well.

Genital Tract Extraction

Mice were sacrificed and dissected for genital tract extraction. Genital tracts were partitioned into uterus, cervix, and oviduct sections. Genital sections from mice were placed in 500 μl of Roswell Park Memorial Institute (RPMI) medium (Sigma), then transferred to 50 x 9mm culture petri dishes. To break down the tissues, 50 μl of type I collagenase (Sigma) was added to each petri dish and the tissues were teased with forceps. Further tissue breakdown was facilitated by incubating the petri dishes at 37ºC with 5% CO_2 for 45 minutes. To separate

cells, tissues were forced through 70mm Nylon Cell Strainers and into 15mL centrifuge tubes with 7.0mL of RPMI. The tubes were centrifuged @ 500xG for five minutes, and the supernatant was discarded. The cell pellet was resuspended in 2mL of RPMI, and 10 µl was transferred into a 1.5mL microcentrifuge tube. 10 µl of tryptan blue stain was added to each tube, and transferred to a hemacytometer for cell counting. Cell counts were adequately for flow cytometry analysis (>1,000,000 cells)

Flow Cytometry Protocol

Fc Blocking: To prevent non-specific binding, 10 µg/ml of BD Fc Block antibody per 2 x 10^7 cells was added into the tubes and incubated at 4ºC for 20 minutes. 10^6 cells were transferred into test tubes and incubated again for 5 minutes at 4ºC.

Antibody Staining: The cells (10^6 per tube) were incubated in 100µl of a staining buffer with <1µg of fluorescent antibody with an Ig isotype-matched control for 30-45 minutes at 4ºC. 200µl of staining buffer was added after incubation, and the tubes were centrifuged at 500xG for 5 minutes to pellet the cells. The supernatant was discarded, and the cells were then washed with 1.2mL of staining buffer. The cell pellet was resuspended in 500 µl of staining buffer.

Antibody Stains: Anti-rat antibodies that were used: CD4, CD3e, CD8, CD11b, NK-1.1, MAdCAM-1, CD19, CD14, and CD11c (Fisher Scientific). Flow cytometry analysis was performed at Marshall University Flow Cytometry Core Lab.

Results

Enzyme Linked Immunosorbant Assays were used to mark levels of TNF-a, Interleukin-2, Interleukin-6, and Interferon-Y in homogenized tissue from the genital tract sections.

Figure 1: Relative levels of TNF-a in the oviduct during primary and secondary infections in stressed vs. non-stressed mice.

Figure 2: Relative levels of Interleukin-6 in the oviduct during primary and secondary infections in stressed vs. non-stressed mice.

Figure 3: Relative levels of Interleukin-2 in the oviduct during primary and secondary infections in stressed vs. non-stressed mice.

Figure 4: Relative levels of Interferon-Y in the oviduct during primary and secondary infections in stressed vs. non-stressed mice.

Figure: Relative levels of TNF-a in the uterus during primary and secondary infections in stressed vs. non-stressed mice.

Figure 6: Relative levels of Interferon-Y in the uterus during primary and secondary infections in stressed vs. non-stressed mice.

Figure 7: Relative levels of Interleukin-2 in the uterus during primary and secondary infections in stressed vs. non-stressed mice.

Figure 8: Relative levels of Interleukin-6 in the uterus during primary and secondary infections in stressed vs. non-stressed mice.

Inclusion-forming units were counted after fluorescent antibody staining of *Chlamydia*-infected

McCoy cells was performed. Ten fields per well were counted, and the *Chlamydia* IFU/mL present

in the vaginal swabs was calculated after finding the mean number of inclusion bodies

per well.

Figure 9: Relative levels of inclusion bodies present in McCoy cell cultures infected with homogenized uterus tissue and Chlamydia isolated from cervicovaginal swabs from stressed vs. non-stressed mice.

Figure 10: Relative levels of inclusion bodies present in McCoy cell cultures infected with homogenized oviduct tissue and Chlamydia isolated from cervicovaginal swabs from stressed vs. non-stressed mice.

Figure 11: Relative levels of inclusion bodies present in McCoy cell cultures infected with homogenized cervix tissue and Chlamydia isolated from cervicovaginal swabs from stressed vs. non-stressed mice.

Flow cytometry analysis was able to isolate specific antibody markers for specific immune cells.

Figure 12: Comparative percentage of CD3e, CD4, and CD8 cell surface markers in the extracted cell populations of the Oviduct in stressed vs. non-stressed mice

Figure 13: Comparative percentage of CD3e, CD4, and CD8 cell surface markers in the extracted cell populations of the uterus in stressed vs. non-stressed mice

Summary and conclusions

Stressed mice demonstrated a more intense *Chlamydia* infection than non-stressed mice. TNF-α production in the oviducts were down-regulated in stressed mice compared to non-stressed mice. Interleukin-2, Interferon-γ, and TNF-α production was up regulated in the stressed mice uterus compared to the non-stressed mice. Cells expressing the innate markers Gr-1 and CD11c were less detected in the genital tract suggesting less activity of innate immunity 8-10 day after infection. Stressed mice had fewer CD3e and CD4 immune cells in the oviduct in comparison to non-stressed mice. Stressed mice exhibited more CD3, CD4, and CD8 cell surface markers in the uterus in comparison to non-stressed mice suggesting that activation of adaptive immune response during 8-day stress period. Flow cytometry has shown to be an effective method of identifying localization of immune cells in the genital tract. Taken together, these data suggest that innate immune cells in the genital tract are less abundant than adaptive immune cells during 8-10 days after infection.

Acknowledgements

Factors Influencing Language Development in Sibling and Non-Sibling Children

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Researchers from a variety of different fields have been intrigued with the development of language: how we learn words, the semantics of language, syntax and word recognition have all been vital in understanding how language develops. Developmental psychologists focus on acquisition, production and comprehension, usually in infants and children. Psychologists do not only look at the physical production of language and the environment of which children learn language, but they also study the neurological and biological aspects of the brain and cognition of children who are able to learning language. Children acquire their entire native language within the first 2-3 years of life with seemingly little effort. This natural progression of learning language is both fascinating and somewhat difficult to study due to the incredible number of variables that can influence how children develop linguistically.

Theories of language acquisition vary as they do in any field, however one of the most influential theories of language development in psychology is the theory that children have an innate ability to access, process, and learn language from an early age, which was first developed by Noam Chomsky with the idea of universal grammar (Zwart, 1998). Although Chomsky's philosophy on language development is extensive and detailed, in simple terms, universal grammar consists of an unconscious awareness of whether or not a sentence is structured correctly. The process in which sentences are perceived as correct is universal, for all languages, and is independent of the meaning. Support for Chomsky's theory came from babies who were only a few days old but could distinguish between phonemes of different languages, which seemed to call for some sort of innate mechanism for processing the varying sounds of the human voice.

Innate language learning ability seems evident because it is irrespective of race or culture, in that all babies in a natural course of events will learn language. Fowler (1974) stated that language is a natural occurrence, due to the fact that it is species-universal as well as species-specific. Humans are the only species that can be taught to understand and use language, and all humans, except for those who are very developmentally delayed, learn language naturally. Fowler agreed with Chomsky's innate theory of language that children possess linguistic knowledge without any noticeable conscious effort and in a 'middle-ground' way supports empiricists' view of language; that language exposure is critical to language

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development. However, his view differs from empiricists' views in that it supposes that this exposure sets in motion an innate language acquisition device.

The empiricist theory of language acquisition differs vastly from Chomsky's innate theory. The most extreme empiricist view supports the idea that all children are born as a "blank slate" (a term coined by John Locke) and have to be taught all the rules and representations of language (Russell, 2004). A more current version of this view is that children are born with domain-general mechanisms for associative learning and develop language through exposure and experience. According to Katz (1964), the innate ability to detect phonemes from a very early age in infancy is evidence of basic perceptual mechanisms shared by both humans and other animals rather than evidence of innate language mechanisms.

These overarching theories provide the foundation for understanding language development. However, the field of language acquisition has continued to expand from the initial theories to asking other questions such as: how and why do children learn language in different ways and time courses, what factors influence language development, and how can children who are delayed in language development be helped. One of the primary questions that have been asked over the years focuses on *why* children learn language differently, with some children learning more quickly and some on a delay. Are children being exposed to certain stimuli that are enabling them to learn language faster, more efficiently or the exact opposite, are they being exposed to certain stimuli that may delay their language capabilities and development? Could the influence of older siblings and their interactions with parents lead to improved language development for children who have them?

Experience, in accordance with the empiricist view, is a necessity for children to acquire a language, and that experience must be through participation or observation of the language the child is being exposed to (O'Doherty, et.al., 2011). Hoff and Naigles (2002) explained that there have been two proposed answers to the question of what children find in conversations that are useful to word learning as well as the nature of the word learning mechanism. The first of these answers focuses on social-pragmatic aspects and social-cognitive abilities. According to this, children figure out the meaning of words by inferring the speaker's attentional focus and communicative intent as described by Akhtar and Tomasello (2000) through

routine and the joint attention during the conversation. The second answer focuses on the data-providing

aspects of conversation. These data-providing aspects include lexical content, syntactic structure, and other

accompanying nonlinguistic context, and are useful for children to discover word meaning and syntax.

In order to understand how children learn the meanings of words that are used in their

environment, researchers must investigate the various types of input that are going on around the child

and discover which ones have a positive effect on language acquisition. How often children are exposed to

language, the type of words, the length of words, child-directed speech, all have different outcomes on

their individual language development. Morgan (1996) stated that developing theories of the nature of

perceptual, representational and linguistic capabilities of children has been difficult due to researchers

reporting only what said the children say rather than what they are hearing in their environments.

However, Morgan also indicated that there is a clear relationship between the language in the environment

and the development of the language learner. Since children only learn language they are consistently

exposed to, sibling and caregiver speech is crucial to language acquisition.

Continuing to focusing on the frequency of linguistic input, Lieven (2009) looked at naturalistic

studies of children and found the higher the frequency of a word used in a child's environment, the earlier

the child will add the word to their vocabulary. Additionally, adults that were around a child used certain

verbs more often when having conversations with the child or talking to the child, which results in the

emergence of particular verbs earlier than others. Hearing these particular verbs was significantly

correlated with syntax diversity in the children's language. The impact only of frequency of input is

restricted to the earliest stages of development. There have been strong correlations between the

complexity of a teacher's speech, as well as parents' speech, and children's syntactical development

according to Huttenlocher (2002). As children age, complexity, in addition to frequency, seems necessary

for language development.

In one study, Lieven (2009) took English- and French- speaking individuals and presented them with

scenes described in non-canonical word orders and found they were significantly more likely to correct

canonical word order with high frequency verbs than verbs of a lower frequency. This shows that

grammatical judgments also are subject to a frequency effect which ties in with the view of language as interconnected representations that change over the course of development.

Even though frequency itself is considered an important influence on language development, there are additional factors that affect development as well. Leiven (2009) also discussed how learning is helped by one-to-one mapping between form and function and the interaction with frequency. For example, the use of the words *no* and *not,* both which occurred with frequency in the mother's speech, led the child to first produce *no* in multiword utterances because the child had already been using it as a single word utterance. This was suggested to be due to the mother's frequent and salient use of the word. Leiven continued that if a particular word is matched with a particular function and is consistently mapped with only one form, then the child will use that form earlier than if the function is used in multiple forms.

The second factor of frequency is known as neighborhood relations, where words relate to one another by a network of connections between shared phonological and semantic features as described by Leiven. She explained that productivity in word learning results from the relationship between a new item and an already existing network of words.

The third factor of frequency is multiple cues. A main question for learning syntax is which cues have frequency effects at which stage of development. Chan, Lieven, Tomasello (2009) compared Cantonese, German, and English children's use of animacy and word order cues to identify the subject and object in active transitive sentences containing novel verbs. They found that there were similarities and differences across cultures. Cross-linguistically, the youngest children were above chance in the appropriate animate noun. Older children later in development, showed preference for word order, and English speaking children showed earliest and greatest reliance on word order. The results indicate that word order productivity closely corresponds with how systematic the input is with providing consistent cues.

Another factor, apart from frequency, is the amount of imitation speech the child participates in. Imitation speech is where children begin to mimic conversations that are going on around them and begin the part of their development where they will potentially repeat anything and everything they hear going on. Although this can be frustrating for parents and older siblings, this has a highly positive impact on their language development. The imitation of speech allows feedback for phonological accuracy and verification,

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and in turn helps with information processing about the object or person allowing them to make multiple connections and learn more about the word itself and what it means (Montgomery, 1977).

Reading to children during early language development is another factor that has been found to increase vocabulary and overall language development. Silverman, Crandell, and Carlis (2013) found that reading aloud at preschool programs had positive effects on a child's ability to gain word learning and to reach a target vocabulary. Silverman and colleagues also included the use of extension activities to incorporate from the book after reading time was held and that with the combination of reading time, and those additional activities showed even stronger effects on target word learning and increased general vocabulary knowledge above and beyond reading-aloud alone.

Reading, compared to toy playing and TV viewing, in mother-child dyads was found to not only increase verbal responsiveness from toddlers, but also effectively encourage mother-child communication exchanges and literacy. While TV viewing was recorded as being detrimental in regards for interactive communication exchanges and verbal responsiveness for toddlers and preschoolers (Nathanson & Rasmussen, 2011). This suggests that reading is a vital component not only to child vocabulary development, but also their verbal responsiveness and with developing their communication exchanges. Hammer, Farkas, and Maczuga (2011) also found that children in preschool programs, such as Head Start, who had increased frequencies of at home literacy activities had greater vocabulary abilities, letter-word identification, and reading abilities in kindergarten, displaying that reading is a crucial factor in language development and in development of communication skills.

Hoff-Ginsberg (1998) researched the variation of mother's child-directed speech and their children's rate of language development as a function of child birth order and family socioeconomic status (SES). The later-born children from the higher SES families displayed advanced lexical and grammatical development. Along with conversational skill which was found to be a measurement of language, Oshima-Takane, Goodz, Derevensky (2008) found that second-born children had more advanced language production than first-born children, especially when measuring spontaneous speech. Hoff-Ginsberg's study focused on the mother's child-directed speech while Oshima-Takane, et. al. focused on caregivers and older sibling interaction in the form of overheard conversations rather than child-directed speech.

Pine (1995) used a longitudinal maternal diary methodology and found that once children reached the 100 word milestone in vocabulary development there was no longer a significant difference between first-born and later-born children. What was found was that second-born children had significantly higher pronouns in their first 50 and 100 words compared to the first-born children. Oshima-Takane, et. al. further supported this finding with their study, finding that second-born children had higher pronoun production at the first test and again at the follow-up test 3-months later. Pine, along with Oshima-Takane, et. al. concluded that the ability for later-born children to have higher percentages of pronoun use is due to the continued occurrence of observational learning from adult-adult, child-adult, and child-child interactions.

When trying to isolate a specific factor for advantageous language development, it is extremely difficult due to all of the potentials factors that make up a child's development. However, McAlister and Peterson (2007) found that children who have two or more child age siblings have higher verbal intelligence scores. This suggests that those younger siblings have not only larger vocabularies, but also have a greater understanding of the word and could potentially use the words more effectively. Although younger sibling children have more extensive vocabularies and acquire features of language behavior, they show difficulties in mastering the linguistic form of language. Therefore, it appears that younger siblings are more advanced at earlier age, but their competency in forming sentences is not as advanced as their vocabularies (Montgomery, 1977). This suggests that although younger sibling children have larger vocabularies, first/only born children display greater complexity in their sentences.

The older sibling(s) may have an effect on the linguistic development of the younger siblings. Comparing boys to girls and their spoken conversation ability was one of the major objectives of Davis (1937). He found that boys had more spontaneity of speech compared to girls, which could possibly be explained by the differing socialization of the sexes. This was contrasted by Morriset, Barnard, & Booth's (1995) more recent study, which showed evidence that girls were more likely to engage in spontaneous language production rather than boys.

Davis reported that the older boys get, the more likely their spontaneity is to decrease. However, both of the previously stated studies were conducted when the children were at the same age in months. This socialization of gender roles and language production seems to be directly related to the socialization

of gender roles and emotional expression. Brody, Ablon, Brown, Khantzian, and Mack (1993) stated in their study that these gender roles arise from various sources and that this socialization has contributed heavily to the differences affecting development and that boys are instructed to act very differently from girls in a general sense. However, according to Tardif, Fletcher, Kaciroti, Liang, Marchman, and Zhang (2008) gender did not have any effect on the word types that English-speaking children, learned at the first 10 word milestone.

Although, further supporting Oshima-Takane, et. al., Hoff-Ginsberg, and Tardif, et. al. found that English-speaking children were likely to produce more pronoun words in comparison to Chinese-speaking children who interestingly, favored verbs over nouns and pronouns. Tardif, et. al. looked at variations of Chinese-speaking children using Mandarin and Cantonese, Hong Kong and Beijing children, respectively, and found that the reported terms from each child showed more different terms and more different types of people terms. The researchers attributed these differences to the different household size, with the Beijing children being 99% only children compared to 49% only children in Hong Kong.

Tardif, et. al. measured language that recorded the length of each child's utterances. Previously, Davis also measured the length of a child's utterance and found that children belonging to an upper socioeconomic class used longer utterances or sentences compared to those at a lower socioeconomic class. Combining this information with Hoff-Ginsberg's research on socioeconomic status and language development, it is apparent that children who are in higher SES groups have higher lexical skills as well longer, more intelligible utterances/sentences. Both groups of researchers suspect this is due to children from high SES groups associating more frequently with adults who use longer sentences.

Tough (1977), using a longitudinal study to study the effects of nursery education children from families with fewer than six children and whose parents had a higher degree of education appeared to have a more thoroughly developed language at the age of 3 years old and again between 5 - 7 ½ years old compared to children from larger families with more than six children. Tough studied 64 children, half who were enrolled in a nursery school program, and half who were not. Of these 64 children, half of the parents had received some higher education while the other half did not receive education more than a high school diploma or the equivalent. The children were 3-3.5 year old English-speakers and were recorded during

child-child play with a companion of their choice for one hour or until they wished to leave the play area. At the next interaction between 5 years and 7 ½ years, Tough used an interview setting with a range of materials and toys. During these recorded interviews as compared to the recorded conversations the researcher found that by age 5 years old the children started developing themes in conversation, primarily personal experiences. Tough found that children whose parents had higher education, smaller families (less than 6 children), and were exposed to a nursery program had an advantage in language development compared to children families with none of these characteristics.

Davis recorded that twins, at the age of 5 years old, had slightly shorter utterances than 3 year old singletons (children without siblings) and also looked at a set of triplets who were greatly delayed at preschool age compared to singletons. Also, using scales to rate behavior and analyzing the behavior results with the language results found that shy, negativistic children used short sentences while distractible children used long sentences. Boys from 5.5 to 9.5 years old had significantly shorter sentence length than girls at the same age while twins, from lower SES had a shorter sentence length while those from higher SES equaled or exceeded that of singletons. This suggested that unless the environment was high quality, twins could potentially be severely delayed in their development.

Based on these studies, it seems that clear that second-born or later-born children seem to have some type of an advantage in learning language, at least in regards to vocabulary development. It is suggested that this is because of the use of a greater proportion of child-directed speech in overheard conversations between caregivers and older siblings. Being a later-born child seems to results in significantly advanced conversational skills which would likely be directed to more overheard conversations or observational learning between adults in their environment. It also seems that socioeconomic status plays a crucial role in language development. Being from a higher socioeconomic status family provides children with an advantage in building their language skills, regardless of birth order. Even though later-born children appear to be at an advantage for vocabulary, first-born and only children may have an advanced level of grammar and syntactical language skills compared to later-born children.

Due to the fact that there are so many factors in language development, from income to amount of interaction for only and first born children, and even more factors are created when variables such as the

age and gender of older siblings are considered, it can be difficult to untangle the effects of any one factor on language development. The goal of the current study was to try to isolate potential home factors that could influence language development and compare language development between sibling and non-sibling children.

For the purposes of this study we wanted to examine home environment factors such as social interactions between children and adults, annual household income, parental education, reading session duration and frequency, and if the child had older siblings. In order to measure the child's language development we wanted to investigate vocabulary acquisition and sentence length and complexity. In order to measure the child's language development, we used the MacArthur-Bates Communicative Developmental Inventory (CDI): Words and Sentences form (Fenson, et al., 1993), optimal for children 16-30 months old and developed our own home environment questionnaire that asked questions about the child including: date of birth, age, sex, if they had siblings, the age and sex of those siblings, hours per day interacting with older children, same age/younger children, and caregivers, if they were read to, the frequency and duration of reading sessions and type of reading material used. There were also questions about the home and family including: the approximate number of books in the home, highest level of education for the mother and father, and the family's approximate annual income.

With the information about the child's language development and knowledge of home factors, we wanted to try to determine if any of these factors could be possible direct influences of language development. We wanted to investigate if any of the factors were shown to be influential, how these factors varied between children who were first/only born or if they were a younger sibling and were any of the factors displaying any advantageous language development for one group and not the other. We wanted to focus primarily on the differences between sibling development and if reading improved development for first/only born and younger siblings.

We hypothesized that children with older siblings would have larger vocabularies than children with no older siblings, the more parents read to children, the greater their vocabulary acquisition, and that higher family income would also lead to increased vocabulary.

Method

Participants

For this study we used 13 parents of children between the ages of 16-31 months old, with a mean age of 21.85 months old. There were 7 female children and 6 male children participants, and there were 6 children with older siblings and 7 children who were first/only born children. The parent(s)/caregiver(s) of the child were the ones who filled out the surveys about their child's language use and provided information for the home environment questionnaire. The parent(s)/caregiver(s) of the child were all at least 18 years of age in order to give full consent.

Materials

The materials used consisted of the MacArthur-Bates Communicative Developmental Inventory: Words and Sentences form (Fenson, et al., 1993) which is optimal to be used with toddlers 16-30 months old. The CDI consists of 22 check box sections of vocabulary for a total of 680 words the child is currently able to say, word forms section of irregular plural nouns and past tense verbs (i.e. children, took), word endings section which is when children begin to place the wrong endings on words (i.e. mouses, falled), which is often a sign of progress at this age, a complexity comparison section where there are two sentences, one with little complexity and one with greater complexity and the parent chooses which sentence their child is more likely to say (i.e. Want more juice. compared to Want more juice in there), and lastly a section for the parent to give up to three examples of the longest sentences their child is currently saying (i.e. That my bear).

We also used a home environment questionnaire that we developed in order to obtain information about the home and family life of the child who was in question. Questions about the child included their date of birth, age in months, sex, if they had siblings, the age and sex of those siblings, hours per day interacting with older, same age, younger children, and adults, if they were read to, the duration and frequency of the age reading time, and the type of reading material. Questions about the home and family included the approximate number of books in the home, the highest education of the mother and father, and the annual income for the household.

Procedure

We began recruiting participants through daycare facilities in southern West Virginia, and students at Concord University's main and extension campuses. There was no incentive given to the parents to complete the surveys and the CDI: Words and Sentences and the home environment questionnaire were given to parents as one survey to take home to complete and return them to the daycare or to the researcher. If the parent received a survey from the daycare facility their child attended the survey was handed out in envelopes and returned in an envelope so that the daycare faculty would not have access to their information. If the parent received that survey directly from the researcher the parents returned the survey to the researcher only. Also, there was an included full disclosure and informed consent about the study and how the results would be presented if they chose to participate. The parents were instructed to sign the informed consent page to acknowledge the purpose and intent of the research study. The data for the children were placed into the Sibling group if they had older siblings or the Non-Sibling group if they were the first born or only child in the family. A child would still be placed in the Non-Sibling group if they had any younger siblings or if they were the only child living at home even if they were younger.

Results

Our sample had a range of demographic characteristics. We had 13 children; (7 females & 6 males) between ages 16-31 months old (M =21.85). There were 6 children in the Sibling group and 7 children in the Non-Sibling group. The children in the Non-Sibling group had a mean age of 19.57 months and the children in the Sibling group had a mean age of 24.50, although this was not significantly different. The parents' education reported ranged for mothers of the children from high school diploma/GED to graduate or professional degrees, with the average being some college courses completed. For the fathers' education it ranged from high school diploma/ GED to college degree, with the mean being some college course completed. The household incomes varied from less than $15,000, for one family, to over $75,000, for two families. The mean income for the families was $30,000 to $45,000. Also, all three families in the low/poverty income and in the income greater than $75,000 were all sibling child families. However, more families with children had increased incomes overall at $45,000 to $60,000 than non-sibling children families who are primarily in the $30,000 to $45,000 income range.

