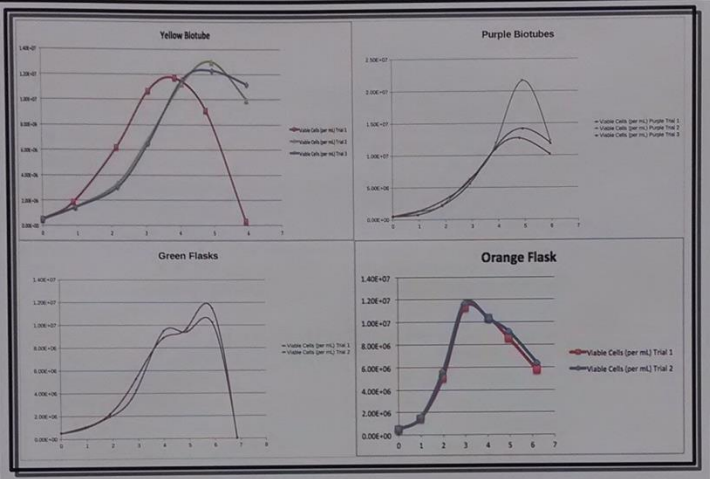
Abstract

In the research conducted, we are tested the growth capacities for different vessels that may be beneficial in growing capacity and cost difference. This research is not only important for the matters of cost effectiveness and optimizing growth conditions of cells that we are given, but also in experiments across the globe in the same aspects. In the research we are grew Sf9 cells in Expression System medium ESF-921, it would appear that between the two different biotubes that we used there was not much of a difference in the growing capacity. These biotubes were a