The CDI data was scored and compared to percentiles for ages from a large dataset (Fenson, et al., 1993). For the raw data, age of the children was highly correlated with increased vocabulary development(r = .879, p < .001), greater sentence complexity (r = .723, p = .028), and longer sentence length (r = .818, p = .004), as was expected from the previous research using the CDI. Therefore, the older the child was, the larger the vocabulary, and the more complex and lengthy are their sentences, which is why children must be compared to age-matched peers for comparison across groups.

We hypothesized that family income would be related to language development, and we found that the duration of reading sessions and household income were highly correlated (r = 0.796, p = .001), thus the longer reading duration the higher the household income. Therefore, we would expect that both reading duration and income would predict language development. We suggest that children from low income families, although with some exception, have smaller vocabularies potentially due to the language input in the home. These lower income families are less able to have as much interaction in the household and many cannot afford daycare services, therefore their child is exposed to less language input in the home overall than higher income families. Since we found that reading session duration and income were highly correlated, perhaps higher income families are able to provide more language learning materials and are able to set more time aside to interact in the reading sessions. Therefore, having children exposed to more reading material and having increased language input in the home may result in increased vocabulary. We also found that families with siblings had higher incomes overall with the mean being $45,000 - $60,000 compared to non-sibling families with the mean income being $30,000 to $45,000. This was not statistically significant but could be evidence of a potential trend.

Environmental Factors

In order for children to learn language they must be exposed to it. Therefore, we investigated hours spent per day with older children, same age and younger, and caregivers. For hours spent with older children we found that the 7 children in the Non-Sibling group spent a minimum of 0 hours to a maximum of 5 hours per day with older children (M = 0.86), and the 6 children in the Sibling group spent a minimum of 8 hours to a maximum of 21 hours per day with older children (M = 11.33), showing that having older siblings results in more contact time with older children. Overall there was a minimum of 0 hours to a

maximum of 21 hours per day interacting with older children (*M* = 5.69). For time spent with the same age and younger children, Non-Sibling children spent a minimum of 0 hours to a maximum of 15 hours per day with same age and younger children (*M* = 2.143), and Sibling children spent a minimum of 0 hours to a maximum of 12 hours per day with same age and younger children (*M* = 6.750). Overall, there was a minimum of 0 hours to a maximum of 15 hours per day interacting with same age and younger children (*M* = 4.269).

Next, we looked at the hours spent per day interacting with a caregiver. Non-Sibling children were recorded having a minimum of 9 hours to a maximum of 16 hours per day with a caregiver (*M* = 12.57), and Sibling children were recorded spending a minimum of 6 hours to a maximum of 20 hours per day interacting with a caregiver (*M* = 10.83). Overall there was a minimum of 6 hours to a maximum of 20 hours per day spent with a caregiver (*M* = 11.77).

We also wanted to examine the importance of reading to children and the impact it can have on language development. All of the participants were recorded as being read to from less than once a week to multiple times per day, with reading durations ranging from less than 10 minutes to 20-30 minutes per reading session. The reading materials parents reported reading to children included mainly story books and picture books. Since all of the children were recorded as being read to we wanted to further investigate the quantity of reading. We found that Non-Sibling children reading frequencies ranged from less than once a week to multiple times a day, with a mean of a few times per week. For Sibling children their reading frequencies ranged from about once a week to multiple times per day, with a mean of a few times per week. The second factor for reading quantity was reading duration of the reading sessions. Non-Sibling children had reading duration ranging from less than 10 minutes to 15-20 minutes per reading session, with a mean of less than 10 minutes. Sibling children had reading durations from less than 10 minutes to 20-30 minutes per reading session, with a mean of 15-20 minutes. When analyzing reading duration data we found that families with Non-Sibling children were read to for shorter durations per reading session (*M* = 1.43, *SD* = 0.535) and also had families with slightly lower incomes (*M* = 3.57, *SD* = 1.134). However, this was not found to be statistically significant.

As for the number of books in the home, recorded answers ranged from 10-20 to more than 60 books. Income for homes with sibling children ranged from less than 15,000 to greater than 75,000, however, only one family was in the less than 15,000, or poverty, category and one family above 75,000. We also analyzed data of reading duration and Sibling children and found that households with siblings read to their children for longer durations (M = 2.17, SD = 0.983), and these families also had slightly higher incomes (M = 4.00, SD = 1.789), although, these were not found to be significant differences. There was a range in the number of books in the home from 10-60 books. Household income was limited in range in that no families were under $30,000, and only one family was in the category of $75,000 or more.

Siblings and Vocabulary Acquisition

We hypothesized that sibling children would have significantly larger vocabularies than non-sibling children in regards to their age group. When comparing Siblings, (M =74.00, SD = 25.132) and Non-Siblings (M=56.43, SD=27.324) as the primary factor influencing vocabulary acquisition, we used an independent samples t-test and the difference approached significance, $t(11)$ = -1.199, p=0.064. Household income and reading durations were highly correlated with one another (r = 0.796, p =.001). Income and vocabulary were also highly correlated (r = 0.752, p = .003) suggesting higher household incomes led to larger vocabularies for all participants and the longer the reading duration of each reading sessions also was strongly correlated with larger vocabularies for all participants (r = 0.887, p < .001).

Siblings and Sentence Length and Complexity

We hypothesized that sibling children would have a greater vocabulary than non-sibling children, however we did not form hypotheses regarding their sentence length and complexity. For our analysis of sentence length, we only used the participants who were advanced enough in their language development that they were speaking in sentences (N = 10), which eliminated 3 of the participants. When analyzing Siblings, (M = 47.583, SD = 18.2110) and Non-Siblings (M = 72.125, SD = 18.0202) as the primary factor for influencing sentence length we used an independent samples t-test and found that there was a significant difference, $t(8)$=2.096, p = 0.0345. Thus, with this sample of children, Non-Sibling children had significantly longer sentence length than Sibling children.

As with sentence length, for sentence complexity we only analyzed the data gathered from children who were speaking in sentences. The complexity of the section of the CDI: Words and Sentences recorded the use of more complex sentences over the use of simple sentences (*N* = 7), which eliminated 4 of the participants who were not yet sentence-ready. We compared Siblings (*M* = 44.17, *SD* = 16.964) and Non-Siblings (*M* = 75.33, *SD* = 20.502) in an independent samples t-test and found that there was a significant difference, $t(7)=2.443$, *p*=0.0225, with Non-Siblings having more sentence complexity than Siblings.

Discussion

Our research and data analysis does not fully support our hypothesis that children with older siblings would have larger vocabularies, due to the fact that the difference was only marginally significant. However, with a larger sample size, there should be clear evidence that children with older siblings would have larger vocabularies. This is likely due to children with older siblings having more interaction with peers and being able to participate and observe more reciprocal interactions; thus, being exposed to more language due to the increased overall language input in the home (Davis, 1938; Pine, 1995; Hoff-Ginsberg, 1998; Hoff & Naigles, 2002; O'Doherty, et al., 2011).

Interestingly, we found that Non-Sibling children had significantly greater complexity and length in their sentences, supporting Montgomery's (1977) hypothesis on language feature acquisition in comparison to language competency, that children with siblings display features of such as vocabulary, but have difficulties with sentence structure. We suggest that the significantly greater complexity and length is due to only and oldest children being exposed to more adult-to-adult interactions which would use longer and more complex sentences than interactions with younger children and toddlers.

Our other hypothesis, that increased reading frequency would lead to increased vocabulary was marginally supported, with the most beneficial for the age group 16-31 months being at least once a day reading sessions, due to once a day sessions not showing a significant difference to multiple times per day. However, duration appeared to play a much more vital role in reading time than expected and we found that 20-30 minute reading sessions were optimal for the age group 16-31 months old and that the reading duration was highly correlated with and significantly effected vocabulary acquisition for all participants.

Our data also supported our hypothesis that high SES (annual income) would lead to increased vocabularies. More specifically, we found that families with incomes greater than $45,000 had an enormous jump in vocabulary acquisition compared to families with incomes less than $45,000, which also proved to be a significant difference. We suggest that lower income families may have children with smaller vocabularies due to decreased language input in the home. If the parents work long hours and/or have mentally or physically taxing jobs, language input may be less than in families with higher incomes. If language input is low then the children are not being exposed to enough language in order to learn and acquire vocabularies. However, the relationship between income and vocabulary acquisition can be mediated by excellent language experience outside the home through high quality childcare. Our study, while showing a relationship between income and vocabulary, also showed children in low income households who had above average vocabularies as well as families from high income households had children with average or below average vocabularies in relation to their age groups.

The number of books in the home also correlated with vocabulary acquisition, in that children of families with more than 60 books in the home had much larger vocabularies compared to families with less than 60 books. Also, lower income families, on average had a lower number of books in the home. This could suggest that low income families not only have less language input for overheard speech, but could also be reading to their children less. We did not find any direct results when comparing social interaction and vocabulary acquisition other than children with older siblings had more hours per day interacting with older children, on average however, both groups spent roughly equal amounts of time with a primary caregiver.

There are several limitations to this study, including that we had a relatively small sample size, which impacts external validity. With only 13 participants, all from southern West Virginia, it is a specific population and the results would likely not be generalizable to more broad populations. The sample size also was also lower when examining only those children who were speaking in sentences, decreasing the number of datapoints to 10 children. Also, we recruited primarily through daycare facilities, limiting the sample to families who were able to afford childcare. There were very few families at the low or high ends of income spectrum, making under $15,000 or over $75,000. Although we attempted to isolate home

factors influencing language development and found positive relationship, language development includes

many different factors which make finding causal relations problematic. A self-report inventory can only

examine a few of these factors, and also allows for parents to under or over report their child's

development, leaving room for considerable error.

Future directions for this study could be to pair the CDI: Words and Sentences and the home

environment questionnaire with in-home observations. These in-home observations would allow the

researcher to be able to record and transcribe the child's word use with more accuracy, observe reading

and play behaviors, and observe social interactions between family members. With in-home observations

the researcher could also investigate the members of the family and their word use and sentence structure

to uncover the types of words and sentences that are used most frequently in the household and see if

those translate to the child's language development. There could be more emphasis on the reciprocal

interactions between siblings, the conversations, type of play, and how reciprocal their interactions really

are. More focus could also be placed on reading and if the children are read to individually, in groups or

pairs, follow along and other behaviors such as asking questions about the story and being engaged.

Therefore, if the CDI was used concurrently with in-home observation to observe direct interactions with

peers and caregivers, we would be able to formulate more accurate data, further support existing

hypotheses of siblings, reading frequency, and SES and vocabulary development. It would also potentially

isolate contributing home factors that have causal effects on language development, such as reciprocal

interactions between children and peers and children and caregivers and also gain more insight on reading

behaviors and effects of those behaviors.

There would also need to be a focus on having a broader range of income levels for siblings and

non-siblings so there would be greater variability which would allow the researchers to isolate the effect of

sibling vs. non-sibling development if income was not so heavily influencing vocabulary acquisition. Future

research would also want to look at reading durations at the various levels of income and try to obtain

greater variability because duration and income were so highly correlated with this study and both had

influence on vocabulary acquisition which overshadowed the potential sibling effect we were looking for. In

order to obtain varying levels of income, researchers would have to expand from daycare facilities where

families can afford childcare to handing out surveys at free medical clinics, doctor's offices, discount stores, or internet and community connections for low income families in need of various services to have a robust sample of participants from low income households. In addition to finding more low income families, there is also the need for expansion for high income households. With the study having only 2 participants from high income homes, generalizing those results would not be possible. In order to find more high income homes researchers could branch out to private preschools and learning centers, country club facilities and parks to gather more participants in higher income families.

If further research could combine the use of in-home observations and CDI: Words and Sentences, have much broader income ranges, and reading frequencies and durations at each income range and increase the sample size substantially there would be more accurate and generalizable results as well as beginning to isolate home factors that are having direct influences on vocabulary acquisition, sentence length, and sentence complexity in young children and toddlers. With this information, we could identify potential problems sooner and also know how to correct them, or develop methods to enhance language development for any child.

The purpose of our study was to try to isolate potential home factors that influence language acquisition between sibling and non-sibling children. In order to do this we used the MacArthur-Bates CDI: Words and Sentences (Fenton, et al., 1993) and a home environment questionnaire for parent(s)/caregiver(s) of children in toddler age (16-30 months) to record words their child is currently saying and record their longest sentences and their level of complexity. Data was gathered for 13 children (7 females and 6 males), 7 with older sibling and 6 with no older sibling, between the ages of 16-31 months old. Using the MacArthur-Bates vocabulary checklist, complexity comparison, examples of sentence length and our home environment questionnaire we were able to find positive correlations for income level and reading durations, suggesting that families with higher incomes are able to read to their children for longer periods of time. In relation to the correlation between income and reading duration, both also had positive correlations with vocabulary. Children from higher income families had larger vocabularies regardless of if they had older siblings or not and children who were read to for longer durations regardless of having older siblings had larger vocabularies. There were also positive correlations for number of books in the home and

higher income households, suggesting that families with higher incomes are able to buy more books and

provide reading materials for their children. Therefore, our hypothesis that income would lead to larger

vocabularies was supported.

Our hypothesis that sibling children would have larger vocabularies was not supported by our data,

but we still believe that with a larger sample size, sibling children would have significantly larger

vocabularies. However, we did find that Non-Sibling children had significantly longer and more complex

sentences than Sibling children. We suggest that this is due to Non-Sibling children having more adult

interactions and witnessing adult-to-adult conversations using longer and more complex sentences than

child aged siblings would use. We were not able to find causal relationships with our study, but did find

positive correlations with different home factors that could lead to the development of causal relationships

with future research.

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Exploring Female Identity Through Visual Art

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Exploring Identity Through Visual Art

Humans are complex beings made up of multiple layers and dimensions that form our personal identities. We are born into some of our identities as society dictates. Some are formed from our life experiences, while other identities we may choose for ourselves based on preference and interests. Identifying parts of ourselves helps us to find commonalities with other people as well as build community around these connections. Most, if not all of us, want to know who we are and where we belong. We find acceptance with other people who can relate to our experiences.

We are born into this world with bodies that have specific parts associated with a particular gender that suggest much about who we are, what we do, what society expects of us and how others treat us.   I began considering my own identity as a woman after discovering that I was pregnant in March of 2010. I had always been interested in self-discovery and expression, but giving birth to my son seven months later made me question everything about who I thought I was. I had always identified as female but all of a sudden I had this new aspect to my identity as a mother. Specific things were expected of me based on my new title. As an artist, I felt compelled to explore my identity visually.

I wanted to develop a process of creating art works on paper that could visually explore the sex and gender that I identify with by combining it with other materials that are typically associated with women and traditional femininity.

Preliminary Research

I researched several well-known female artists to become familiar with different artistic approaches to visually representing identity. Among these artists and most inspirational to my work was Kiki Smith. Smith is an influential female contemporary artist who uses sculpture, printmaking, photography and other mediums to address several subjects including identity. I found inspiration in why she uses and references the body and its functions to explore identity. She does this because it is through our bodies that we exist, and how are here, how we experience our world. After studying Smith's work, I was intrigued with how she approaches her work by taking apart and putting back together the parts of the body. Her work addresses the body as a whole but also isolates parts of the body for focus and further contemplation. I was especially drawn to her piece titled *"Moons".* This piece is a large collage of various breast prints. I liked this direct

approach of using the body to create visual art and came to the conclusion that if my physical body is how I experience life and the world, then it made sense for me to use my physical body to explore my own personal female identity.

I also became familiar with the work of Yves Klein, a French Artist who painted women's bodies with an ultramarine blue paint and used them as human paint brushes on canvases. I found these images interesting and direct as well as having the power to address

Smith's *"Moons"* and Klein's work made me think about fingerprints and how they are unique marks made by individuals that undeniably and scientifically identify who they are are. When a person touches an object or surface, they leave a mark behind. This mark says "I was here, I touched this." I became interested in the connotations this could suggest and wondered if printing other parts of my body could be an interesting way to visually explore female identity and roles. If fingerprints are used to reveal someone's identity, then why couldn't I take this a step further and attempt to explore and reveal aspects of my identity by printing my body or parts of it.

I began applying paint to my body, laying out large sheets of paper and laying down on top of the paper. The image left on the paper was interesting and easily read as female. I tried replicating the same image over and over by adding more paint to my body but no two prints looked the same. Again, I was reminded of fingerprinting. I felt that I could apply paint to my body and print it onto paper a million times and probably never get the exact same image twice. I enjoyed the uniqueness of the prints I was achieving with this simple process but discovered several issues with my materials that needed to be addressed before I went any further.

I created several prints using an inexpensive acrylic paint but I was concerned about the toxicity of traditional oil and acrylic paints since I was applying them to large areas of my body and trying to make dozens of prints. I switched to non-toxic finger paints but the color choice was limited and the paints were not heavily pigmented enough to show up as clearly as I wanted them to and most of these prints failed for my purposes. I experimented with a non-toxic pre-mixed tempera paint as well that came in dark colors like black and brown, but it had a foul odor and I had an allergic reaction to it. I also tried non-toxic face and

body paint which had a nice and heavy pigment to it, however the paint quickly dried on my body after application but would not completely dry on the paper I was printing onto.

Getting in Touch with My Femininity: Monoprint with body paint on paper

Getting in Touch with My Femininity is a monoprint that I created with body paint mixed with water. I was interested in using red because I liked the way this color could suggest blood and perhaps explore and address the menstrual cycle as a "feminine" process as well as acknowledge the genitals and breasts as the identifying parts of our body that make up our sex and associated gender.

Female Torso Woodblock

Although I was pleased with the way the monoprints looked, I felt that there were too many

variables in creating them that would affect how they were interpreted by the viewer. In addition, since I

wanted to experiment with adding other materials to these prints, I needed a quick way to be able to

reproduce an image that would give me more control over the final piece. I decided to create a woodblock

from one of the torso monoprints that I had already made using acrylic paint.

Female Torso: Monoprint with acrylic on paper

I laid tracing paper on top of this monoprint and traced around the edges of the print that showed through the paper. This created a sort of visual topography of my torso and allowed me to lightly clean up some of the edges to ensure that the viewer would see a torso that was undeniably female.

Female Torso: tracing of image outline
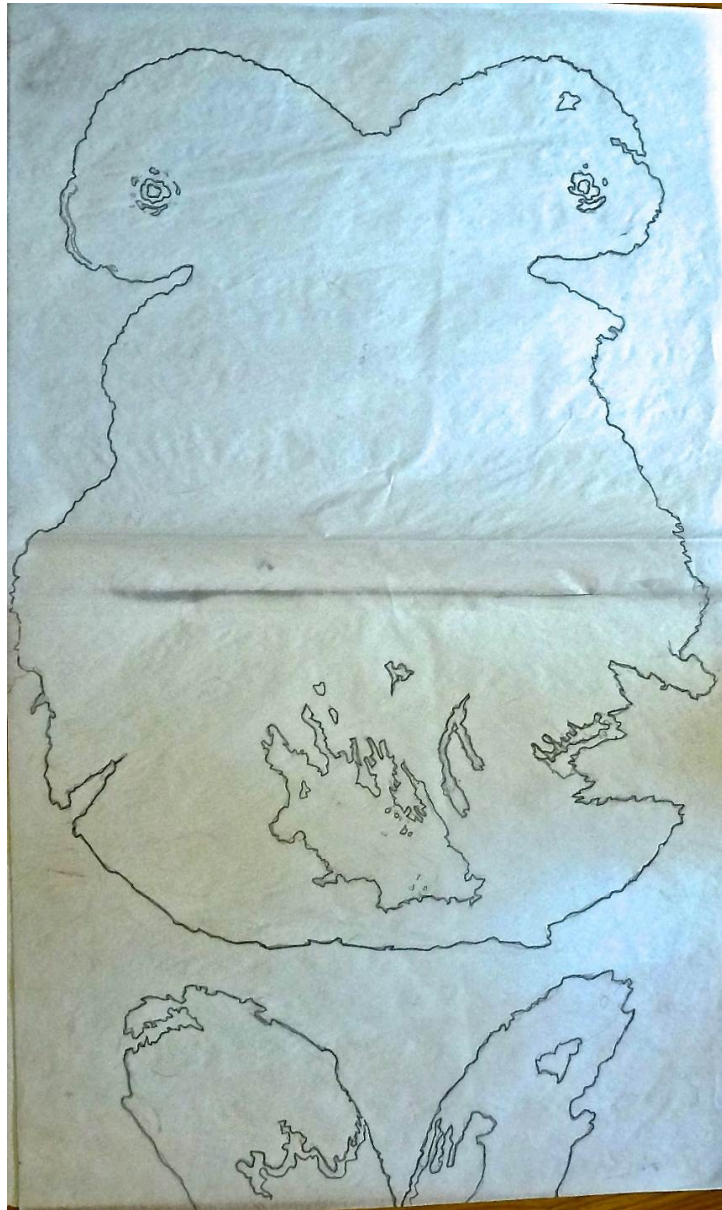
I transferred this image onto a large woodblock and carved away the negative space leaving a positive image of the torso that ink could be rolled onto it and printed onto any material of my choosing as is traditionally done with woodblock prints.

Female Torso: final carved woodblock

I made quite a few test prints, trying out different colors of ink on different papers and clear

acetate and fabric.

I was not as excited about the image printed in color, but enjoyed the boldness of the image printed in black on white paper. The contrast here reminded me of a silhouette. I also loved how the grain of the wood translated onto the paper in conjunction with the body shape. I was interested in using the acetate to build up different colored layers of the torso together, I did not like the glare that light created on the surface of the acetate and it was difficult to work with because of smudging, crinkling, and tearing. The ink I was using also easily scraped off of the acetate. I decided that paper or fabric was my most reliable material to print my images on and they gave me a good sturdy base that I could add other materials to.

I created two successful pieces with the female torso woodblock. The first piece is called *Lush*. It is printed in black on white paper and morning glory and hibiscus flower petals are attached to the surface. I laid the fresh petals on the paper and brushed them with 91% isopropyl alcohol in hopes that some of the flower pigmentation would get drawn into the paper creating a watercolor effect. I applied the petals in a manner that would draw attention to and add visual interest to the genital and breast area. After the petals dried, I sealed them to the paper with a collage medium. Emphasizing these areas with flowers explores female fertility and depicts a body that is capable of creating and sustaining life. However they also emphasize the ephemeral nature of beauty, youth and life itself.

Lush: woodblock on paper with flower petals

The second piece that I created from the female torso woodblock is called *Blush.* I printed

the female torso onto white paper and attached dozens of fresh orange poppy petals to the print with

collage medium. I cut around the print and attached it to a larger sheet of brown paper that I had sewn

together from many pieces and smaller squares of brown paper. I tore apart paper sewing patterns and

collaged them onto the piece and added pink india ink to emphasize the genital area as well as the nipples.

I used pink because of its modern association with females and femininity as well as wanting to call

attention to these erogenous zones. Blushing, reddening, or pinking of human skin is a physical response to

increased blood flow in the skin from a rush of adrenaline such as in the case of being embarrassed or after

sexual activity.

Blush

Side View Woodblock

I wanted to create a piece that would address my identity as a mother so I made a monoprint of

the side view of my body and transferred this to woodblock. I also made a side view print of my one and a

half year old son. I printed the life size print of myself onto canvas in black ink. I printed the woodblock of

my son onto thin, delicate tracing paper with brown ink and then attached his print to mine with a

combination of hand sewing and machine stitching. The area where our bellies connect is hand sewn with

golden thread. He is also attached at the breast with hand sewing. These areas emphasize the lasting bond

that exists between a mother and a child after the physical separation of birth.

Mother and Child: woodblock prints on canvas and paper, thread

Smaller Scale Prints

After working on the large scale body prints, I wanted to try printing parts of my body on a

smaller scale. Still inspired by Kiki Smith's *Moons*, I printed hundreds of breast prints on tracing paper in

black india ink as well as a rainbow of colors. I took the black breast monoprints and attached them to a

pair of old windows I found with collage medium allowing areas of light and dark to develop from

overlapping the images. The translucency of the tracing paper allowed light to come through the images

but created a sort of film, or fogginess to the glass. The piece is titled *Windows* but I like thinking of these

windows as "dirty windows", suggesting that the breasts are sometimes viewed as something "dirty" when

a woman is questioned over breastfeeding in public. This piece also calls references the repetitive domestic

work that is often expected and overlooked from a woman who identities as a homemaker or stay-at-home

mother.
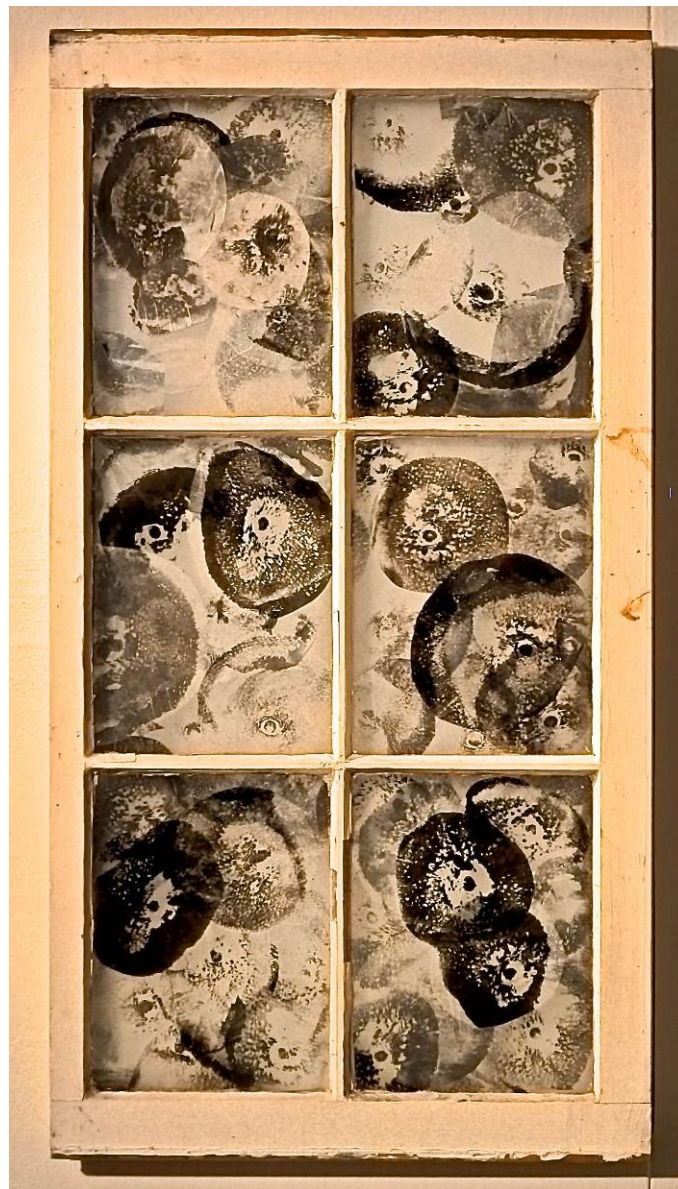
Window 1: monoprints on found object

I realized that the breast prints were very versatile due to their small size and that I could

create compositions on a small scale and easily incorporate the materials that I wanted to use into them

without using too many materials. I wanted the compositions to be simple but layered. I created 16 more

pieces that integrated the breast prints into the piece. Each of these pieces utilizes materials that are

typically associate with women, femininity and women's work. I was inspired by nature and flowers,

fabrics, lace, bright and soft colors, organic shape, as well as sewing. I found that including and layering

these items together added visual interest and deeper content to the breast prints. Some of these smaller

scale pieces started with just a breast print on paper in a bright, feminine color. Other pieces were inspired

by a scrap of old lace or fabric, a particular thread color, or a certain flower petal or found object. During

the process of creating these works of art, I was very interested in the layers of sewing that I was adding to

the pieces. Prior to this research, I did not have any experience with sewing.
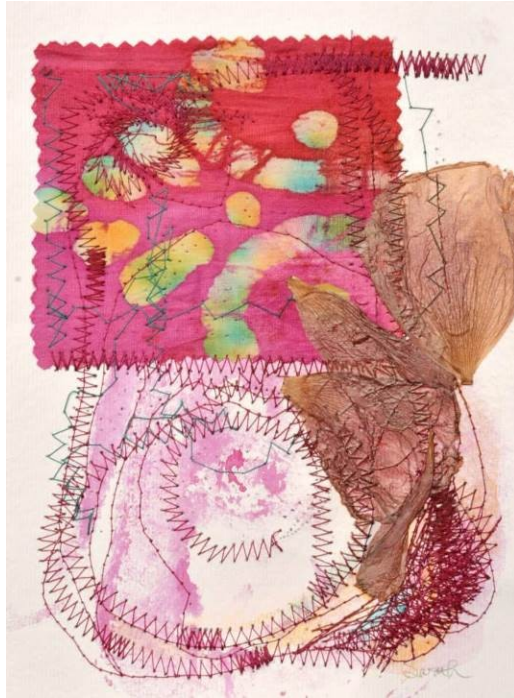
Raspberry Swirl
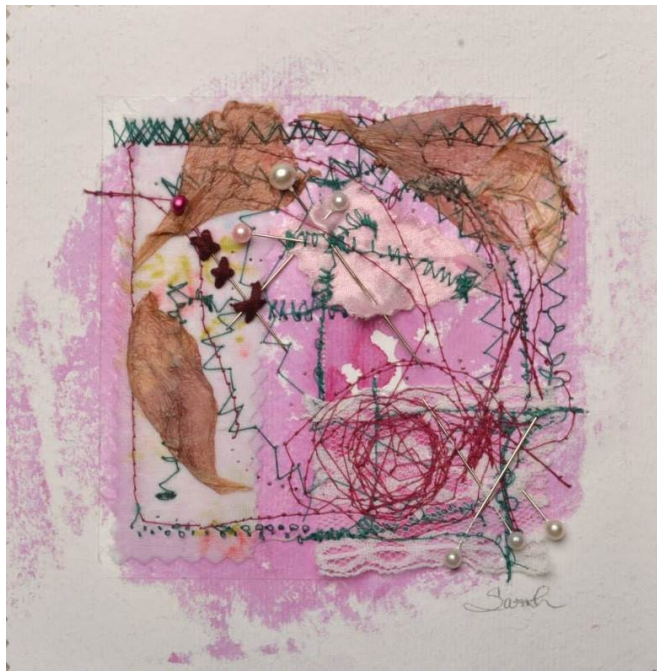
Itty Bitty

Perk Up

Pale Purple

Spectrum

Morning Glory

Lure

Blood Roses

Good Little Rose Buds

Flow

Blossom

Bloom

The last four of the finished pieces explored expectations I have had of myself based on the

observations I made about my own mother and what her many roles were in my family.

Happy Homemaker

Lover

Peace Maker
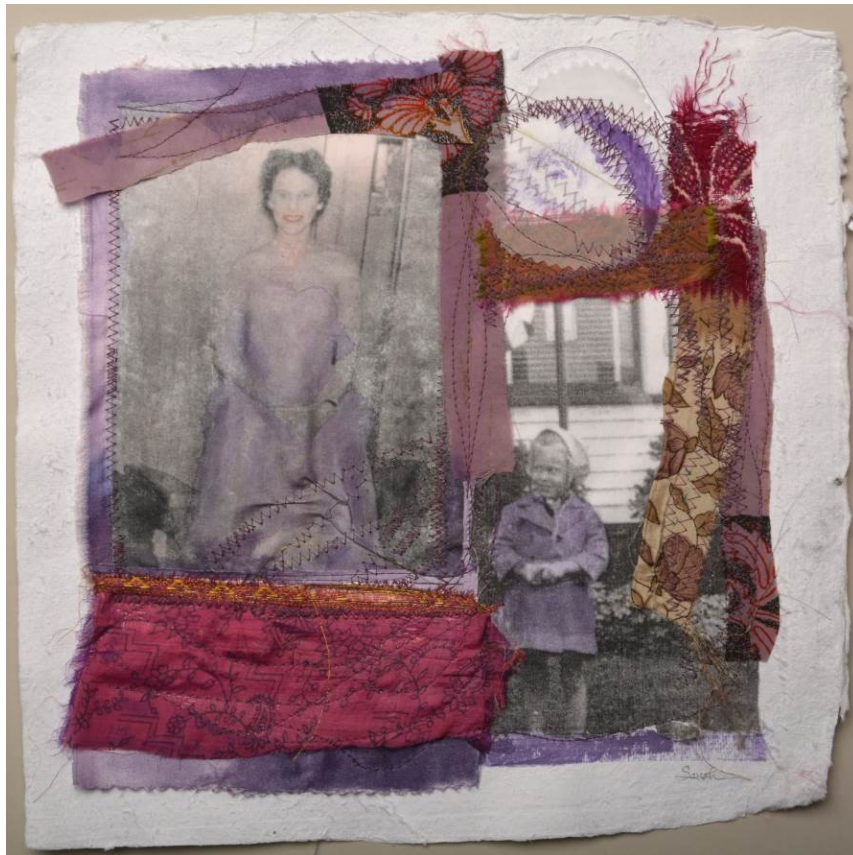
Joyful Girl

The sewing became an important part of this work. Once I begin sewing on a piece of paper, I

cannot take back the marks I make. It is not like erasing a drawing mark. It is a permanent mark. I can cover

it with more fabric or paper, but the needle of a sewing machine is unforgiving when it pierces the paper.

There is a satisfactory feeling in sewing on paper especially in adjusting the stitch length and width. I can

make long straight stitches that create thin lines and I can make short wide zig-zag stitches that can be used

to build value. These stitches can even be sewn over again with other thread. I can make the machine go

back and forth across the same stitches, increasing the thickness of the stitch mark. When sewing, the

thread tension can be off and the thread gets tight or too loose and this too affects how the stitch marks

look on the paper. At times when the tension became too tight, the thread would tear the paper and break

and I would have to adjust the tension on the machine immediately. At other times if the thread was too

loose, it would sew onto the paper with extra loose loops next to a tight stitch.

I enjoyed the spontaneity of these "mistakes" and felt that they added to the composition. Instead

of starting over, I let them become part of the composition. When these areas occur, I like the visual

interest it adds to the piece as well as possibly suggesting a struggle with the information and ideas that are

being explored. I felt that when I ran a piece through the sewing machine that I was giving up a certain

amount of control that I had over the piece. Using materials and crafts that are traditionally associated with

women's work and craft also brings attention to materials that are often overlooked for use in art. These

materials can be used in a way to empower other women and artists.

There is a repetitiveness to the printing processes I have used to create this work as well as

repetition in the craft of sewing. The repetition mirrors much of a traditional woman's daily life and the

domestic duties she is expected to have. Instead of creating pieces that were monotonous in their

repetition, I used creative lines and brilliant, contrasting colors for thread. I did not want the act of sewing

to get lost in the layers of paper and fabric. While the process is repetitive, it is versatile enough to suit my

needs to continue visually exploring issues of sex and gender.

Using my own body to create the prints for my work was a way for me to explore my own attitudes

and ideas about being a woman. The many roles that women must fulfill can be overwhelming and so many

of these expectations are based on the fact that we are born into this world with these parts that

determine much about who we are, what we do or are expected to do, as well as how we are treated by

others. I play many roles in my life and some of those roles are based on my gender, not what things I am skilled at.

My work says that it is ok to be a woman. It is ok to like soft, delicate and romantic things. It is ok to do domestic things and take care of your family. Some women are happy being homemakers, some women are happy being artists. Some women want to and can do both.

Alliance Management; A Progression Towards Sustainable High Performance Partnerships

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Abstract

The current state of business partnerships leaves something to be desired with numbers topping 70%
failure rates, it would make one wonder why a successful organization would want to partner up with
others, for fear of failure. The research covered in this report is comprised of one main area, which is
Organizational Behaviour. That of High-Performance Organizations and their business process and the
partnering and partnership management element found in the area of Strategic Alliances, known as
Alliance Management. Recently the areas of High-Performance Organization have formed their own
strategic alliances known as High-Performance Partnerships or an (HPP). The proposition of the contained
information is to support the creation of an alliance management function in High Performance
Partnerships to form Sustainable High Performance Partnerships or a (SHPP) "Ship".

Overview

Business organization trends of the late twentieth century and the current twenty first century have seen a move towards High Performance Organizations (HPO's). HPO's are organizations that have been modified to deliver superior results i.e. longevity and revenue, compared to their competitors. Total Quality Management (TQM) seems to lie at its core, dedicated to improving long term success through customer satisfaction. Even though there are many structures and or processes developed recognizing elements and characteristics of HPO's all seem to agree that people (employees) are their greatest asset or element. One of the best definitions of what an HPO is provided by, Dr. André A. de Waal MBA, "A High Performance Organization is an organization that achieves financial results that are better than those of its peer group over a longer period of time, by being able to adapt well to changes and react to these quickly, by managing for the long term, by setting up an integrated and aligned management structure, by continuously improving its core capabilities, and by truly treating the employees as its main asset." (de Waal, 2007) Dr. André A. de Waal is also attributed to being the creator of the "HPO framework" and "The 5 HPO Success Factors", with its' "35 HPO aspects", (hpocenter.com, n.d.) outlined and referenced later in this paper.   "An HPO is an organization that concentrates on bringing out the best in people... HPOs give employees the tools to empower themselves and make valuable contributions to the organization. Organizations who strive to maintain being an HPO also respect and encourage diversity. They recognize diversity is also an asset and the differences in backgrounds foster innovation and creativity, adding value." (Goessl, 2008).

Another emerging trend in today's tough economic times is a partnership, which is the partnering up of two or more organizations as allies to form a common goal. This partnering is generally known as a Strategic Alliance (SA). Strategic Alliances typically have 4 to 5 stages; "Selection, Negotiation, Implementation, and Evaluation (Jiang, Li, & Gao, 2008)with termination as a possible fifth stage, this is when the strategic alliances have met their objectives or goals or are no longer

able to meet them. SAs are also classified in to four types these are; Joint ventures, equity strategic alliance, non-equity strategic alliance and global strategic alliances. In this study we will be looking all the types with the exception of the non-equity strategic alliance. Since revenue will be the key factor used to determine success and to save time this will be limited to publicly traded companies.

As more HPOs emerge some have recognized the need and profitability of forming partnerships in what is known as a High Performance Partnership (HPP)," it is not enough if the individual chains become HPOs, but that the links between the chains must also be HPOs. In other words, a High Performance Partnership (HPP) must be created." (HPO Center, 2012)This could be considered a form of Strategic Alliance (SA). The problem with SAs is that according to studies their failure rate is somewhere in between 30% and 70% (Bamford & Gomes-Casseres, 2002) and termination rates around 50% (Lunnan & Haugland, 2008). This leads us to a seemingly paradoxical situation, if the intentions of the partnerships or alliances are formed with success in mind, why do so many fail? This is where we have to look at the most obvious area of the partnership and that is the management of said alliance. This is covered in an element of Strategic Alliances known as Alliance Management (AM) and is the focus of this paper, specifically forming a dedicated alliance management function, either individual or group that maintains its focus on the operations and success of the partnership. With this function in mind we will venture to posit the following propositions.

Proposition 1: Both High Performance Partnerships and Strategic Alliances that maintain a dedicated Alliance Management Function will outperform financially and have a longer lifecycle than those that do not have a dedicated AM Function over time.

Proposition 2: That the formation of a True Sustainable High Performance Partnership (SHPP) will need to establish the following life evolvement or progression:

1. All partners must be recognized or characterized as High Performance Organizations.

2. These partnerships must also be considered Strategic Alliances; Complimentary, Compatible and Committed.

3. They must establish a Dedicated Alliance Management Function either individual or group that is dedicated to the partnership and unbiased in its management decisions, not showing preference to any particular partner in the alliance.

Introduction

Background to the Topic:

The background for this research is comprised of, one main organizational behaviour, that of High-Performance Organizations and two business processes, partnering and partnership management as found in the areas of Alliance Management stemming from Strategic Alliances and High-Performance partnerships stemming from High-Performance Organizations. The Table found at the bottom of this introduction has separated the literature for this report and citations for ease in separation of the information presented.

High Performance Organizations (HPO's)

The best way to introduce this topic and its theoretical design is to look at its background which receives its roots from research in High Performance Organizations that is a Performance driven organization. HPO's are generally recognized by their characteristics rather than self-proclamation it is an organization built by focusing on the people (employees) rather than the processes. "High-performance companies are the role models of the organizational world. They represent real-world versions of a modern managerial ideal: the organization that is so excellent in so many areas that it consistently outperforms most of its competitors for extended periods of time." (Overholt, Dennis, Lee, Morrison, & Vickers, 2007) HPO's are the centrepiece and driving factor behind the literature and research outlined and entailed in this report.

Partnering

The next area of research moves in to the partnership phase of organizations for the purpose of this paper the focus is on two main areas, Strategic Alliances and High-Performance Partnerships.

"Strategic Alliances are groups of organizations—non-profit, for-profit, and public—voluntarily working together to solve problems that are too large for any one organization to solve on its own." (Wohlstetter, Smith, & Malloy, 2005) SA's usually collaborate to create a need or service in a particular industry. They form these alliances when they know that it may not be too great of a risk to attempt these projects alone. More often than not these are cross-sector strategic alliances where a company or organization may not have the experience, know how or ability to promote or provide a particular product or service they want to offer. For example "In February 2001, The Coca-Cola Company and Procter & Gamble announced a $4.2-billion (all currency in U.S. dollars) joint venture to use Coca-Cola's huge distribution system to increase reach and reduce time to market for the P&G products Pringles and Sunny Delight." (Gonzalez, 2001) "Alliances are widespread in today's business landscape. In the face of growing competition, the high rate of technological change and discontinuities within most industries, firms pursue a large number of alliances to access new resources, enter new markets or arenas, or minimize their risk. Yet there is a paradox: They frequently fail to reap the anticipated benefits of most of their alliances." (Kale & Singh, 2009). The reason that they fail to reap these benefits concerns the alignment of the parties. It is not "if" this alignment will break down but more about "when" it breaks down and having a strategy in place to correct this alignment. If this is not corrected this is what causes the termination of the alliance and contributes to the overall staggering percentage of failure previously mentioned.

Another area of partnership and could be considered a form of Strategic Alliance is the High-Performance Partnership (HPP). An HPP is a partnership that is formed from two or more HPOs. "When an organization is hard at work transforming into a High Performance Organization (HPO), sooner or later the time will come when the quality of the value chain in which the organization operates will become important. After all, if the suppliers and buyers are not HPOs, the quality of

the organization will be offset in full or in part by the poorer quality of the other partners in the chain. The result is that the end buyers (consumers) can never be served as effectively as possible. That is why it is important that not only the organization, but also its value chain, operate integrally at a higher level. This means that it is not enough if the individual chains become HPOs, but that the links between the chains must also be HPOs. In other words, a High Performance Partnership (HPP) must be created." (HPO Center, 2012) In order to be considered an HPP the organizations must first meet the requirements and elements ascribed to being an HPO by achieving performance driven results and placing people first. "A high-performance partnership has two essential dimensions. First, it must have a structure for the individual organizations to share authority, resources, and accountability for achieving a mutually decided goal. Some reorganization, merger, or redefinition of authority and responsibility takes place when the partnership is formed. Second, it must produce significant results. So, the second dimension takes the partnership to a higher level. A partnership is defined by its organizational structure and approach, while a high-performance one is defined by what it produces. A high-performance partnership does not necessarily begin as a sophisticated operation. It can develop incrementally from less intensive forms of collaboration." (Barnett, Becker, Goldberg, Hale, Melendez, & Rogers, 2003)

Partner Management

The next and most critical area of the partnership is the management of the partnership. It is both the key driver to success and the largest element of failure. "Conflict in any alliance is inevitable. It is not the fact that it occurs that is a problem, but rather how it is dealt with and resolved. A conflict-management process is an important element of alliance management." (Gonzalez, 2001) This strategic alignment within conflict mangement of the partners is one of the most difficult areas to overcome.

In an HPP the necessity is that the management of the partnership must be high performance as well, but it does not necessarily elaborate or designate, other than attributes as to how this will be achieved. "The following HPP factors determine whether that the collaboration is high performing:

- **Control**: supervising one another openly and honestly and confronting each other regarding performance.
- **Trust**: the expectation that the other will not behave opportunistically but will continuously consider mutual interest.
- **Involvement**: the interest and willingness to develop a long-term relationship.
- **Coordination**: tailoring one's processes to those of the other in order to improve joint performance.
- **Dependence**: mutual dependency that occurs when both parties invest an equal amount of time and money in the relationship.
- **Communication**: continuous and effective communication to ensure that both parties are always informed.
- **Conflict handling**: quickly and adequately resolving conflicts that can and do occur in any type of relationship.
- **Diversity**: recognizing and appreciating the uniqueness of the other party."

 (HPO Center, 2012)

While these "factors" are crucial to overall success a strategy or formal outline as to how this will be achieved during the life of the partnership must be formed to ensure that these are met.

In the area Strategic Alliance a possible solution to this "critical area" may have been found in the form of an Alliance Management Function (AMF) that is formed from either individuals or teams from each organization, from a completely separate third party organization that manages the alliance or both. The advantage of having e third party management is that they approach this partnership as a dedicated and unbiased function allowing the other organizations to focus on their particular goals while the AMF is allowed to dedicate itself to the success of the partnership. One of the greatest assets of this third party AMF is that it approaches this partnership with everyone in mind and without any presupposed positions or agendas other than making the partnership work. The only possible downfall to third party AMF is the cost and how that is

distributed among the partners involved. However, this may be a necessity cost to ensure the long term success of the overall Partnership. Research would also seem to support this statement which will be elaborated on in the body of this paper. "An alliance strategy is most effectively developed jointly by the business team and an objective third party, whether the latter is an external consultant or part of the organization." (Gonzalez, 2001)

The Current State of Partnerships

The current state of partnerships leaves something to be desired with numbers topping 70% failure rate. It would make one wonder why an organization would want to partner up with others in the first place simply because of the fear of failure. So the next logical question or step is to look at the percentage or the sample of those who do succeed and find out what it is that makes their partnership successful. In the next area of this article we look at some of the reasons why partnerships fail. While there is no cure all or exact recipe for success it is likely by sampling and identifying the characteristics of failures and success it will lead to a greater understanding and set a foundation for those looking to succeed as partners in the future.

First to look at the reasons partnerships fail, in my studies I have identified a few key areas that can be identified as;

Partnerships That Have Developed Too Quickly

This problem can be identified when two heads of organizations cross paths and after meeting at a conference or playing a round of golf have decided to partner up in a venture with no clear direction or strategic plan. Just because you both run very successful organizations does not mean that you should partner up, there should always be an end goal in mind or purpose for the partnership.

Secret Agendas or Conflicts of Interest

Some organizations will partner up with others to build their reputation or clean up a tarnished one. Others may do so to obtain proprietary information such as technologies, patents, processes

or client information. Either way these partnerships do not usually end a good note and usually end in some type of legal conflict.

Power Struggle

This is another toxic mix to look out for when there is no balance of power. One organization may feel that they are the reason for the partnerships existence and may feel because of the reputation or name associated with their organization that they should lead the partnership. Organizations should strive to have all parties and interests represented, with a fair and balanced approach to conflict resolution.

High Expectations and Unfulfilled Promises

Difficulties arise when one organization expects too much out of another, and of course the flip side of this coin, don't promise more than you can deliver. In order to keep this from happening guidelines must be set as to the expectations of each partner with periodic updates to ensure that goals are being met.

Lack of communication

This by far is the underlying theme and possibly the biggest threat to a partnership. If partners are not kept current on the state of the relationship this is where the partnership starts to fall apart. Communication with trust is the glue that will hold a partnership together, without these two essential elements a partnership will never succeed.

Lack of Leadership

This is probably the most detrimental flaw it falls on the heels of lack of communication and is strongly related to the power struggle. Since most of the people involved with the partnership or at least at the high levels are managers they sometimes form and elitist mind-set. This mind-set as a manager is the "I know what's best!" syndrome, and creates "glass doors" for those involved. "And in most cases, these managers will really believe what they are saying. What they don't realize, however, are the many invisible barriers — the "glass doors" — they put in place. Leaders

remove these barriers and that is part of what separates them from managers… Leaders put a real effort into listening to and learning from people throughout their organization. Listening is the clearest way we can show respect and build trust." (Clemmer) Leadership of the partnership is key and the main reason for the need or creation of an alliance management function.

Methods

The Forming of the SHPP

The next logical step is to look at how this Sustainable High Performance Partnership might possibly be formed. The accompanying progression attached will also serve as a simpler means of explanation.

High Performance Organizations (HPO's)

Strategic in Nature	People Oriented	Processes & Structure in place	Dynamic Leadership	Positive Organizational Culture

Strategic Alliance

Complimentary	Compatible	Committed

Dedicated Alliance Management Function

Individual / Group	Dedicated	Unbiased

Sustainable High Performance Partnership (SHPP)

Ability to acheive & maintain growth	Maintain and increase revenue	(TQM) core	Sustained results throughout life of partnership

HPO's

To begin with all parties involved in the alliance must be recognized as HPO's. In order for an organization to meet this standard they must meet the five factor test as outlined by one of the leading authorities in the field, PhD. André A. De'Waal and the founder of the HPO Center. The five factors also recognize 35 characteristics intertwined throughout.

The five HPO factors are:

1. ***Management Quality***. In an HPO, belief and trust in others and fair treatment are encouraged. Managers are trustworthy, live with integrity, show commitment, enthusiasm, and respect, and have a decisive, action-focused decision-making

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style. Management holds people accountable for their results by maintaining clear accountability for performance. Values and strategy are communicated throughout the organisation, so everyone knows and embraces these.

2. *Openness and Action-Orientation*. HPOs have an open culture, which means that management values the opinions of employees and involves them in important organizational processes. Making mistakes is allowed and is regarded as an opportunity to learn. Employees spend a lot of time on dialogue, knowledge exchange, and learning, to develop new ideas aimed at increasing their performance and make the organization performance-driven. Managers are personally involved in experimenting thereby fostering an environment of change in the organization.

3. *Long-term Orientation*. An HPO grows through partnerships with suppliers and customers, so long-term commitment is extended to all stakeholders. Vacancies are filled by high-potential internal candidates, and people are encouraged to become leaders. The HPO creates a safe and secure workplace (both physical and mental), and lays-off people only as a last resort.

4. *Continuous Improvement and Renewal*. An HPO compensates for dying strategies by renewing them and making them unique. The organization continuously improves, simplifies and aligns its processes and innovates' its products and services, creating new sources of competitive advantage to respond to market changes. Furthermore, the HPO manages its core competences efficiently, and sources out non-core competences.

5. *Workforce Quality.* An HPO assembles and recruits a diverse and complementary management team and workforce with maximum work flexibility. The workforce is trained to be resilient and flexible. They are encouraged to develop their skills to accomplish extraordinary results and are hold responsible for their performance, as a result of which creativity is increased, leading to better results.

(Orij, van der Veer, & de Waal, 2010)

Once the factors have been recognized and an organization can be classified as a high-performer it is understandable why these positive results can be sustainable. "High-performance companies

are the role models of the organizational world. They represent real-world versions of a modern

managerial ideal: the organization that is so excellent in so many areas that it consistently

outperforms most of its competitors for extended periods of time." (Overholt, Dennis, Lee,

Morrison, & Vickers, 2007)

Some other areas that I have observed in my research, would be that these organizations must

also be;

- **Strategic in Nature**- Organization's must have a strategy in place and "walk the talk". This
  should be evident in their vision and mission statements.
- **People Oriented**- focused on the most important people in the organization the customer
  and the employees that interact with them. Remembering that even if you are not a
  service oriented business your employees may still have networked interaction with
  potential customers
- **Processes & Structure in place**- Having a written plan and outlined guide for different
  levels of the organization to maintain the continuity of their objectives.
- **Dynamic Leadership**- Effective leaders that motivate and positively affect the organization
  and those they work with.
- **Positive Organizational Culture**- Values & beliefs of the employees align with those of the
  strategic mission set in place by the organization.

Forming a Strategic Alliance

The next phase of the partnership is to form strategic alliances with a partner or partners. These

strategic alliances are generally formed when an organization has reached a point in their process

that they cannot undertake without significant investment. Rather than invest heavily in time and

resources they will tend to partner up with another organization(s) that may be better suited for

this process or next step. "Strategic alliances are groups of organizations—nonprofit, for-profit,

and public—voluntarily working together to solve problems that are too large for any one

organization to solve on its own." (Wohlstetter, Smith, & Malloy, 2005)

Three factors seem to be prevalent in the forming of these alliances, those involved must be;

- **Complimentary**- In other words you are both needed to make a particular project work, because your strengths make up for their weaknesses and vice versa. "Partners with available financial resources can help an organization begin, grow, or significantly innovate programs. They can also serve as coping mechanisms through which to forestall, predict, or absorb uncertainty and achieve reliable resource flow and exchange." (Wohlstetter, Smith, & Malloy, 2005)

- **Compatible**- Compatibility will have more to with organizational culture for this intended study all partners must be HPO's. "The key is to determine if both organizations are strategically aligned and culturally compatible. A Joint Strategy Session where both (or multiple) organizations articulate their vision and strategy will determine if the organizations are strategically aligned. It will also become clear whether all parties have like ambitions and are culturally compatible." (Gonzalez, 2001)

- **Committed**- Probably the biggest factor in the alliance is that these partners must be committed in order for the alliance to be both sustainable and successful. "Firms are committed to an alliance relationship by contributing specific resources and capabilities. Commitment signals a firm's loyalty to the alliance as well as to the partners. It demonstrates a long-term orientation in maintaining the collaborative relationship long enough for partners to realize their benefits…. By contrast, if a firm is not committed to the alliance, it is less likely to cooperate closely with its partners. As a result, the lack of commitment on the part of either partner will become a destabilizing factor." (Jiang, Li, & Gao, 2008)

The idea of being, complimentary, compatible and committed stems from the formation phase outlined by (Kale & Singh, 2009)

Forming the Alliance Management Function

The next area we move to is the formation of the Alliance Management Function AMF. "The purpose of alliance management is to minimize the risk of failure of a partnership due to management complexity… Alliance Management is a philosophy – a way of thinking – enabled by a set of policies, processes, and tools. It is also a profession and a corporate function, requiring a defined vision and mission, structure, goals, and metrics." (Twombly & Shuman, 2010) This role if

correctly diagnosed is the main reason for success and supporting research associated with this project.

The Alliance Manager(s) represent the alliance itself. Their primary function is to support the alliance and ensure that it is successful. "The goal of the alliance manager is not to create harmony but to create a sense of dynamic tension… Think of the cathedral at Notre Dame with its flying buttresses. The equal and opposing pressure keeps it up. That is the basic architecture inside the alliance. An alliance manager must create a situation where all the different forces push inward and they are so strong that they create stability, provided, of course, they are all vectored in the right direction." (Ranf & Todărița, 2009) They serve as an advocate for all those involved and are essentially the process through which the alliance operates. One of the unique features of the alliance manager is their impartial nature this needs to supplement their dedication to the partnership. As a third party they come into the alliance generally free of prejudices or biasness to a particular partner involved. A legal background is generally helpful tool but not necessary for the alliance manager, since most of his time will be spent in negotiation and is the instrument through which arbitration is achieved. The alliance manager should however have both experience and education in the particular field of which the alliance pertains. They will be the head diagnostician for the health of the alliance, they will know about problems or differences that may arise generally before anyone else in the partnership.

Open communication and interaction with all involved is a key area or function where the alliance manager must excel. This helps create the cohesive synergy the partnership will need to survive. Ranf & Todărița explain in their article how an alliance manager must be able to operate at three different levels, "These levels are inter-organizational, inter-organizational, and interpersonal. On the inter-organizational level, the alliance manager must balance the needs, resources, and desires of each of the partner companies. On the inter-organizational level, alliance managers must

manage the needs, resources, and desires of each of their own company. On the interpersonal

level, the alliance managers must manage relationships with superiors, peers, and subordinates,

not only in their own firm, but also across boundaries of their various partner organizations." (Ranf

& Todărița, 2009)

Data Analyzed

The Third State of Alliance Management Study | 2009, performed by Maastricht University has

some of the most compelling evidence for the support of this theory that the secret to success and

sustainability is the alliance management function.

Figure 2: aLLIANCE sUCCESS RATES IN 2007 AND 2009
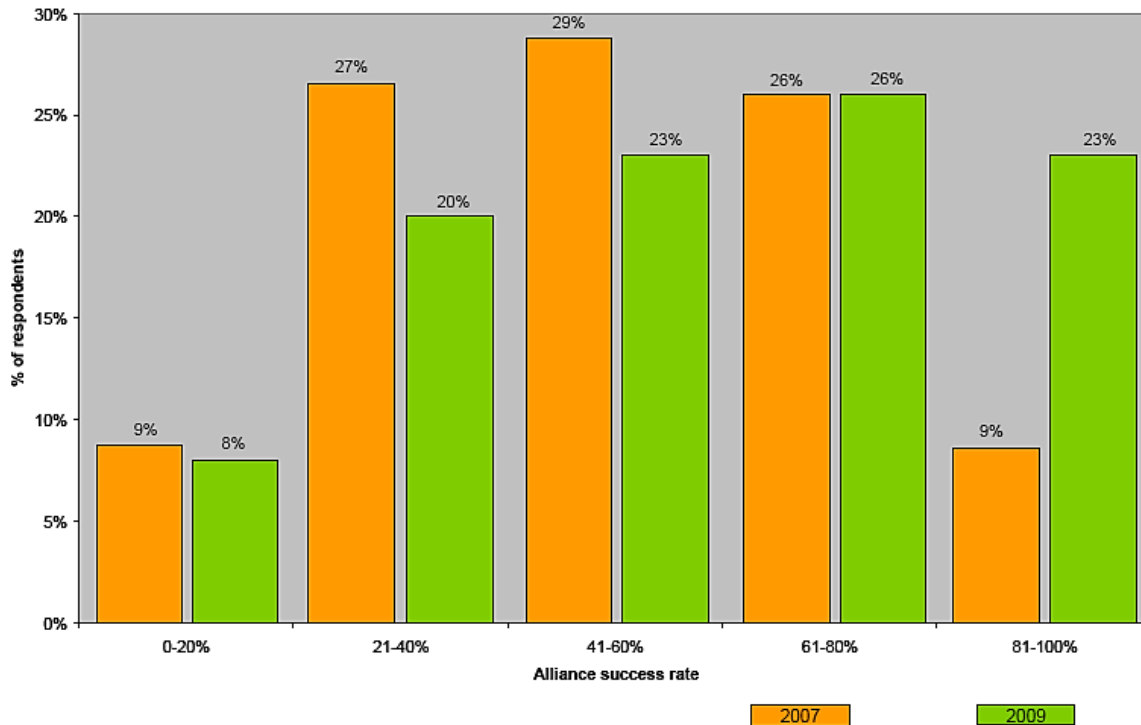
(Figure 1) Shows that 23% of the companies now have alliance success rate of more than 80%,

compared to 9% of the companies in 2007. However there remains a small group of companies

(8% in 2009 versus 9% in 2007) that is unsuccessful. Their Alliance success rate lies below 20%.

The Increase in success rate has mainly been achieved by companies moving through the

successfully categories step-by-step, Rather than jumping at once from a low to a high success

rate. Growing experience backed up by investments in alliance management tools (Figure 2) and

processes make companies successful. The first important result of this study is that the alliance success rate has increased to 57%. In the earlier studies the success rate was around 50%. The increase could have been expected based on the previous study, which showed that investment in alliance management had increased substantially in 2007. In 2009 Companies are reaping the fruits of the investment. (NSI/Universiteit Maastricht, 2009)

Figure 3: the top 10 most frequently used tools
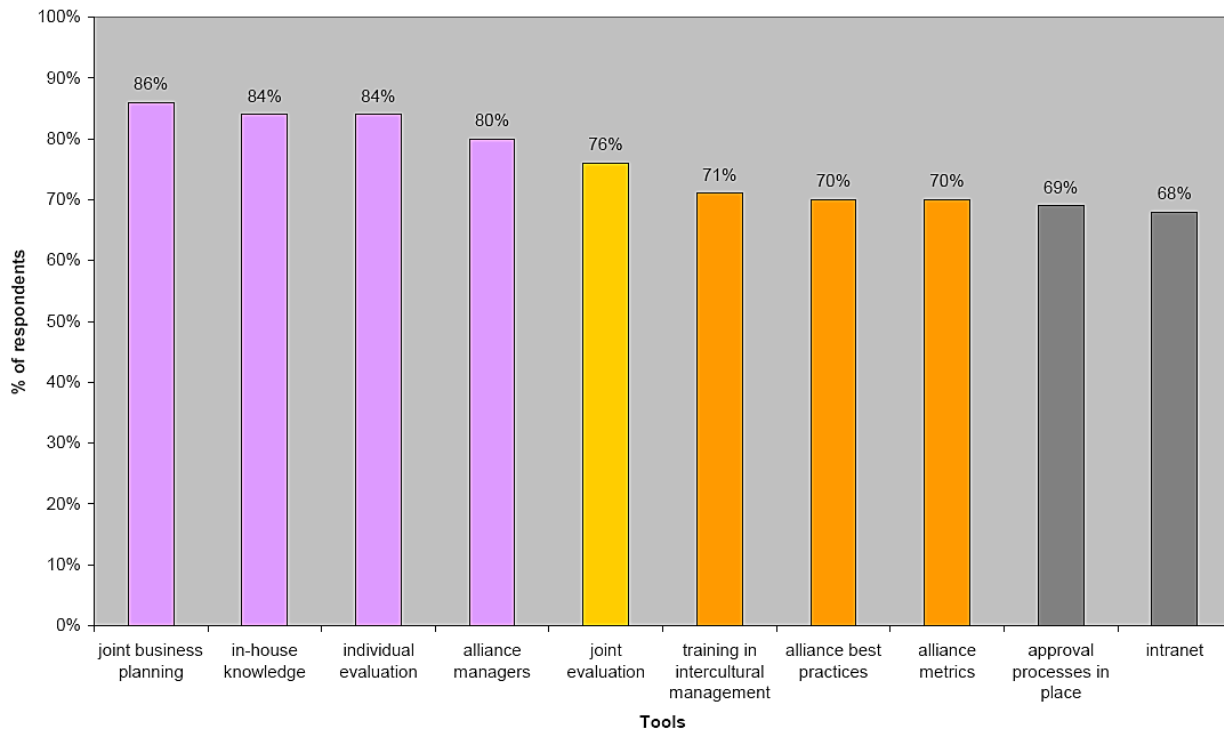
(Figure 2) shows which alliance management tools were the most implemented. Except for some minor differences, this list is the same as in 2007. This is an indication that companies have not radically changed their investment in the number and type of management tools and processes they companies have not radically changed their investment in the number and type of management tools and processes they invest in. The least used tools were: alliance management is a part of the management development program (36%), gatekeepers (35%), culture programs (30%), financial experts (27%), and mediators (13%) (NSI/Universiteit Maastricht, 2009)

Limitations & Further Directions for proposed research

There have been certain limitations or barriers in the research conducted. Mainly being that of time to compile sufficient organizational and financial data to prove a hypothesis hence the reason for propositions earlier in the paper.

The suggested route or experiment to prove or disprove these propositions would be to;

1. Research and find business partnerships or Strategic Alliances.
2. Of those samples, establish those that can be considered both High Performance Organizations & High Performance Partnerships.
3. Of those selected that would be considered High Performance Partnerships or HPPs, establish how the alliance was managed, particularly whether or not an Alliance Management Function (individual or group) was present.
4. Once the presence or non-presence of the AMF could be established test for:
    a. Whether or not the partnership is on-going or has it been terminated?
        i. If terminated or ended
            1. How long was its lifecycle?
        ii. Did the partnership achieve its' end goal, mission?
    b. Observe selected financial ratios.
        i. Profitability
        ii. Liquidity
        iii. Debt
        iv. Market (if publicly traded)
5. Determine statistical significance of whether or not the AMF played a key role in the success and sustainability of the partnership

Implications / Significance of the Study

It is my hope or belief in the implications and importance of this study to progress in the field of business research and attain a better understanding of organizational behaviour as it pertains to maintaining and establishing a successful and sustainable business partnership.

Conclusion

The alliance manager may be more easily viewed as a coach that gets his team working together.

"Attitudes and knowledge, while the foundation of effective alliance management, are not sufficient to guide alliances to consistent success. Top performing alliance manages also act as great coaches to all parties in the alliance." (Seidman & McCauley, 2005)

As an analogy consider the coaches of the NFL all-star teams for the Pro-Bowl. Every person on their team is a leader hence their all-star status, most likely they have spent the entire season in the spotlight for their respective teams. Now in this final game of the season they are a star amongst stars and will need to work together with other "stars" in order to bring their side (AFC or NFC) the victory. I'm quite sure that most of these players, even though modest and humble in interviews have their own idea of how things should work, after all it was their "high performance" that got them where they are.

Now they must form new alliances and a team in order to achieve a common goal. However forming a team is not enough, someone must lead. As a team these guys could probably go out on the field and play football and possibly win, without the leadership and perspective of a coach, but the question would still remain, who leads? On the offensive side, is it the Quarterback, wide receiver, center or the tight end? Or how about on the defensive side one of the line-backers, defensive end, cornerback or how about defensive tackle? Any one of the players probably could take the leadership role but there is no doubt that this could result in some contention between players they only have a narrow view of the playing field and cannot focus simultaneously on all other positions, their main objective is to focus on the area where they excel. If this team were to take the field without a coach and only one of the players as a leader, and the other side did have a coach to guide and lead their team, then there would be no question that this would more than likely be a very one-sided football game.

The next scenario involves being able to manage all of these leaders to victory & deciding which ones will play as starters, reserves and alternates, because not everyone can be in the game at the same time. This is where the need for a coach comes in to play some one, who can see the entire field of play and see where strengths and weaknesses are on both sides, one who knows the strengths and weakness of the other team (competition) as well, either through observation or research.

Then comes the greatest challenge for the coach to decide who the best is and which of the players would he want on the field at a given time, considering whether the group that takes the field is offensive or defensive team? A great coach is a coordinator, an arbitrator and negotiator, he not only observes what is going on out on the field but also listens and takes suggestions from his players, after all they are the ones in the trenches. In the end the coach looks to his players and says, "Great job, YOU did it!" the team and the players receive the notoriety and honour of having won the game but in actuality this success would have been very hard to accomplish were it not for the efforts and the coordination of the coach the "alliance manager"

So to explain the analogy is easy enough, the partner or partners that team up generally will have already formed a team of their top executives to work on the alliance their "stars" so to speak. As stars they were picked because they are leaders and experts in particular areas of their home organization. In the initial phases of the alliance it is very difficult to refrain from trying to "shine" or share ideas or best practices that may have worked in your organization, but may not work in this alliance. This is the creation of the need for an alliance management function AMF or a "coach" or "coaches" to oversee or direct the alliance, to make it their main priority so that the "stars" can focus on their areas of expertise. In the end if they successful in creating a sustainable partnership these alliance managers are able to look at those involved and say, "Great job everyone, YOU did it!"

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A great coach is a coordinator, an arbitrator and negotiator, he not only observes what is going on out on the field but also listens and takes suggestions from his players, after all they are the ones in the trenches. In the end the coach looks to his players and says, "Great job, YOU did it!" the team and the players receive the notoriety and honor of having won the game but in actuality this success would have been very hard to accomplish were it not for the efforts and the coordination of the coach the "alliance manager".

ANALYSIS OF VISITOR PREFRENCES OF THE HATFIELD-MCCOY TRAILS

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Social Sciences: Recreation and Travel Management

09/27/2012

Abstract

The Hatfield-McCoy Trail System has become a major tourism attraction and an economic boon for the southwestern area of West Virginia. Communities there are seeking to sustainably develop the area to provide services for Hatfield-McCoy Trail visitors. Managers and planners must anticipate the unique demands from this group of recreationists. Analyzing visitor preferences will allow these communities to plan effectively.

Preliminary findings indicate that Hatfield-McCoy users are highly specialized, experienced riders that plan multiple day trips to the system. Initial analysis shows visitors average over 14 years of riding experience and spend over $1300 per year on off-highway vehicle (OHV) equipment. Initial data also suggest that 88% of trail users will return within the next 12 months.

Survey collection is ongoing as of June, 2012, and additional study will include importance performance analysis of Hatfield-McCoy trail features, lodging preferences, and sources of information used for trip planning.

Chapter 1: Introduction

1.1 Background

The Hatfield-McCoy Trail System (HMTS) was opened in the year 2000 by the West Virginia legislature to generate economic development through tourism for the counties of Logan, Kanawha, Wyoming, McDowell, Mercer, Wayne, Lincoln, Mingo, and Boone (CBER 2006). The area served by the trail system is one of most poverty stricken regions in the U.S. with incomes, wages and earnings well below the national and West Virginia averages. In 2004, while West Virginia's per capita income was only 78 % of the national average, the Hatfield-McCoy region's was only 63%. For earnings, West Virginia was only 68% of the national average and the study region's was only 48% (CBER 2006). The Hatfield-McCoy Trails are a major factor in improving the economic conditions of the area.

The trail system is a multi-use system that provides recreation opportunities for many different types of off-highway vehicles (OHVs) such as all-terrain vehicles (ATVs), side by side utility vehicles (UTVs), and dirt bikes; however trails are open for mountain bikers, horseback riders, and hikers to use as well. The trails create the biggest system of its kind on the East Coast and the second largest in the nation (Wilcox, 2011) with visitors arriving from surrounding states such as Kentucky, Virginia, and Ohio, and as far as Canada.

Currently there are six of the nine WV counties (Wyoming, McDowell, Mercer, Mingo, Logan, and Boone) with over 600 miles of off-highway vehicle (OHV) trails. The HMTS has become a major service sector creating a financial advantage for these counties and for the state of West Virginia. An IMPLAN analysis, an economic impact modeling system that produces in-depth examinations of state, multi-county, county, sub-county, and metropolitan regional economies (IMPLAN, 2007) was done on the economic impact of the Hatfield-McCoy Trail System on West Virginia and showed an increase in income of $2,789,036 and the generation of 146 new jobs (CBER 2006). These increases would not have happened in the absence of the trail system.

1.2 Problem Statement

As participation in OHV recreation on the Hatfield-McCoy Trail system has grown, it has rapidly outstripped the available riding facilities and complementary businesses within the gateway communities. The purpose of this research will be to examine visitor preferences of the OHV riders of the Hatfield-McCoy Trails, in addition to importance-performance analysis of trail features and facilities to assess the level of consumer

satisfaction with the trail system in order to increase the amount of information on OHV riders and their

lodging preferences, which can be used to create better opportunities for accommodating the Hatfield McCoy

visitor.

The study identifies a need for information that would allow the gateway communities to make more

effective decisions that improve the quality of recreation experiences, lodging preferences, and sources of

information used for trip planning.

1.3 Purpose and Objectives

The purpose of this research is to improve management and planning of Hatfield-McCoy Trail System

(HMTS) communities by providing managers with information that will aid in the development of facilities,

businesses, and riding areas that meet the needs of OHV riders in an effective and sustainable manner. To

fulfill this purpose, several objectives will be met:

1.   To determine lodging preferences of Hatfield-McCoy visitors;

2.   To determine the experience level, and spending characteristics of Hatfield-McCoy OHV riders;

3.   To identify group size, hours traveled, frequency, and seasonality of visits to the HMTS;

4.   To identify the importance and satisfaction of HMTS facilities and features to OHV riders;

5.   To identify information sources most used by Hatfield-McCoy visitors;

Chapter 2: Literature Review

The purpose of this literature review is to explore research that is relevant to the present study.

To provide context for the project an overview of OHV use in the United States and current Forest Service

OHV publications are summarized. Then recreation perspectives and the theory of specialization which will

be applied to project will be reviewed. Finally, a review is done of studies that have applied economic impact

analysis related to OHV recreation and which provide a basis for comparison with this research.

2.1 Overview

Outdoor recreation is one of the quickest growing economic activities in the nation. Last year more than $33

billion were spent on outdoor recreation equipment. Over 159 million individuals in the U.S. partook in 18.3

billion outdoor recreation experiences (CBER, 2006). An important element of outdoor recreation is the

activity that takes place on trails. A recent study (Outdoor Industry Foundation, 2006) estimated that 72% of

Americans aged 16 and older participated in an outdoor activity in 2005, with hiking, running and bicycling

on trails being three of the most frequently reported activities, however, OHV recreational use on trails is also growing in popularity.

In the first nationwide recreational study in 1960 by the National Survey on Recreation and the Environment off highway vehicle recreation was not included because levels of OHV use were so low (Hammit and Cole, 1998). OHV use first entered the recreational scene in the 1970s with 5.3 million user days being recorded on U.S.D.A Forest Service land (Feuchter, 1980, as cited in Silberman and Anderek, 2006). Cordell (1999) reported that in 1994/95 14% of Americans 16 years and older, (27.9 million participants) engaged in off-road driving. The Specialty Vehicle Institute of America (SVIA) estimates that ATV sales have increased over 280% nationwide in the US since 1994 (SVIA, 2006). Participation in ATV recreation is expected to continue to increase across the US through 2015 (Cordell, et al, 2005). This sort of recreational participation assures future demand for off-highway trail systems, with OHV recreation being recognized as one of the faster growing outdoor activities by the National Survey of Recreation in the Environment (NSRE) (Cordell et al., 2008).

Although off-highway vehicle recreation is becoming a favorite pastime it comes with its share of environmental issues like noise pollution, air pollution, and soil erosion. With such rapid growth, the necessity for available riding facilities becomes apparent. It has been a challenge for many public land management agencies to provide adequate areas for OHV use. Conflict emerges between OHV users and other types of outdoor recreationists (hikers, birdwatchers, wildlife hunters, etc.) who feel that the land should be preserved. While the positions of the interest groups may differ, they typically share the concern that OHV use be carried out responsibly (Cordell et al., 2008). Trail systems like the HMTS in West Virginia are an important component when it comes to management of off-highway vehicle recreation.

The overall goal of the Hatfield-McCoy Trails is to establish a world class OHV trail system while focusing on safety by providing discipline and structure for the sport (Lusk, 2006). An expansion plan for the trail system plans for 2,000 miles of trails with suitable facilities and an Off-Highway Vehicle Park located in Kanawha County (CBER 2006). Local communities are seeking to sustainably develop the area to provide services for Hatfield-McCoy visitors. Studying tourist preferences will allow these communities to plan successfully for these inherently specialized recreationists.

2.2 Recreation Perspectives

In defining varieties of recreation visitors possibly will find more desirable than others, it is important to recognize the needs and expectations the participants have of the experience. Goodale and Godbey (1988) suggested the following eight variables that may be involved in determining a type of recreation: self-improvement, pleasure, socialization, identification, creativity, recovery, consumption, and spiritual.

Understanding social diversity, or relative distribution of the interrelation or independence of interests, is necessary in obtaining an understanding of the recreationist (Carpenter, 1985). An individual or family's culture, income, social status, age, gender roles, and/or employment status can all have effects on recreation preference (Hanson and Hanson, 1981). As recreationists age, their needs and choices change (Carpenter, 1985). As identified by Goodale and Godbey (1988), "They sometimes center much of their lives and identities around their sports or hobbies" (p. 234).

Opportunity may have been an additional influential aspect in recreation decision making too. According to Hendee (1969), opportunity theory expresses the idea that recreationists partake in whatever experiences are easily obtainable. Goodale and Godbey (1988) furthermore thought time and travel distance were significant variables, as well as travel costs. Travel costs can be measured differently including automobile costs, opportunity cost during travel, or a per mile fee (Hagerty and Moeltner, 2005). The National Park Service endorses a developed tourism experience by deliberation of the following: accommodations, access roads, trails to remote locations, and trails for general recreation (Shivers, 1967).

One other influential factor in selecting recreation is the anticipated experience to be acquired. There is a necessity for a person to pursue a brief ultimate experience. Clearly stated by Andrews and Nowak (1980, p. 286)... "I do not think there is anybody here that does not get a kind of sensual jolt out of going over a little bump at 60 miles an hour because your whole body responds and you feel a little bit different than you did when you started." A single illustration of this understanding is the use of OHVs on particular trail systems with various skill level ratings. This type of experience is regarded as extreme sports, a recreation that delivers a departure from basics and meets with endurance and sometimes danger (Andrews and Nowak, 1980).

2.3 Specialization

The concept of specialization is used by recreation researchers to describe the way in which participants incorporate an activity into their life. Specialization is defined by Bryan (1977, as cited in Manning, 1999) as "a continuum of behaviour from the general to the particular, reflected by equipment and skills used in the sport and activity setting preferences". Manning (1999) also states that specialization can consist of a number of elements, such as experience level, skill/ expertise, involvement/ commitment, and centrality to lifestyle. This study looks at the visitor preferences of lodging, trail facilities, and information sources, as well as, frequency of participation, years of participation, and participation at selected trails to help determine specialization. Highly specialized participants will have different goals, participation habits and spending levels than less specialized participants. OHV recreation is a significant part of many participants' life style. It is believed that OHV riding offers opportunities for the participants to connect with friends and family, reduce stress, and enjoy nature (Baker, 2007). This study will help recreation managers and entrepreneurs understand the OHV tourism market.

2.4 Economic Perspectives

In the likelihood that a tourist stays overnight, the immediate communities may possibly be affected directly through spending at restaurants, lodging, and retail outlets. If a tourist enjoys his or her time recreating, by word of mouth a new visitor may possibly be enticed and in return may add additional external money into the local economy. In respect to cost-benefit relation, recreationists will pay for the facilities needed to accommodate them for the duration of their visit, therefore generating a positive net benefit for the local and surrounding communities (Liu, 2006).

  Economic development may also result from sustained tourism (Edgell, 2006). Implements considered for identification of sustainability include: designated recreational areas, government or private regulations, visitor management, environmental assessments, recognizing carrying capacity, public outreach, codes of conduct, and access to recreational locations/facilities (Mowforth, 2003).

  Three comparable studies were found on economic impacts of tourist destinations within a local economy. The first study (Michigan Licensed Off-Road Vehicle Use and Users: 1998-99, 2000) was performed in 1999 to measure OHV trends over the past quarter century with Michigan users. This study was comparable in

visitor preferences (outdoor recreation, lodging preference, spending on equipment and trips, and miles travelled).

Results of this study included:

- the average licensee spent $1,944 during the months of July 1998 through June 1999 on OHV items not related to trip expenses, with a combined total of all respondents equalling a total of $134 million annually;

- respondents reported an average of 100 or more miles for their most recent trip that had a primary purpose of using their OHV, and spent $264 en route and in the local area where they rode their OHV;

- respondents reported spending the most stayed at hotels/motels, whereas those spending the less stayed with relatives/friends;

- the average trip involved 4.3 public land riding days with an average of 2.5 people;

- a combined total of 152,000 OHV trips reported having taken place between the months of July 1998 through June 1999 generated an average of $40 million in en route and local area spending, provided $16.4 million in income to Michigan residents, generated approximately $ 2.4 million in state sales and use taxes, and $336 thousand in state income taxes.

The second study of significance is of Iron Range OHV Recreation Area, located in Gilbert, Minnesota, and is comparable by economic impact to Gilbert, WV, the town that serves as the base of the Rockhouse Trail part of the Hatfield and McCoy Trail System. The Iron Range OHV Recreation Area was developed from old mine stockpiles. According to an article, *Iron Range seeing economic spinoffs from controversial OHV park*, published in 2004, stated that by the year 2003 the park had 971 users, and by 2004 the park had 1,512 users. As stated by the article, the campgrounds were recorded as being full, and retail businesses were growing by demand. Particular expansions that transpired due to overall demand were: ATV rental shops, ATV mechanic shops, restaurants, surrounding campgrounds, gas stations, and plans for a $5 million hotel and water park nearby. This is responsible for a huge source of income into the immediate communities and City of Gilbert. (Iron Range seeing economic spinoffs from controversial OHV Park, 2004).

The third and final study focused on the economic impact of OHV Recreation and Tourism in Wayne National Forest, Southeast Ohio (Economic Impact of Off-Highway Vehicle

Recreation & Tourism in Southeast Ohio). This study was comparable in visitor preferences (outdoor recreation, length of stay, visitors per group, repeat visits) and local economic impact. The impact monitored the sum of expenditures, local re-expenditures, and induced impact from salaries paid to impacted industries. Results of the study included:

- direct spending related to OHV recreation totalled $1,390,953.22;

- total economic output related to OHV recreation and tourism was $1,842,265.58;

- total labor income earnings related the OHV recreation and tourism was $656,980.81;

- 26.26 full-time equivalent jobs were supported by OHV recreation and tourism;

- the average number of individuals per group was 3.3;

- the average length of stay per visit was 2.4 days and 1.7 nights;

- the average number of visits per group per year was 4.6;

These three studies were found comparable to the HMTS study area in relation to environment, visitor preferences, and/or the analysis of the economic impact within a local economy. These comparable studies provided guidance to the design of visitor surveys for the HMTS study.

Chapter 3: Methodology

3.1 Study Area Description

HMTS is a multi-county development that includes nine West Virginia counties of Logan, Kanawha, Wyoming, McDowell, Mercer, Wayne, Lincoln, Mingo, and Boone where a century of coal mining has left numerous mine-scarred lands. The trail system started in 2000 and currently made up of 600 miles of trails located throughout the south-western part of the state. The trail system shares in the rich history and culture of the state, with development of brownfields and historical sites famous for the famous Hatfield-McCoy Feud. The system is managed by the Hatfield–McCoy Regional Recreation Authority and provides trails for OHV recreational excursions. HMTS was developed to give OHV users an opportunity to enjoy safe riding in West Virginia. Permits are required to ride the trails and the system is open 365 days a year from dawn to dusk. Many of the trail systems offer community connecting trails to allow visitors access to OHV friendly towns.

Figure 4 HMTS Map

3.2 Survey Design

During a 12-month period between October 8, 2011 and October 6, 2012, surveys were conducted at HMTS

trailheads and Hatfield McCoy special events to collect visitor data. The survey was designed to gather

information about Hatfield-McCoy Trail visitors, their recreational experiences and their travel expenditures.

In the process of designing the survey errors pertaining to the instrument were identified, such as need for a

change in question wording and/or survey design. A final survey was then designed and approved by the

Human Subjects Review Board at Concord University. The study questions incorporated the following

dimensions:

- Distance Traveled to HMTS

- Lodging Preferences

- Total Number of Days Spent at HMTS

- Sources of Information Most Used

- Importance and Expectations of HMTS Facilities

- General Demographics

- Level and Years of OHV Experience

- Estimated Yearly Spending on OHV Equipment

- Total Expenditures of Average trip to HMTS: Fuel/Lodging, Meals, and Miscellaneous Shopping

- Trails Typically Used

The surveys were administered on-site to one visitor per group. Initial communication was personalized and presented a selfless purpose for participation. The purpose of the survey and what will be done with the results was explained to participants as well as clear identification of the source and authority of the organization conducting the survey and assurances about confidentiality.

3.3 Sample

The respondents come from non-probability sample of HMTS visitor who voluntarily answered the survey. In order for a visitor to have been part of the sample, he/she had to be onsite at HMTS, and agreed to take part in the survey. No surveys were made available off-site. The surveys were limited to one per household, and offered at the visitor's discretion. If two individuals from separate households were in the same party, then two surveys were issued. If two individuals of the same household were in the same party, then one survey was issued. Surveys were also distributed in person to visitors attending HMTS special events such as Trailfest and Dirt Days.

3.4 Data Analysis

To date, 201 surveys have been administered and collection will continue throughout 2012. The sample consisted of 201 Hatfield-McCoy Trail visitors (98 males and 42 females). The trail users come from various locations with travel times ranging from less than one hour to more than eight hours away. They are highly specialized and experienced with over 67% being repeat visitors. Approximately 90% of respondents were surveyed at the 2011 Hatfield-McCoy Trail Festival in Gilbert, WV. Surveys were administered on-site. Data generated from surveys was checked to eliminate any entry errors, and then analyzed using Statistical Package for the Social Sciences (SPSS) data analysis software and Microsoft Excel. The results were then analyzed and served as the basis to meet study objectives:

- To determine lodging preferences of Hatfield-McCoy visitors;

- To determine the experience level, and spending characteristics of Hatfield-McCoy OHV riders;

- To identify group size, hours traveled, frequency, and seasonality of visits to the HMTS;

- To identify the importance and satisfaction of HMTS facilities and features to OHV riders;

- To identify information sources most used by Hatfield-McCoy visitors;

Chapter 4: **Results Summary**

Research began by seeking general knowledge through library and internet resources of other existing OHV trail systems, any trends in visitor's preferences and expectations of an enjoyable experience, the identification of other similar OHV recreational systems, and comparisons of OHV recreation systems and the economic impact on gateway communities.

After conducting an initial research, a survey of questions was distributed to HMTS participants for one year. A summary of the 201 visitor surveys conducted over a 12 month period from voluntary participants is as follows…

Figure 5 First Time Visit to HMTS
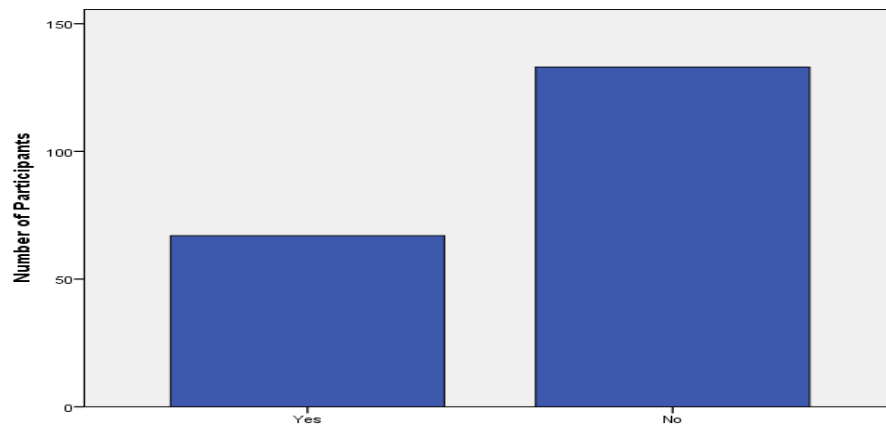
Table 1 Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	146	72.6	72.6	72.6
	Female	55	27.4	27.4	100.0
	Total	201	100.0	100.0	

Analysis shows that over 67% of trail users are repeat visitors. Initial data shows that this group is 73% male and 27% female.

Table 2 Likeliness of Off-Season Use of HMTS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at All	52	25.9	26.4	26.4
	2.00	37	18.4	18.8	45.2
	3.00	34	16.9	17.3	62.4
	4.00	18	9.0	9.1	71.6
	5.00	19	9.5	9.6	81.2
	6.00	15	7.5	7.6	88.8
	Very Likely	22	10.9	11.2	100.0
	Total	197	98.0	100.0	
Missing	System	4	2.0		
Total		201	100.0		

Their goals are different than typical OHV operators with 37% of users indicating receptiveness toward off season use.

Figure 6 Self-Reported Level of Experience
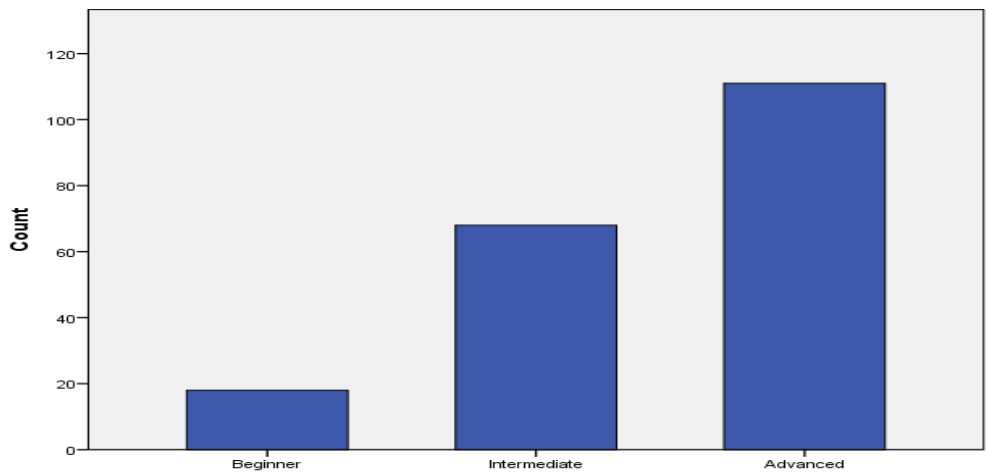
Findings indicate that Hatfield-McCoy users are highly specialized and experienced, likely to travel in groups of two to six people and plan multi-day trips to the system.

Figure 7 Return Visits within the Next Twelve Months
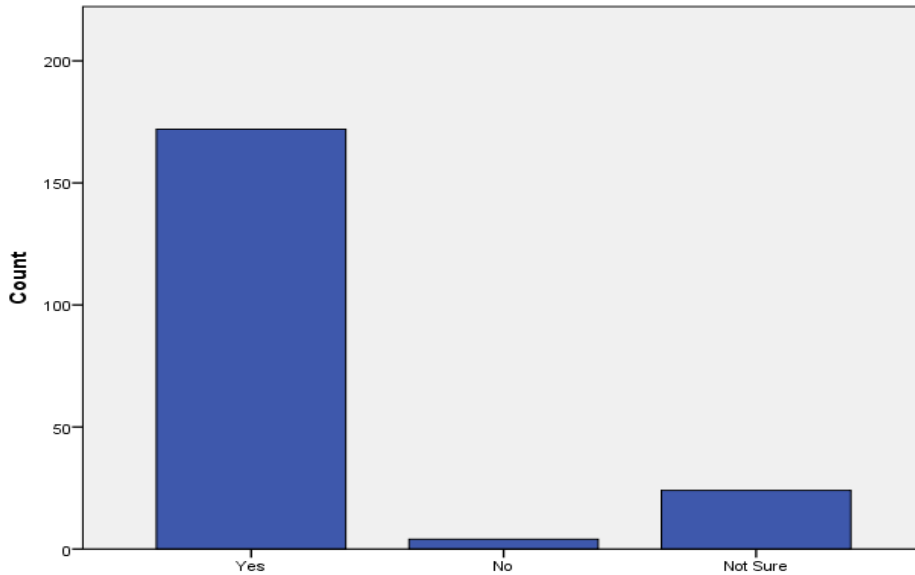
Table 3 Self-Reported Spending

	N	Minimum	Maximum	Mean	Std. Deviation
Approximately how much do you spend per year on OHV equipment?	164	.00	8000.00	884.7561	1143.53850
Approximately how much do you spend on an average trip to Hatfield-McCoy Trails?	178	.00	3000.00	457.5899	408.39943
Valid N (listwise)	157				

Initial analysis shows visitors average over 10 years' experience and spend over $1100 per year on OHV equipment. Results indicate that 86% of trail users will return within the next 12 months with participants' spending ranging from $0 to $3000 dollars per trip with the mean being $457.58.

Figure 8 Lodging Preferences by Percentage
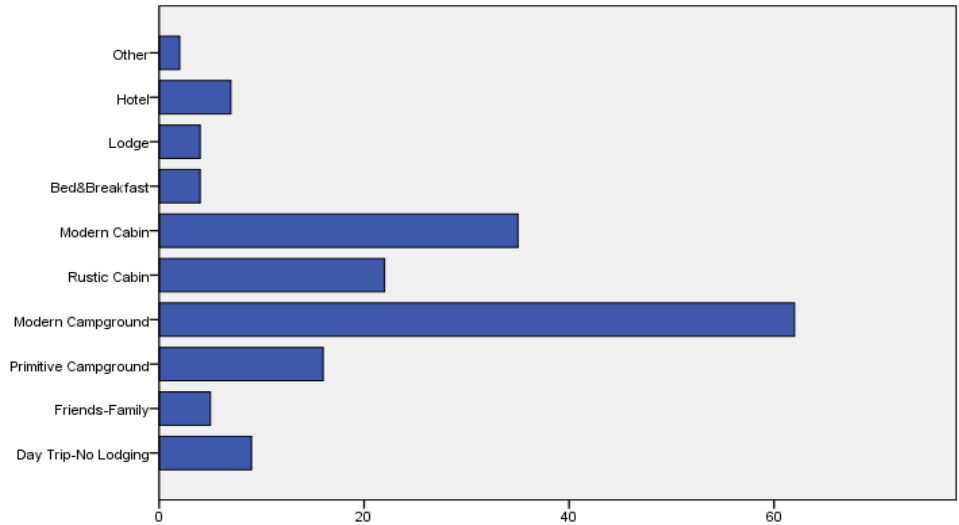
More than 90% of participants plan for overnight stays, and roughly 80% of visitors surveyed preferred Primitive or Modern Campgrounds and Rustic or Modern Cabins, over Hotels, Bed & Breakfast, Lodges, and friends and family.

Figure 9 Hours Traveled by Percentage
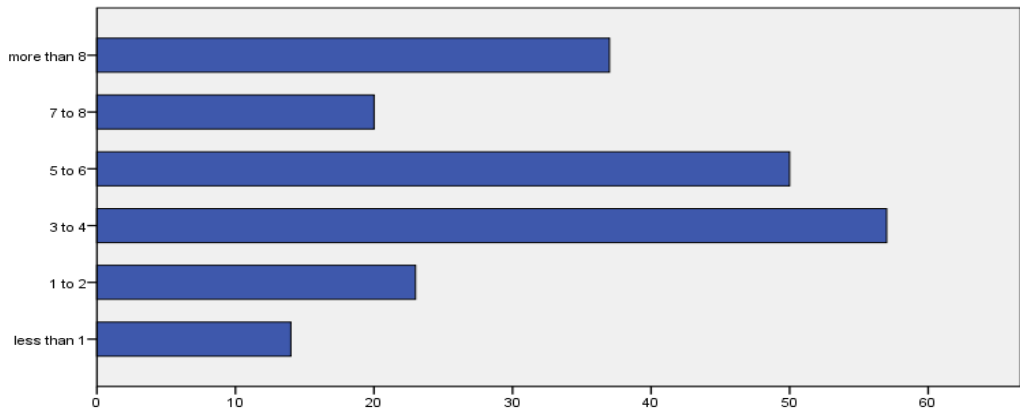
Chapter 5: Conclusion

5.1 Discussion

Data analysis of the 201 visitor surveys reflects that OHV riders represent a vast and growing economic resource for the state of West Virginia. The data exposes the possibilities of the local economy gaining HMTS visitor injected dollars via number of visits to HMTS, miles traveled from home to HMTS, lodging choices at HTMS, total cost of expenses (food, fuel, lodging, shopping, OHV part/supplies) while visiting

HMTS, and demographics of the visitors. The economic impact of this recreational sport will continue to grow as trails and recreation opportunities are made available. This growth can contribute to job development and drive entrepreneurship opportunities while making West Virginia a premier destination for OHV Tourism. Being more responsive to users will allow for the trail system to grow and increase the number of annual visitors.

The first three objectives of this study was to establish data on the lodging preferences, rider experience, travel expenditures, identify group size, hours traveled, frequency, and seasonality of visits to the HMTS users so that managers of the leisure and hospitality sector can better understand how to plan and provide services. HMTS users are experienced and inherently specialized recreationists whose goals are different than typical OHV users. Managers and planners must anticipate the unique demands of this group. Findings from this study are useful planning tools for HMTS administrators as well as for entrepreneurs planning complementary business development.

The fourth objective of this study was to determine the importance and satisfaction of HMTS facilities and features of HMTS users. Overall visitors find that restrooms, parking areas, signage at trail heads and on the trails, as well as trail quality are all very important features to the system. Satisfaction of all of these features meets or exceeded expectations as well. Access to gas and food also ranked high as important feature, but did not meet visitor expectations. Visitor centers were seen as somewhat important feature but did not rank as high importance yet met visitor expectations.

The fifth objective was to identify information sources most used by Hatfield-McCoy visitors. The analysis of information collection by trail system visitors indicates that visitors rely heavily on the Hatfield-McCoy website and information from their friends when planning visits to the trail system. Other Hatfield-McCoy materials like those provided by visitors' bureaus ranked third in visitor reliance. Traditional tourism information channels, such as websites by the state's division of tourism, local convention and visitors bureaus and advertising on radio and television are used by only small percentages of Hatfield-McCoy visitors. The Hatfield-McCoy website is a comprehensive guide to the area and offers links to some lodging and amenities, thus making heavy reliance on a single site more understandable. The reliance on friends as an information source is a traditional problem in outdoor recreation settings, as information from such

informal sources may vary widely in accuracy and reliability. Word-of-mouth sources are also inaccessible to managers trying to send critical information to potential visitors.

5.2 Recommendations

While conducting this study and speaking with HMTS visitors' recommendations suggested for HMTS included: a fun family environment, surrounded by retail businesses to meet supply and demand, and to maintain a system of challenging family friendly OHV trails. Suggestions for HMTS to continue maintaining an OHV recreational system as an economic contributor to gateway communities included the following: seasonal/annual events, on-site modern campgrounds, access to water outlets, on-site law enforcement/safety officer, all of which can encourage visitors to extend their stay and spend within the gateway communities. Suggestions for the local and surrounding communities to have HMTS visitor money introduced into the economy include: providing and maintaining preferred lodging facilities, retail shopping, restaurants, and convenience/fuel stores, and family activities/events.

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Appendix A – Survey

Off Highway Vehicle (OHV) Users Survey

Thank You for participating in this survey. No record will be kept of who has responded to this survey. This survey is completely voluntary; you may choose to answer or not answer any question. By filling out this survey, it is understood that you have volunteered this information. If you have any further questions you may contact Dr.Roy Ramthun at (304)384-5263.

(Please circle or mark the answers that describe you most accurately: Please mark only   one answer for each question.)

1. How many hours have you traveled from home to the Hatfield-McCoy Trails?
   Less than 1   1 to 2   3 to 4   5 to 6   7 to 8   more than 8

2. How many days do you plan to stay at the Hatfield-McCoy Trails?
   Day Trip   2 to 3 days   4 to 5 days   more than 5 days

3. Is this your first trip to the Hatfield-McCoy Trails?   Yes   No

4. Do you think you will visit the Hatfield-McCoy Trails again within the next twelve months?
   Yes   No   Not Sure

5. On a multi-day trip to the Hatfield-McCoy Trails would you prefer to stay in:
   Day Trip/No Lodging _____   Friends/Family _____
   Primitive Campground _____   Modern Campground _____
   Rustic Cabin _____   Modern Cabin _____
   Bed & Breakfast _____   Lodge _____
   Hotel _____   Other _____
   (If you checked "Other", please explain _____)

   How likely are you to use the Hatfield-McCoy Trails during the months between November and March?

   Not at all   Very Likely

   1   2   3   4   5   6   7

6. When planning a visit to the Hatfield-McCoy Trails, do you get information from:

		Never						Often
a.	The Hatfield-McCoy Website	1	2	3	4	5	6	7
b.	WV State Tourism Website	1	2	3	4	5	6	7
c.	Hatfield-McCoy Publications	1	2	3	4	5	6	7
d.	WV Tourism Publications	1	2	3	4	5	6	7
e.	Radio	1	2	3	4	5	6	7
f.	Visitors Bureau	1	2	3	4	5	6	7
g.	OHV Magazines	1	2	3	4	5	6	7
h.	TV Programs	1	2	3	4	5	6	7
i.	Clubs or Organized Groups	1	2	3	4	5	6	7
j.	Friends	1	2	3	4	5	6	7
k.	Other (Please Specify _____)							

7. How many other people are in your party on this visit?
   0-1   2-3   4-6   7-9   10 or more

7. Are you with an organized group? (Scouts, Church Group, Club) Yes   No
8. Are you being guided by a local guide or outfitter?   Yes   No
9. Do you consider yourself to be a leader or organizer for your group? Yes   No
10. How important to you is the quality of the following features at Hatfield-McCoy:

<div style="text-align:center">Not important   Very Important</div>

Restrooms……………………………… …1   2   3   4   5   6   7

Parking Areas………………..……….   1   2   3   4   5   6   7

Signage at Access Point ……………… 1   2   3   4   5   6   7

Signage on Trails ……………………… 1   2   3   4   5   6   7

Trail Quality…………………………… 1   2   3   4   5   6   7

Visitor Center………………………… ..1   2   3   4   5   6   7

Access to Fuel & Food ……… ………..1   2   3   4   5   6   7

11. How would you rate the performance of these features at the Hatfield-McCoy areas?

<div style="text-align:center">Doesn't Meet My   Exceeds My</div>

<div style="text-align:center">Expectations   Expectations</div>

Restrooms………………………… ……….1   2   3   4   5   6   7

Parking Areas……………..………… 1   2   3   4   5   6   7

Signage at Access Point ……………… 1   2   3   4   5   6   7

Signage on Trails……… ……………… 1   2   3   4   5   6   7

Trail Quality……………………… … 1   2   3   4   5   6   7

Visitor Center……………………………1   2   3   4   5   6   7

Access to Fuel & Food ……… ………..1   2   3   4   5   6   7

14. Are you a   Male   Female ?

15. Age _____

16. Do you consider yourself a : beginner   intermediate   advanced rider?

17. Years of Off Highway Vehicle Experience   _____

18. Approximately how many times per year do you use your OHV? _____

19. Approximately how much do you spend per year on Off Highway Vehicle

equation?   _____

20. Approximately how much do you spend on an average trip to the Hatfield- McCoy Trails? _____

21. Please indicate which trail systems you typically use at Hatfield-McCoy:

    BearWallow _____   Buffalo Mountain _____

    Little Coal River_____   Indian Ridge _____

    Pinnacle Creek _____   Rock House _____

    Pochahontas _____   Don't Know Name of Site _____

22. Have you attended a Hatfield-McCoy event such as Dirt days?   Yes   No

23. Will you attend other Hatfield McCoy events in the future?   Yes   No   Not Sure

The Bonner Scholars Program and its Impact on Issue Areas: An Athens/Concord Study

Adam Pauley
Mentor: Dr. Cynthia Khanlarian

Abstract

This paper examines the Concord University Bonner Scholars program and the impact of service learning in the Athens and Concord communities from 2009-2012. Results express the value of volunteer time contributed by Bonner Scholars exceeds $1 million dollars to agencies and the community during the 4 year period.

West Virginia's unique history includes many stories of citizens who contribute a lifetime of effort to the greater good; Corella Allen Bonner is no exception. Though Corella may not be a native of West Virginia, her experience living in the rural coal mining towns of Appalachia undoubtedly influenced a later desire of service to others, especially the issues of hunger and poverty. Born in Eagan, Tennessee, Corella and her family moved between coal camps until the age of 14 before finally settling in the city of Detroit. Corella found work at a local cafeteria and attended Wayne State University at   night. Eventually, she progressed to a manager's position and was transferred to a New York hotel   where she would later meet her husband, Bertram Bonner, and marry in 1942 (Bonner Network Wiki).

Bertram Bonner, like Corella, was born into poverty. Bertram's determination to succeed, displayed by putting himself through college at night while working full time at Heda Green Bank, led   him to the position of Head Treasurer at the young age of 22. Bertram learned a great deal from making loans to New York builders which inspired him to continue to work in the area of real estate. His success, like many others, was destroyed in the aftermath of the stock market crash of 1929. This   unfortunate event did not deter Bertram from his passion for business and he eventually spent nearly 60 years building more than 30,000 homes and apartments (History: Bertram & Corella Bonner, 2011)

Together, the Bonners established the Bonner Foundation in 1989 with the hope and expectation for their support to address the issues of hunger and education. The Bonner Foundation accomplishes this mission through the Crisis Ministry Program, Bonner Leader and Bonner Scholar programs. Berea College became host to the first Bonner Scholar program offered by the foundation a year later in 1990. The Scholar program was established and designed to provide college students *access to education and an opportunity to serve* with the belief that students engaging in service have unique gifts and talents that bring energy, creativity, and hope to individuals and communities (The Bonner Program). University and college affiliates of the foundation must be a *telling presence* in their

local communities through service. Today, the Bonner Foundation supports 24 Bonner Scholar programs

across the nation, providing $12 million in financial assistance to 2500 active Bonner Scholars (The

Bonner Program). Additionally, the Bonner Foundation awarded $5 million endowments to 7

institutions which host Bonner Scholar programs, including Concord University.

Concord University remains the only public institution chosen to participate and host a Bonner

Scholars program throughout the entire Bonner network. Dr. Beasley, President, Emeritus of Concord

University, describes Concord College acquiring the endowment from the Bonner Foundation "by

chance" under his administration. Dr. Beasley's attendance at a meeting in regards to service learning

for colleges and universities in Washington, D.C. allowed him to meet representatives from the Bonner

Foundation, thus forming a relationship 22 years strong. Currently, the program provides up to 80

students each year *access to education and an opportunity to serve* in the communities of Concord and

Athens.

The Bonner Scholar program is designed to benefit the students who are directly supported by

the program and also the campus and community in which they serve and learn. The Bonner Foundation

identifies the goals of the program in four key areas which includes students, communities, colleges and

universities, and higher education (Bonner Network Wiki). Participation in the program   provides

financial assistance towards a college education for students. Programs should provide a supportive

community whose common focus is community service while offering opportunities to enhance abilities,

talents, and leadership for scholars during their time at college (Barrientos). The programs should

create a channel for the energies of college students, faculty, and staff to continue to improve and

expand upon the quality and nature of services offered to the community.

Program goals for a host institution include the ability to recruit and retain a diverse group of

students interested in community service who might not otherwise be able to attend college. The

Foundation hopes to support a culture of service for institutions with missions that encourage service of

every student, faculty, and staff member. Institutions should also benefit from having a group of

thoughtful, committed citizens willing to build or strengthen organizations which promote a culture of

service (What is Service Learning, 2013). Ideally, programs should serve as a successful leadership model

for other institutions interested in combining service learning and scholarship. Service learning among

various institutions creates a group which shares the common commitment of service to their

communities. Additionally, programs provide leadership opportunities for young people to engage in

meaningful acts of citizenship. The Bonner Foundation's goals for the program are achieved through

student participation and hours of service.

Concord University requires each Bonner Scholar to complete 140 hours of service learning each

semester. Bonner Scholars at Concord achieve this level of service through partnerships with local

service sites and social justice events. Typically, scholars engage in a comprehensive placement process

to complete the required hours. Scholars move on from being a regular volunteer to taking on additional

responsibilities such as volunteer management, service learning and community based research, and

wider community engagement. Scholars are required to attend regular class meetings, enrichment and

training activities, as well as participate in developmental models that challenge and support each

Bonner in order to develop skills, knowledge, commitments, and responsibilities. Service hour

requirements are usually achieved through 10 hours of direct service each week of the semester and in

addition to program enrichment and training activities.

Service hours are typically completed by Bonner Scholars through an agreement with a

community partner. The Community Learning Agreement, commonly abbreviated as CLA, is a formal

agreement made between each Bonner Scholar and the community partner. CLAs outline the roles and

responsibilities as a volunteer. CLAs also include learning objectives and skills for each Bonner Scholar to

meet and develop during time spent at the service site, incorporating learning with service. Bonner

Scholars participate in other service activities without a formal agreement, such as weekend trips or

Bonner program initiatives. Hours earned without a community agreement are classified as NON-CLA

hours. Both CLA and NON-CLA hours contribute to the Foundation's three issue areas of Education,

Human Needs/Public Safety, and the Environment.

Hours completed at service sites and through activities are categorized in three issue areas,

depending on the mission of the service site or activity (Bonner Network Wiki). Bonner Scholars serving

at placements in the capacity of tutors, teacher's aides, or special project coordinators at schools serve

the issue area of Education. The issue area of Human Needs and Public Safety might be served by

Bonner Scholars through relief work at outreach organizations and homeless shelters. Recycling, soil

conservation, park maintenance, and Earth day activities support the Environment issue area. Dividing

service hours into issue areas help determine the benefit towards the community. The following data

tables describe the years of 2009-2012 and the amount of service hours to issue areas:

2009			
Issue Area For Year	**NON-CLA Hours**	**CLA Hours**	**Total Hours**
Education	1,529	6,719	8,248
Human Needs	1,121	1,330	2,451
Environment	213	25	238
Total	**2,863**	**8,074**	**10,937**
Percentage	26.2%	73.8%	100%

2010			
Issue Area For Year	**NON-CLA Hours**	**CLA Hours**	**Total Hours**
Education	2,372	13,344	15,716
Human Needs	1,285	2,324	3,609
Environment	338	433	771
Total	**3,995**	**16,101**	**20,096**
Percentage	20%	80%	100%

2011			
Issue Area For Year	**NON-CLA Hours**	**CLA Hours**	**Total Hours**
Education	1,275	16,989	18,264
Human Needs	955	2,306	3,261
Environment	35	968	1,003
Total	**2,265**	**20,263**	**22,528**
Percentage	10.1%	89.9%	100%

2012			
Issue Area For Year	**NON-CLA Hours**	**CLA Hours**	**Total Hours**
Education	1,583	16,229	17,812
Human Needs	1,786	4,543	6,329
Environment	29	597	626
Total	**3,398**	**21,369**	**24,767**
Percentage	13.7%	86.3%	100%

The following data is comprehensive of the study:

2009-2012			
Issue Area	**NON-CLA**	**CLA Hours**	**Total Hours**
Education	6759	53281	60040
Human Needs	5147	10503	15650
Environment	615	2023	2638
Total	**12521**	**65807**	**78328**
Percentage	16%	84%	100%

The data represents a total of 78,328 hours of service learning over the duration of the previous four years (Bonner Web Based Reporting System, 2013). 84% of the hours were completed at permanent service placements using the community learning agreements. 81% of the CLA hours focus on the issue area of Education, followed by Human Needs with 16% and the Environment at 3%. The remaining 16% of total hours were completed without a community learning agreement at informal service opportunities. The area of Education includes 54% of Non-CLA hours. Human Needs consists of another 41% and the remaining 5% towards the issue area of the Environment for Non-CLA hour

classification. Overall, the issue area of Education makes up 77% of the total hours provided by service learning through Concord University's Bonner Scholar program. The remaining hours are divided between Human Needs with 20% and the Environment area at 3%.

78,328 hours of service of the course of four years is no small feat. In fact, this total would equal 2,174 regular work weeks, taking nearly 44 years to complete for one person. How do we effectively measure the impact of service learning? One way to measure the impact of 78,328 hours is to assign a dollar values to each hour. After all, we use the dollar everyday to assign the value of goods and services. Though it may not feel right to compare generosity with a financial value, it is important that we understand the impact of this sector in the national and local economy. Volunteering is often overlooked and undervalued; numbers add weight to the conversation and place an importance into a context that is relatable, understandable, and protectable.

Independent Sector, a leadership network for nonprofits, foundations, and corporate giving programs, helps acknowledge the value of service learning. The organization consists of a coalition of approximately 600 entities and focuses on leading, strengthening, and mobilizing the nonprofit and philanthropic community. Each year, Independent Sector produces a dollar value for an hour of community service. This value is based on the average of all hourly earnings of all production and non-supervisory workers on private non-farm payrolls (Independent Sector's Value of Volunteer Time, 2013). Independent sector then applies a 12 percent increase to estimate for fringe benefits. According to the Financial Accounting Standards Board, the value of community service using Independent Sector's figure can be used on financial statements representing volunteer time at a registered nonprofit. Entities especially use these figures for external purposes such as grant proposals and annual reports.

Using Independent Sector's values for the past four years, we can measure the impact of service learning on the Athens and Concord community from the Bonner Scholars Program. Remember, 78,328

hours were contributed throughout the time period of 2009-2012. The following data explains the

result of applying Independent's Sector value to CLA and Non-CLA hours:

2009		
Issue Area for Year	NON-CLA Hours	CLA-Hours
Education	1529.00	6719.00
Dollar Value	20.85	20.85
	31879.65	140091.15
Human Needs	1121.00	1330.00
Dollar Value	20.85	20.85
	23372.85	27730.50
Environment	213.00	25.00
Dollar Value	20.85	20.85
	4441.05	521.25
Total Value of Hours	$ 59,693.55	$ 168,342.90

2010		
Issue Area for Year	NON-CLA Hours	CLA-Hours
Education	2372.00	13344.00
Dollar Value	21.36	21.36
	50665.92	285027.84
Human Needs	1285.00	2324.00
Dollar Value	21.36	21.36
	27447.60	49640.64
Environment	338.00	433.00
Dollar Value	21.36	21.36
	7219.68	9248.88
Total Value of Hours	$ 85,333.20	$ 343,917.36

2011		
Issue Area for Year	NON-CLA Hours	CLA-Hours
Education	1275.00	16989.00
Dollar Value	21.79	21.79
	27782.25	370190.31
Human Needs	955.00	2306.00
Dollar Value	21.79	21.79
	20809.45	50247.74
Environment	35.00	968.00
Dollar Value	21.79	21.79
	762.65	21092.72
Total Value of Hours	$ 49,354.35	$ 441,530.77

2012*		
Issue Area for Year	NON-CLA Hours	CLA-Hours
Education	1583	16229
Dollar Value	22.39	22.39
	35443.37	363367.31
Human Needs	1786.00	4543.00
Dollar Value	22.39	22.39
	39988.54	101717.77
Environment	29.00	597.00
Dollar Value	22.39	22.39
	649.31	13366.83
Total Value of Hours	$ 76,081.22	$ 478,451.91

*22.39 is an estimated value for 2012. The average increase per year for the last five years is 0.60 which is applied to 2011's total of 21.79, deriving at an estimated value of 22.39 for 2012.

The following table describes the combined totals for the value of service during 2009-2012.

Issue Area	Year	NON-CLA Hours Dollar Value	CLA Hours Dollar Value
Education	2009	31879.65	140091.15
	2010	50665.92	285027.84
	2011	27782.25	370190.31
	2012	35443.37	363367.31
Human Needs	2009	23372.85	27730.50
	2010	27447.60	49640.64
	2011	20809.45	50247.74
	2012	20809.45	101717.77
Environment	2009	4441.05	521.25
	2010	7219.68	9248.88
	2011	762.65	21092.72
	2012	649.31	13366.83
Total Dollar Value of 4 Years	$ 251,283.23	$ 1,432, 242.94	

As we can see, $1,683,526.17 worth of volunteer time was contributed by the Bonner Scholars Program from 2009-2012 to the Athens/Concord Community.

Since its founding in 1989, the Bonner Foundation has awarded more than $86 million in annual grants and an additional $85 million in Bonner Scholars Program Endowment awards, including Concord University's $5 million endowment (The Bonner Program) The foundation remains one of the largest privately funded scholarship organizations in the United States. The foundation continues to lead a number of federally sponsored initiatives in higher education, including Learn and Serve America grants and State AmeriCorps grants. The Bonner Scholars model serves as the leading example of service learning programs in the United States, sponsoring scholarship and leadership programs, as well as inspiring campuses to commit to service to surrounding communities. Hopefully, this study expresses the value of service learning to the Athens/Concord communities. The Bonner's endowment to Concord University continues to be a far reaching investment into the lives of students and community partners.

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Individual Beneficiaries: User-Type Husbands in the Swinger Lifestyle

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Abstract

There are numerous variations on the structure of marriage. One such variation is that of a swinger, or "wife-swapping," lifestyle. The present study focuses on user-type husbands; hypothesizing that the more agreement demonstrated on interest category selection between partners, the less likely the male partner would be to select One-on-One sex as an interest. In order to determine consistency both between and within couples, agreement numbers were calculated for each couple, males alone, and females alone. Using a content analysis of 60 couples' online swinger profiles, the present study found no significant correlation between male agreement number and category selection, $rs[49] = .039$, $p < .793$. It did, however, find a significant correlation between couple agreement number and category selection, $rs[50] = .319$, $p < .024$, suggesting that the higher a couple's agreement number, the less likely they would be to select One-on-One as an interest. These results pose implications in the ways in which swinging behavior is viewed by clinicians.

Individual Beneficiaries: User Type Husbands in the Swinger Lifestyle

In the 1960's and '70's, America witnessed the emergence of a middle-class subculture previously unexplored. Swingers, for the purposes of this research, are defined as married or committed couples who have agreed that, through some organized or institutionalized manner, they will have sexual relations with people other than their spouse (Walshok, 1971). The idea of swinging—previously known as "wife-swapping"—has existed for centuries. History suggests swinging behavior occurring as far back as ancient Rome. Even at the height of this phenomenon, few scholarly researchers were examining the topic. Today, those numbers are even fewer. With the development of new phenomena, research concerning swingers has fallen to the wayside. Although the research on this group may have dwindled, the behavior itself has not. Some studies suggest that it is, in fact, increasing (D'Orlando, 2010).

Before attempting to delve into this group's behavior, it must first be understood who, exactly, is being studied. As implied above, the majority of researched swingers fall into the middle or upper-middle class in socioeconomic standing (Jenks, 1985; Levitt, 1988). The overwhelming majority are middle-aged (Bartell, 1970; Jenks, 1985; Levitt, 1988) and Caucasian (Bartell, 1970; Jenks, 1985). They are generally above average in both income and education (Jenks, 1985; Levitt, 1988), and tend to label themselves as politically conservative (Bartell, 1970).

In a 1973 study by Henshel, the process of couples deciding to swing was broken down into three questions; who first learned of swinging, who was first to suggest it, and who reached the final decision. After examining results, Henshel found that not only are husbands more likely to first learn of swinging, but 68% of the husbands in the sample made the first suggestion of swinging to their wives. When combined with the finding that 64% of husbands made the final decision to swing—compared to a 28% joint decision or a 2% wife only decision—Henshel reports that husbands are making 59% of *all* decisions regarding swinging. This finding appears to suggest that wives are engaging in swinging

behavior simply at the request of their husbands. Research demonstrates, however, that women, although initially apprehensive, often come to enjoy swinging *more* than their husbands (Cole & Spaniard, 1974; Smith & Smith, 1970).

Here, an important distinction is to be made between "types" of husbands suggested to be involved in swinging. Varni (1972) identified two types of male swingers: the *user* and the *encourager*. The user-type uses his wife simply to gain sexual access to other swinging wives, showing little concern for his own wife's wishes or feelings. His purposes for swinging are self-serving, deceptive, and manipulative. The encourager-type, on the other hand, emphasizes togetherness and honesty, and feels as if swinging will have positive effects on both himself and his wife. He views his wife as his equal and believes their swinging activities should be mutually beneficial.

The most frequently reported positive effect of swinging is improvement in overall marital satisfaction (Varni, 1972; Walshok, 1971). For a marriage struggling with monotony, swinging may serve to revitalize the marriage. Levitt (1988) reports that 74.9% of married participants in his sample reported their swinging behavior to be either "mildly enhancing" or "very enhancing" to their marriage. Some criteria for this enhancement appear to be the newly shared interest, which increases togetherness (Bartell, 1970), more confidence in sexual technique (Bartell, 1970; Varni, 1972), a more active social life (Bartell, 1970; Varni, 1972; Walshok, 1971), increased openness and honesty within the marriage (Varni, 1972), more excitement in their lives (Levitt, 1988), and increased sexual interest in the spouse (Bartell, 1970; Walshok, 1971).

Swinging is also often reported as a solution for or alternative to extramarital affairs. Denfeld and Gordon (1970) reported that, in swingers' opinions concerning extramarital sex, the aspect which damages the marriage most is the lying and deceit accompanying an affair. Swinging rebukes mononormativity—the prevailing idea that human beings should be both emotionally and sexually monogamous with a single partner—without threatening an emotionally monogamous marriage.

The act of swinging, though, may come with emotional concerns for some participants, such as possessiveness, competitiveness, fear of inequality between spouses (in terms of opportunity and success with sexual partners), and feelings of guilt (Ziskin & Ziskin, 1975). Others report having dropped out due to the mechanistic and emotionally disconnected nature of swinging (Bartell, 1970). The most common emotional issue reported is that of jealousy. These negative effects may lead to the couple dropping out of swinging. Because of the difficult nature of finding swinging dropouts, very little research has been done concerning them.

One such study, however, was conducted by Denfeld in 1974. A survey of 463 marriage counselors, each of whom had counseled at least one dropout couple, revealed nine main problems that couples reported as resulting in their dropping out of swinging. The most frequent problem, as mentioned previously, was jealousy. This was cited by 109 couples; reported more frequently by men than women. Male jealousy tended to center on the popularity of their wives or their own sexual performance, whereas female jealousy focused on fears of losing their partner. Another problem frequently reported was a threat to the marriage. This was reported by 68 couples. Contrary to prior research, these couples suggested that swinging weakened their marriage rather than strengthening it. It can be assumed that a perceived threat to the marriage may also include a combination of two other problems; namely, jealousy and another problem which was frequently listed—guilt. A fourth problem, reported by 53 couples, was the development of an outside emotional attachment. Although swingers often take steps to ensure a disconnect between emotionality and sex (Walshok, 1971), an emotional attachment can occur between swinging partners. For the sample, this attachment often lead to divorce or separation; a problem listed by 29 couples. The remaining reasons cited include boredom and loss of interest (49 couples), disappointment (32 couples), wife's inability to "take it" (29 couples), and fear of discovery by community or children (15 couples).

Along with the potential for negative emotional effects, there could be negative practical effects as well. Two such practical concerns are that of unwanted pregnancy and contraction of a sexually transmitted disease, most specifically, the AIDS virus. In a study of 88 swingers, Jenks (1992) found that 57.6% agreed that they feared getting AIDS. When asked if their sexual habits had changed because of AIDS, 62.5% reported that they had. Those changes consisted of being more selective in choosing partners (40%), practicing safer sex (30.7%), less sexual contact (14.7%), and dropping out of swinging all together (6.9%).

One theory, presented by Walshok (1971), emphasizes middle class marginality as an explanation for swinging. Of initial importance is the anxiety caused to newly middle-class people, resulting from their attempt to maintain their middle-class status. Secondly, and more importantly, is the manner in which corporate life has infiltrated all aspects of middle-class living. This routinized, segmented infiltration branches all the way to interpersonal skills, resulting in difficulty establishing personal relationships. It is reflected in the organized manner in which the middle-class man seeks personal interactions. As a whole, this is a manifestation of the middle-class's lack of personal autonomy. Because these factors contribute to middle-class marginality, they can be viewed as a pressure, urging middle-class residents to seek others with whom to share a common experience. In seeking out other swingers and participating in swinging behavior, individuals are maintaining a systematic and routinized way of interrelating. They are also, however, gaining personal freedom through freeing themselves of sexual restraints and taboos. This does not pose a threat to their middle-class lives, as could be assumed; rather it enables them to deal with the bureaucratic nature of suburban living.

An argument against Walshok's theory, though, is that it fails to explain why *all* marginal people do not seek out swinging behavior. For this reason, Jenks (1998) proposes a social psychological model of swinging. The initial requirement is an early involvement in or interest in sex; one must be interested

enough in sex to invest the time and energy needed for swinging. There are also suggestions that

involvement in deviant sexual activity prior to becoming a swinger, such as premarital sex, will increase

the likelihood of one later participating in another form of sexual deviance—swinging, in this case.

Although these two factors are important, Jenks suggests two personality traits which may influence an

individual's predisposition to becoming a swinger; liberal sexual views and low degree of jealousy. Jenks

suggests that, without all of these factors, successful, long term swinging will not occur.

Another theory, proposed by Loevinger (1966), offers an ego development framework. This

theory draws on the aspects of cognition, interpersonal relations, impulse control, character structure,

and moral development. Loevinger presents three levels of ego development into which most adults

are categorized: conformist, conscientious, and autonomous. Most swingers will fall under the

conformist category. At the conformist level, individuals maintain partially internalized social rules.

Interpersonal relations function on actions rather than feelings. Sex and love can be disconnected from

one another. Individuals at this level also demonstrate a preoccupation with material things, reputation,

status and appearance. Swingers in this category tend to focus solely on the physical aspects of

swinging, preferring to make no emotional connection with their partners. Some swingers, though, may

instead fall under the conscientious category. For the conscientious swinger, interpersonal relationships

function in terms of feelings more so than actions. Individuals focus on their own inner standards. For

the swingers in this category, there may be more of a focus on an emotional relationship amongst

partners instead of a strictly physical one. This theory suggests that those involved in successful

swinging relationships are likely to be at a higher level of ego development. It is the movement to these

higher levels which increases an individual's predisposition to involvement in swinging.

The present study focuses on the distinction previously discussed between the user and the

encourager-type of husbands in the swinging lifestyle. In order to determine which male participants

may be users and which encouragers, the present study focuses on the selection of One-on-One—

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meaning meeting a potential partner for sexual activity without the presence of their primary partner—

in the interest categories. Because One-on-One extramarital sex does not involve the presence of the

primary partner, it can be inferred that a male who chooses this interest is more interested in finding

new sexual partners for himself, finding pleasure for himself, than he is his primary partner. This

Machiavellian approach to swinging would be characteristic behavior of the user type of husband that

Varni (1972) evidenced in his earlier research. I hypothesized that the more agreement demonstrated

on category selection between partners, the less likely the male partner would be to select One-on-One

as an interest.

Method

Participants

At the time data was collected, all participants were current members of the website

www.swingerzonecentral.com. Using a random number generator, profile ID numbers in the URL were

replaced with the randomly generated number in order to achieve a random sample. Only profiles of

couples were examined; all profiles for singles were disregarded. Sixty participants (60 couples; 30 men

and 30 women) were examined in the study. The women ranged in age from 24 to 59, with a mean age

of 39. The men ranged in age from 27 to 65, with a mean age of 42.

Consistent with prior research, the sample was both middle-aged and Caucasian (Female- 83.9%,

Male- 84.5%). Of the males, 5.2% identified as African American, 3.4% Hispanic/Latin, 3.4% Native

American, 1.7% Asian, and 1.7% Middle Eastern. Of the females, 7.1% identified as African American,

5.4% Hispanic/Latin, 1.8% Asian, and 1.8% Middle Eastern.

In 70% of couples, the female partner identified as either bisexual or bi-curious. In another 10%,

both the female and the male identified as bisexual or bi-curious. In the final 20%, both partners

identified as straight.

Over 40% of both males and females identified themselves as being "Height/Weight Proportionate" (Male- 41.7%, Female-43.3%). For males, another 18.3% identified as "Athletic/Muscular", 18.3% "A Little Chunky," 11.7% "Slim/Slender," 6.7% "Very Large," 1.7% "Full Figured," and 1.7% did not disclose their body type. For females, 15% identified as "Slim/Slender," 15% "A Little Chunky," 11.7% "Full Figured," 5% "Athletic/Muscular," 1.7% "Very Slim," and 8.3% chose not to disclose their body type.

Design & Procedure

The present study employed a variety of research techniques. In order to achieve the most complete picture of the data, both qualitative and quantitative methods were used. Participant profiles were collected cross-sectionally, and a content analysis was conducted. Due to the mostly nominal nature of the data, SPSS was used to conduct both Pearson's Chi-Squares and Spearman's Rhos.

Further, in order to demonstrate consistency within a couple, a Couple Agreement number was calculated. This number could range from 0-15 and is representative of the total number of categories that were selected and agreed upon by both members of a couple. Also, males and females were each given their own respective agreement numbers, ranging from .00-1.0, indicating the amount of agreement in category selection each had with their respective partners.

Results

Results of a Spearman's Rho revealed a significant correlation between One-on-One interest selection and Couple Agreement number, rs[50] = .319, p < .024. Further results of a Pearson's Chi-Square support the hypothesis that the higher a couple's agreement number, the less likely they would be to select One-on-One in the interest section, χ^2(2,50) = 5.58, p < .061. When analyzing the male and female agreement numbers alone, however, no significant correlation is observed; male, rs[49] = .039, p < .793, female, rs[51] = .201, p < .157.

A Spearman's Rho also showed a significant correlation between One-on-One interest selection and the Male Total, rs[52] = .486, p < .000. A follow up Pearson's Chi-Square supports the hypothesis that the higher the male total number of categories selected, the more likely they would be to select One-on-One in the interest section, χ^2(2,52) = 12.71, p < .002. There were also significant findings regarding Female Total and One-on-One category selection, rs[53] = .303, p < .028. A Pearson's Chi-Square is further supportive of the idea that, similar to males, the higher the female total number of categories selected, the more likely they would be to select One-on-One in the interest section, χ^2(2,53) = 4.86, p < .088.

Discussion

Secondary Findings

In keeping with prior research suggesting swingers tend to be more politically conservative than the general population (Bartell, 1970), swingers in this sample also tended to be more conservative in their own behavior and in the behavior they look for in potential partners. On their profiles, only 38.3% had posted pictures of themselves. Of those, 52.2% of the photos did not contain nudity. When asked if they smoked, 60% of males and 61.7% of females responded that they did not. Regarding drug use, 81.7% of both females and males reported that they did not use drugs. Fifty-five percent of males and 50% of females indicated that they did not have tattoos. When asked if they had any piercings, 60% of females and 80% of males selected no. It is unclear, however, if pierced ears were considered as a "piercing" in this category. These selections seem to be indicative of swingers' conservative behavior. Behaviors considered as being deviant by society; smoking, drug use, having tattoos and piercings, are not being reported as being engaged in by swingers.

Despite their conservative behaviors for themselves, results suggest that they expect slightly less from their partners. Only 6.7% of both males and females indicated that they would not meet someone who was tattooed. With regards to piercings, only 1.7% of females, as well as males, reported

that they would not meet someone who had piercings. They tended to be more stringent, however, regarding smoking and drug use. Twenty percent of males and 21.7% of females reported that they would not meet someone who was a smoker. Females indicated at 46.7% that they would not meet someone who was a drug user; 53.3% of males responded the same.

The one area in which swingers do not appear to be typically conservative is their feelings towards drinking. Both females and males, when asked if they were drinkers, responded at a rate of 88.3% that they were. With regards to their potential partner, males reported at 98.3% that they would meet someone who was a drinker. Females reported the same. It is unclear how often swingers are drinking, however. It may be the case that swingers regard themselves as social drinkers. Swinging, by nature, is a social activity. It could be expected that alcohol consumption is a regular occurrence during swinger parties or couplings. This is an area in which further research should be conducted.

Not only do swingers appear to be conservative in their social behaviors, but they also appear to be relatively conservative in their sexual behaviors as well. Although it can be argued that swinging behavior in itself is deviant, the ways in which they prefer to interrelate is fairly conservative. Of the 15 options swingers could select as interests, the 6 most frequently selected options evidence a common theme; heteronormativity. The six most frequently selected interests were "One-on-One" (Males- 40%, Females- 36.7%), "Threesome" (Males- 76.7%, Females- 76.7%), "Foursome" (Males- 68.3%, Females- 70%), "Moresome" (Males-51.7%, Females- 46.7%), "Orgies" (Males- 43.3%, Females- 35%), "Full Swap" (Males- 65%, Females- 60%), and "Soft Swap" (Males- 43.3%, Females- 43.3%). With each of these selections, the focus is on male/female sexual activity. Within the swinging community, male homosexual activity is frowned upon (Bartell, 1970). Female homosexual activity, however, is encouraged. These attitudes maintain consistency with a conservative general population, as well as focusing on heteronormativity.

The four least frequently selected interest options tended to be those which a general population would also consider as deviant. Those options were "Tantra" (Females- 3.3%, Males- 3.3%), "Bukkake" (Females- 3.3%, Males- 5%), "Sadism and Masochism" (Females- 1.7%, Males- 1.7%), and "Bondage and Discipline" (Females- 6.7%, Males- 5%). These were selected at an astoundingly lower rate than any others. This avoidance of deviant sexual behaviors, paired with the double standard regarding homosexual activity, and the focus on heterosexual sex, is indicative of the swingers' conservative sexual views.

Another finding of interest may unveil an inconsistency between swingers' attitudes regarding condom use and their behaviors in swinging situations. When asked if condom use was required during swinging encounters, 50% of males and 55% of females responded that they were. Although 15% of females and 23.3% of males requested that their potential partners ask privately about their feelings regarding condom use, 26.7% of males and 30% of females reported that condom use was not required or they did not care if condoms were used. This is inconsistent with Jenks' finding that the majority of swingers are not using condoms when being intimate with couples with whom they are familiar (Jenks, 1992). This may be an example of swingers wanting to appear to practice safe sex, as they consider that to be the social norm, however, behaving differently in practice. Further investigation should be done in this area.

Major Findings

The results of this study failed to support the hypothesis that the more agreement demonstrated on category selection between partners, the less likely the male partner would be to select One-on-One as an interest. It did support, however, the idea that the more agreement was demonstrated between partners, the less likely both partners would be to select One-on-One as an interest. This suggests a serious limitation to Varni's theory of user and encourager type husbands. This theory fails to take into account that not only male partners use or encourage their partner; female

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partners can engage in this type of behavior as well. The general idea of the theory, however, is supported. A high agreement number suggests that a couple has entered into swinging with a focus on togetherness. They have no interest in One-on-One encounters because those types of sexual meetings are not mutually beneficial for them as a couple. It is important to note that although female and male agreement number alone yielded no significant results, the couple agreement, in fact, did. Swinging is not an individualized activity. By its very nature, it is dualistic. The importance of male and female behavior separately is minimal. A focus should be maintained on the behaviors they emit as a solitary unit.

The main limitation to this study is the use of online profiles. The internet makes it easy to be anonymous, making it very easy to lie. Despite all measures take to protect against it, there is no way to assure that each profile examined was filled out by both partners individually, by a couple in general, or even by someone who is actively participating in swinging behavior. This poses issues with the study's validity and generalizability. The best solution to this problem is for future research to be conducted using face to face interview or survey methods.

The findings of the present study may present changes in the ways in which swinging is viewed from a counseling perspective. For those couples who enter into swinging in search of their own personal sexual gratification, there may be a larger issue at hand. Historically, and probably due to misconceptions about the lifestyle, all swingers have been considered to be deviant. This study, along with others before it, brings to light, however, that the swinging behavior in itself is not deviant, can actually be beneficial to a marriage, and is rather more mainstream than many other "alternative" sexual lifestyles. By deciding to swing, it does not follow that a couple is inherently bored with their marriage or that one partner has lost interest in the other. For those where swinging has become a problematic issue, however, it may be a symptom of a larger problem rather than being the main issue itself. If one is utilizing duplicitous tactics in interrelating with their partner, the issue is not the

swinging, but the manipulation of the partner in all aspects of the relationship.   These Machiavellianistic

ideals may be important in determining motivations of behavior for user type partners; however, further

research should be conducted into the Machiavellian tendencies of swingers in general. It could be

found that their ability to detach from mainstream moral views on sex and emotion is indicative of a

higher level of Machiavellianism than a general population.

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Effects of Acid and Alkaline-Mine Drainage on Functional Diversity of Microbial Communities
in Streams of southern West Virginia

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Abstract

The objective of this study was to determine the effects of acid and alkaline mine drainage resulting from coal mining have on microbial communities in streams of southern West Virginia. Microbial communities were analyzed by inoculating BIOLOG Eco (bacteria) microplates and FF (filamentous fungi) microplates. Water samples were collected from three control sites, four alkaline mine drainage impaired sites, and five acid mine drainage impaired sites. BIOLOG microplates contain different commonly occurring carbon sources along with a tetrazolium dye. As the carbon source is utilized the dye is released and produces a purple/red color. A microplate reader was used to measure absorbance at a wavelength of 590nm for the EcoPlates and 540nm for the FF microplates. The plates were read every 24 hours for 7 days. Alkalinity, pH, conductivity and heavy metal concentrations were analyzed at each site. Average well color development (AWCD) for the bacterial communities was higher for the control sites than for the acid and alkaline mine drainage affected sites. The FF microplates showed no difference in AWCD between the control sites and the acid and alkaline min drainage affected sites. The community metabolic diversity (CMD), the number of carbon substrates used, was also higher for the control sites in the EcoPlates but demonstrated no difference in the FF microplates. Principal components analysis revealed that the bacterial and fungal communities from the acid mine drainage, alkaline mine drainage, and reference streams utilized different suites of carbon sources. The results from this study indicate that acid and alkaline mine drainage has a negative effect on microbial communities in freshwater streams. Impacted microbial communities can lead to impaired ecosystems that are unable to process energy as efficiently as unimpaired streams. The high metal concentrations within the mine run-off can coat the leaf litter and make it difficult for the microbial communities to colonize and break down the litter. Leaf litter is the main energy source for freshwater ecosystems and microbial communities convert the energy within the leaf litter into an energy form that is suitable for other stream biota.

Introduction

Detrital decomposition accounts for the majority of energy flow in freshwater stream ecosystems. Energy is produced by the breakdown of terrestrial vascular plants that fall into the water (Webster and Benfield 1986). Microbes, mainly fungi and bacteria, are responsible for the majority of the breakdown of this organic matter (Findlay 2010). Webster and Benfield (1986) described organic matter processing in freshwater ecosystems in a three step mechanism. First biomass is lost directly after immersion through abiotic leaching. Microbes then colonize the leaf litter and produce extracellular enzymes that break down vascular plant tissue. Finally the conditioned litter is broken down by current abrasion or by invertebrates with the capability of shredding (Webster and Benfield 1986).

Fungi are one of many microbes that break down organic matter for use by other aquatic biota. Aquatic hyphomycetes colonize submerged plant tissue and use it as their primary source of carbon (Lecerf and Chauvet 2008). Fungi execute a variety of processes during plant litter decomposition that converts plant carbon into fungal biomass and releases carbon dioxide due to respiration. Fungi also dissolve the leaf litter into finer particles that can be used as a food source for detritivore consumers (Gulis et. al. 2006). Bacteria also aid in the breakdown of plant material after it has been partially broken down by fungal communities (Pascoal and Cassio 2004).

Acid mine drainage (AMD) creates highly stressed freshwater ecosystems that are difficult for aquatic biota to thrive in. Streams affected by AMD are typically low in pH and contain high concentrations of dissolved metals associated with mining (Hogsden and Harding 2012). AMD is the result of the exposure of sulfide minerals used in mining to weathering processes. The effects of AMD are multiplied as groundwater and surface water systems are

contaminated and minerals are carried downstream (Johnson and Hallberg 2005). The amount of leaf mass lost is reduced in those streams that contain high concentrations of heavy metals or are in the process of acidification (Pascoal and Cassio 2004). Mine runoff can also cause streams to have a net alkaline pH (alkaline mine drainage). Alkaline mine drainage occurs in watersheds that contain limestone and is the result of removal of carbon dioxide which causes an increase in pH and increases the oxidation rates of iron (Kirby et. al. 2009).

Microbial communities are strongly affected by AMD. Streams that are affected have shown lower fungi diversity, richness, and biomass than streams that are unaffected by AMD. Metal hydroxides deposition primarily controls microbial activity by limiting colonization and respiration. The depositions reduce substrate availability by coating the leaf litter (Hogsden and Harding 2012). Leaf litter breakdown rates can be severely hindered and slowed by up to twenty times in heavily acidified streams (pH of < 5, Dangles et. al. 2004; Baudoin et. al. 2008).

Community level physiological profiles (CLPPs) are used to characterize the potential metabolic diversity of a microbial community. CLPP involves inoculating a 96-well microplate (Weber & Legge, 2010; Baudin et al. 2008; Dangles et al. 2004) and tetrazolium dye (Biolog Ecoplate; Weber and Legge 2010) . Respiration or the use of the carbon source results in a reaction with the dye and the formation of a purple color. Optical density of each well is measured periodically which allows average metabolic response and community metabolic diversity parameters to be quantified. The average metabolic response describes the average respiration of the carbon sources by the community. The community metabolic diversity is calculated by the number of substrates used by the microbial communities (e.g. Classen et. al. 2003; Garland et. al. 2000; Balser et. al. 2002)

CLPPs provide a rapid tool for characterizing microbial communities and measuring their metabolic potential and diversity (Smalla et. al. 1998). The Biolog EcoPlates allow for the study and comparison between whole microbial communities in an efficient manner. The analysis of these physiological profiles can be used to compare the functional diversity of microbial communities from diverse environments. Another advantage of Biolog plates is the ability to investigate changes in microbial community in response to an environmental contaminates (Stefanowicz 2006).

Community level physiological profiles are an excellent resource for determining functional diversity of microbial communities but have drawbacks. The microplate cultures favor faster growing bacterial populations. Prior research has suggested that environmental samples are dominated by slow-growing bacteria (Konopka et. al. 1998). In addition to the growth bias, bacterial species with a high tolerance level to temperature and other factors associated with sample incubation could appear to comprise a greater proportion of the microbial community than is actually true in situ (Grover and Chrzanowski 2000; Christian and Lind 2006).

To study the effects of mine drainage on energy processing we used community level physiological profiles to monitor microbial communities in three stream types. Streams were divided into three categories; impacted by AMD, impacted by alkaline mine drainage, and unimpaired. Water samples were taken at each site to analyze microbial communities using Eco and filamentous fungi (FF) Biolog plates. Water chemistry was examined for each site by measuring, pH, conductivity, hardness, alkalinity, and sulfate and heavy metal concentrations.

Methods and Materials

A total of 12 locations were sampled. Four locations that were impaired from alkaline mine drainage, five impaired from acid mine drainage, and three reference or unimpaired streams. All streams were located in southern West Virginia.

Water samples were taken from each location using Whirlpak bags. The Whirlpak bags were washed by the particular sites stream water before each sample was taken to prevent confounding results. Community level physiological profiles (CLPPs) were used to analyze the microbial communities for each sample site. Biolog EcoPlates were used for the bacterial communities and filamentous fungi (FF) microplates were used for the fungi.

CLPPs measure the functional diversity of a microbial community. Each EcoPlate has 96 wells that contain triples of 31 of the most useful carbon sources and a tetrazolium dye (Christian and Lind 2006). Each well on the plate was inoculated with 150 µl aqueous sample. EcoPlates were then incubated at room temperature (~23°C) and analyzed by a microplate reader at a wavelength of 590 nm every 24 hours. After inoculation microplates were stored at room temperature in plastic bags to prevent desiccation. Wells were analyzed for substrate utilization patterns, rate of color change, and the diversity of substrate utilization. As the carbon substrate in each well was metabolized a purple color developed causing a higher absorbance reading from the microplate reader (BIORAD model 550).

Filamentous fungi (FF) microplates differ in that there are 95 different carbon sources on each plate. Antibiotics (streptomyocin, ampicillin, and canomyocin) were used to suppress bacterial growth in the wells. Each well on the filamentous fungi plates was inoculated with 100 µl of sample. This was done using a multi-channel micropipette. 15 mL of water sample was mixed with 150 µl of antibiotics (1µg/ml for each antibiotic) in a centrifuge tube. This solution

was then used to inoculate the plates. As the carbon sources are utilized they react with the iodonitrotetrazolium violet to form a reddish-orange color (Rice and Currah 2005). The plates were incubated at room temperature (~23°C) and analyzed every 24 hours at 540 nm using the microplate reader.

A standardized absorbance was calculated by subtracting the absorbance of the control (A1-water) well from each of the wells containing carbon sources. Average well color development (AWCD) was determined daily for each steam by calculating the mean absorbance for the 31 carbon sources on the EcoPlates or 95 carbon sources on the FF plates. AWCD represents the average respiration of the carbon sources and allows for comparison between communities. Community metabolic diversity (CMD) was also calculated for each day of incubation and shows the functional richness of a community. CMD is the number of carbon sources that demonstrated a reaction (well absorbance of >0.25). Principal components analysis (PCA) was conducted for the EcoPlates (day 6 standardized absorbances) and FF plates (day 4 standardized absorbances). PCA was conducted using the prcomp command in R (version 2.15.0).

Conductivity and pH of each stream was measured with a YSI Professional Pro meter. Water samples taken from each site were analyzed for alkalinity and hardness. Iron, aluminum, manganese, and sulfate concentrations were also tested. A HACH digital titrator was used in assessing alkalinity and harness, along with the iron concentration. Metal and sulfate concentrations were measured using a HACH DR8200 colorimeter.

Results

For the EcoPlates, the control sites had a higher AWCD than both the alkaline and acid mine drainage sites (Figure 1). The control sites also had higher CMD than both the acid and

alkaline mine drainage sites (Figure 2). Principal components analysis showed that for the EcoPlates the acid mine drainage sites were more closely related to the control sites than the alkaline mine drainage sites (Figure 3).

For the FF plates, the control sites had a similar AWCD to the alkaline and acid mine drainage sites (Figure 4). The community metabolic diversity garnered similar results. Two of the alkaline sites (White Oak Creek and Toney Fork) had a higher CMD while (Laurel Creek and Little Marsh Fork) were very similar to the control sites. One of the acid mine drainage sites (Ten Mile Fork) was much higher while one (Morris Creek) was much lower than the control sites. The remaining two acid sites were similar to the controls (Figure 5). Principal components analysis for the FF microplates demonstrated opposite results than the PCA results for the EcoPlates. PCA showed a strong similarity between the alkaline mine drainage sites and the control sites (Figure 6).

The 12 sites used in the study were place into three categories (control, acid, alkaline) based upon their pH and conductivity relative to one another. The Three control streams had pH values ranging from 7.50 to 8.10 (Table 1). The controls had conductivity between 181.6 µS/cm and 386.1 µS/cm. Acid mine drainage impaired streams had a much lower pH ranging from 2.71 µS/cm to 5.47 µS/cm. These streams also had a much higher conductivities than the control sites ranging from 362.7 µS/cm to 954.0 µS/cm. The alkaline sites were by far the most conductive though with values ranging from 782.0 µS/cm to 1175.0 µS/cm. These sites also had a much higher pH than the controls (8.01-8.33).

Table 1. Water Chemistry Data for Test Sites

Site Name	Site Type	pH	Conductivity (µS/cm)	Aluminum (mg/L)	Manganese (mg/L)
Sycamore Creek	Control	7.98	234.3	0.047	0.8
Camp Creek	Control	7.50	102.1	0.006	0.4
Brush Creek	Control	8.10	386.1	0.000	0.5
Paint Q.3	Acid Mine Drainage	3.50	495.1	-	-
Paint Q.5	Acid Mine Drainage	2.71	991.0	-	-
Ten Mile Fork	Acid Mine Drainage	5.47	928.0	-	-
Craig Hollow	Acid Mine Drainage	3.83	362.7	0.029	-
Morris Creek	Acid Mine Drainage	3.51	954.0	0.392	-
Toney Fork	Alkaline Drainage	7.94	1335.0	0.036	0.1
Laurel Creek	Alkaline Drainage	8.08	1558.0	0.000	0.4
White Oak Creek	Alkaline Drainage	8.28	2328.0	0.000	0.4
Little Marsh Fork	Alkaline Drainage	8.33	1056.0	0.023	0.5

Conclusion

The ECOPlate data in this study supports the previous research that indicates that acid

and alkaline run-off from mines adversely affects the microbial communities of freshwater

streams. Kim et. al. (2009) used community physiological profiles (BIOLOG EcoPlates) to

examine the affects an abandoned copper mine on groundwater. This study found that the

community activity of microbes decreased with increasing concentrations of heavy metals from

the mine run-off. Dangles et. al. (2004) showed a correlation between increasing stream acidity

and decreased microbial respiration. Leaf biomass breakdown rates varied 20-fold between the most acidic and the control sites for that same study. A diminished microbial community can be an indicator for overall stream health.

The fungal community was not impacted in the same manner as the bacterial community from mine impacted streams. Overall no difference was shown in either CMD or AWCD development for the fungal communities in each stream type tested. PCA of the fungal communities did reveal that the communities in each stream type were utilizing different suites of carbon sources. This could be an indication that the community composition in the mine impacted streams is different than the control streams. Duarte et. al. (2008) conducted a study that showed that a high diversity of fungal species within a stream can mitigate the impact of a decrease in water quality. Other factors contributing to the variability of the fungal community results could include the fact that antibiotics were used to suppress bacterial growth in the filamentous fungi plates and could have been used in incorrect amounts. The lag time and then growth in the fungal communities could have also been caused by bacteria that survived the initial antibiotic inoculation. Conductivity in the tested streams was high which is indicative of high amounts of dissolved metals in the water (Table 1). High concentrations of dissolved metals can coat leaf litter and other organic material making it difficult for fungal communities to colonize and break down these materials.

Further research could show what effect dissolved metal concentrations have on microbial communities in freshwater ecosystems. In unimpaired streams energy processing begins with the breakdown of plant tissue by microbial communities. This breakdown of energy converts plant biomass to a form of energy that is utilized by other animals in the stream. Mine drainage creates a stressful environment (pH and metal concentration) that microbial

communities may not be able to persist in. Impaired streams that contain diminished or

unhealthy microbial communities are at a greater risk of losing biodiversity at all other trophic

levels when compared to unimpaired streams.

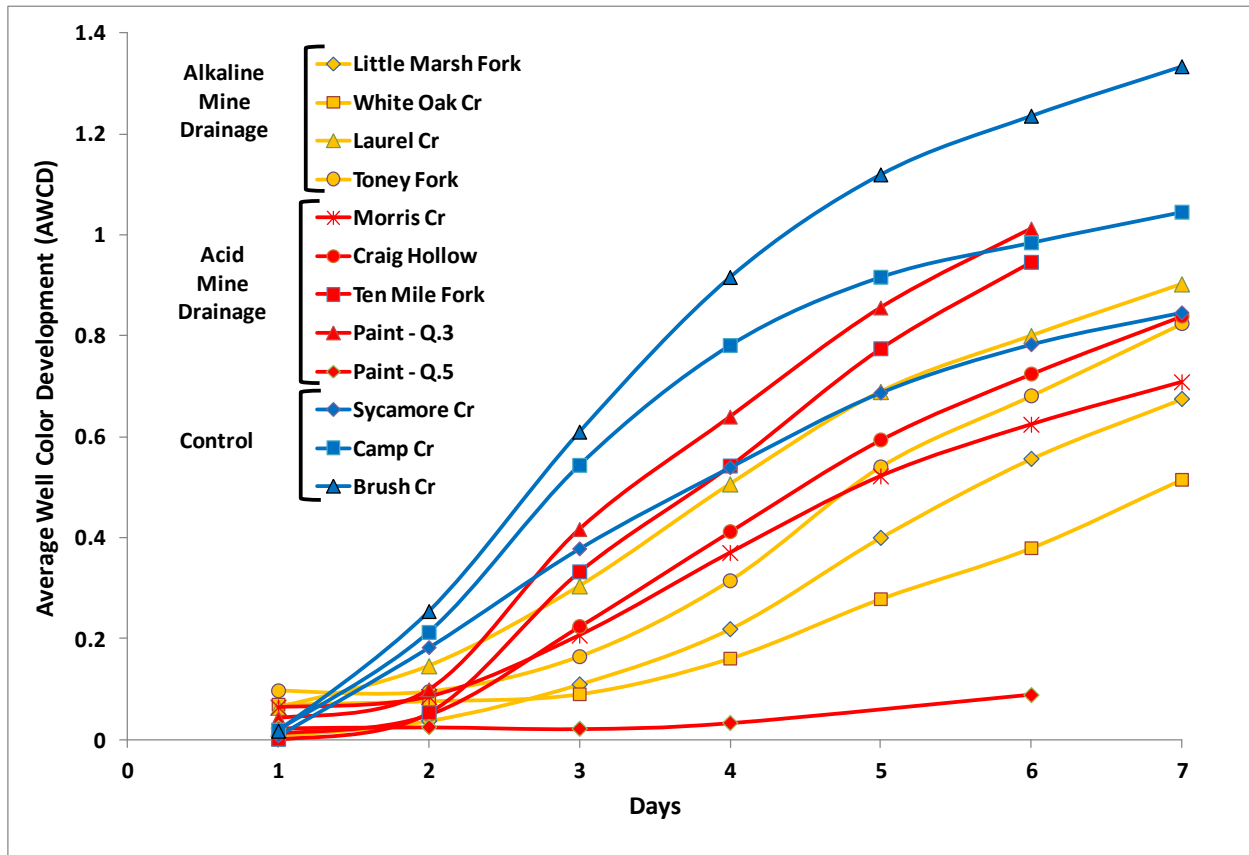Figure 1. Average Well Color Development for EcoPlates

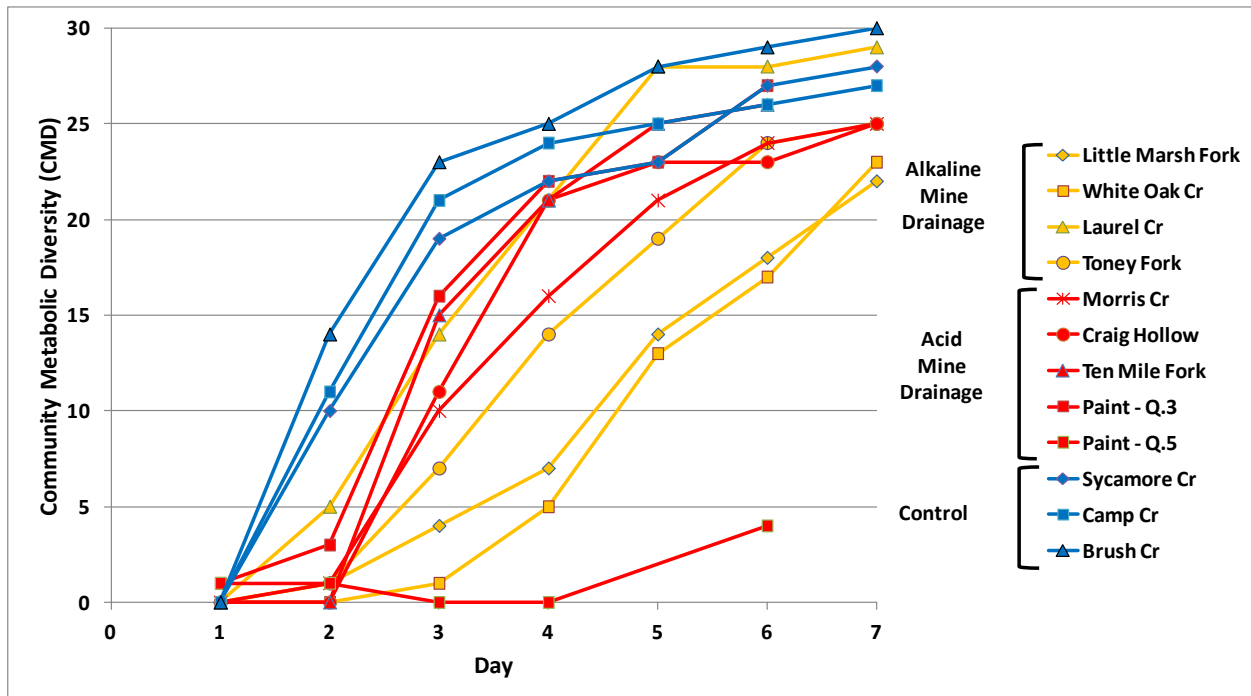Figure 2. Community Metabolic Diversity for EcoPlates
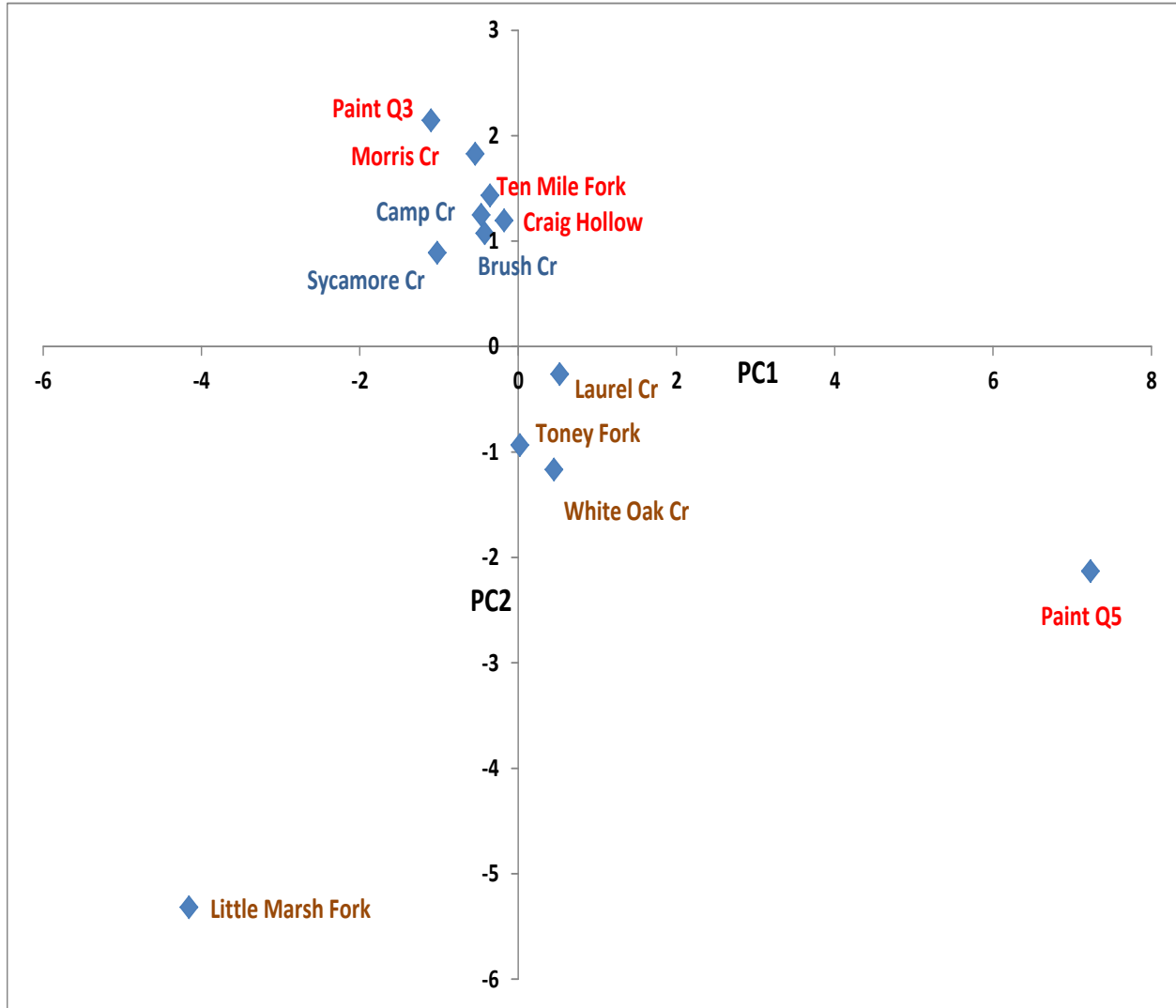
Figure 3. PCA for EcoPlates

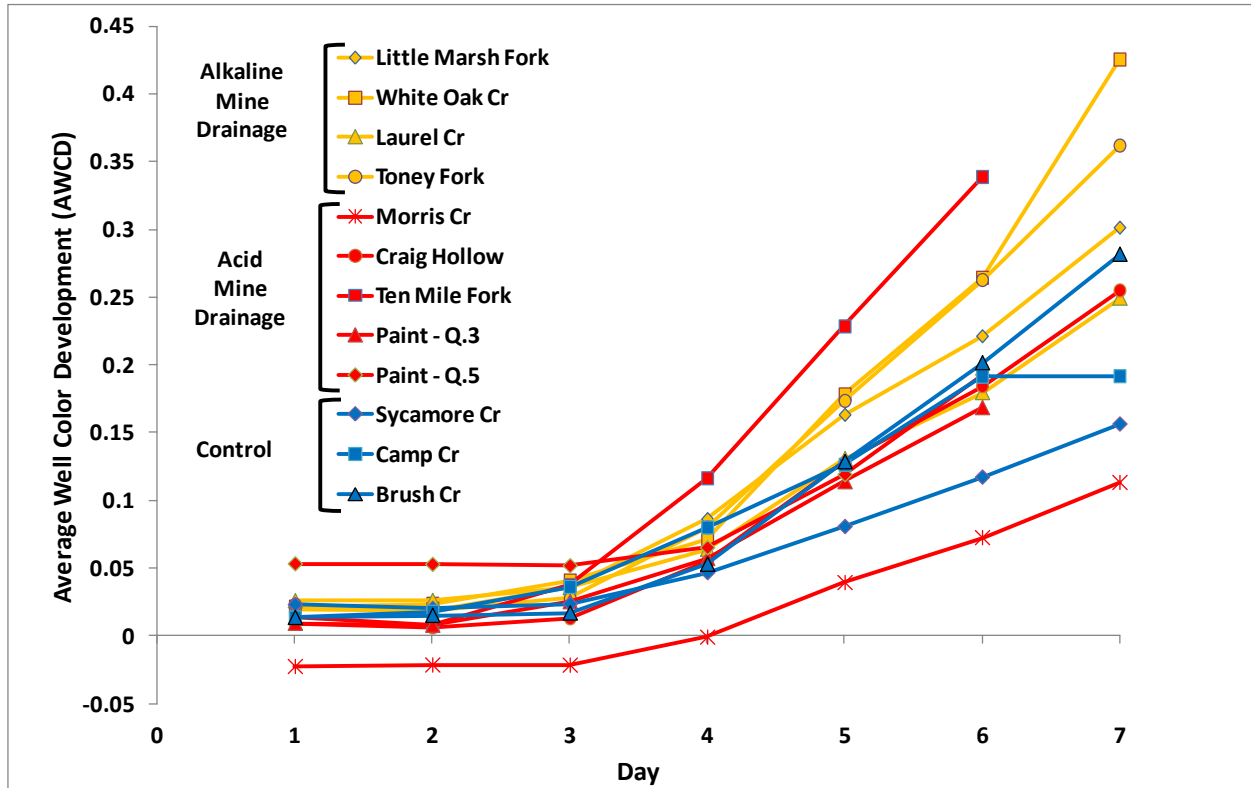Figure 4. Average Well Color Development for FF microplates
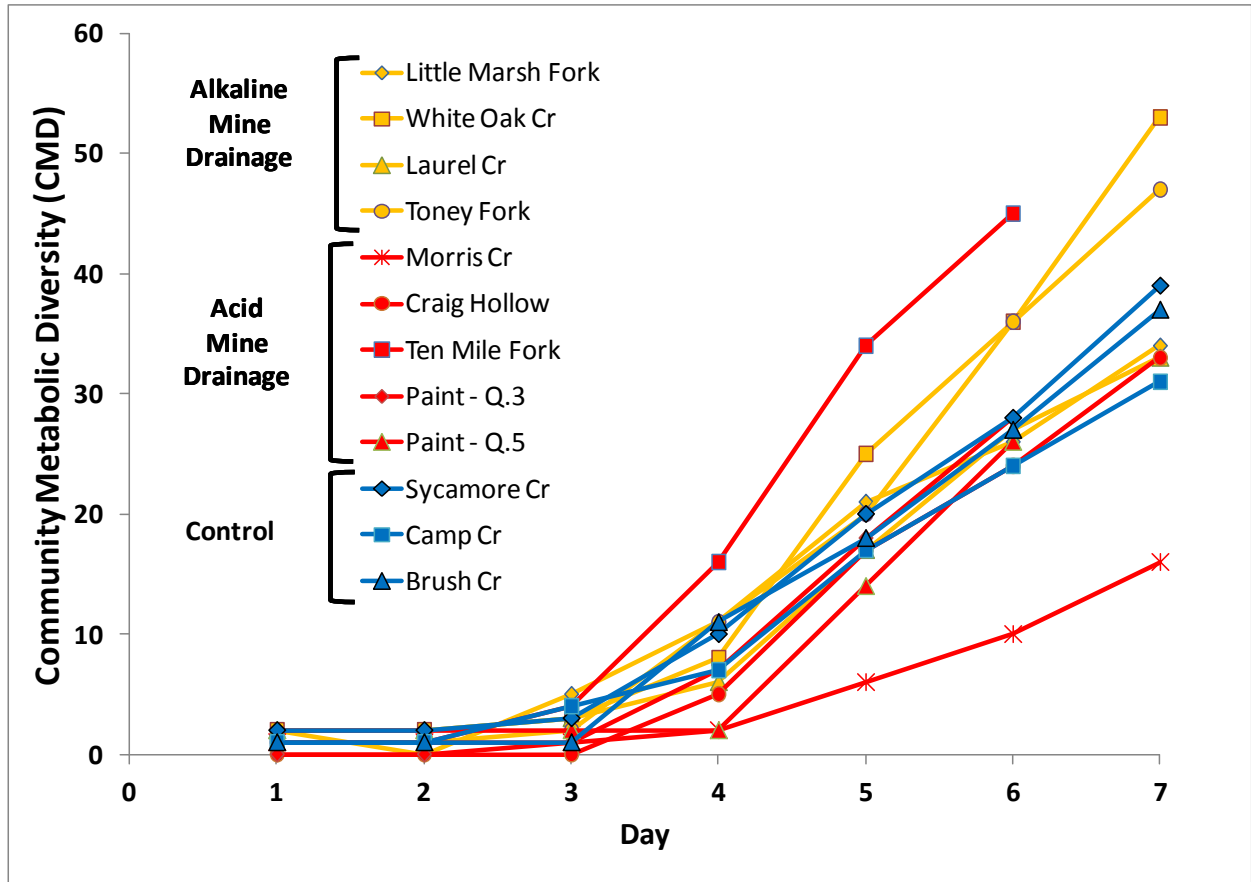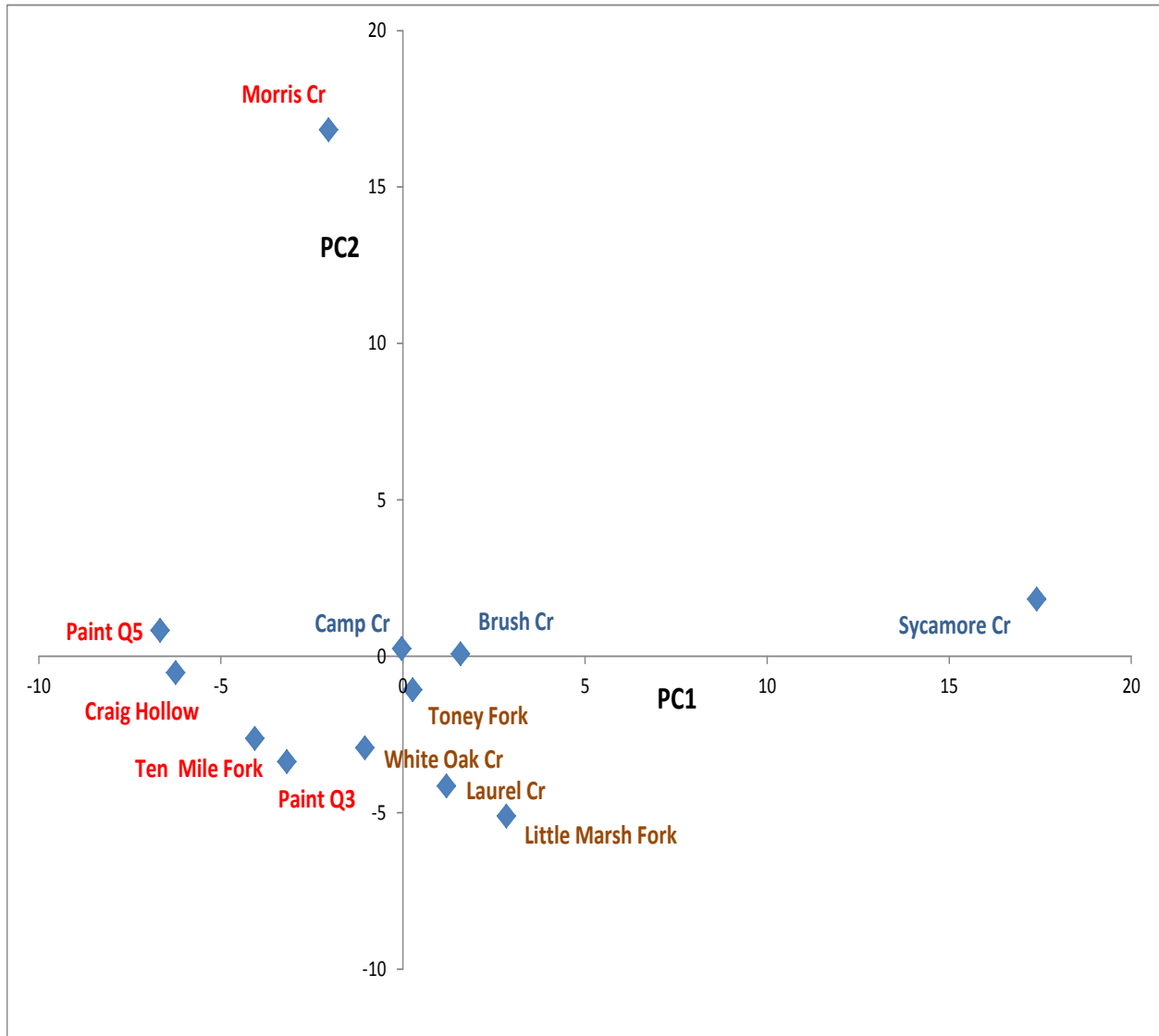
Figure 5. Community Metabolic Diversity for FF microplates

Figure 6. Principal Components Analysis for FF (Filamentous Fungi) Microplates

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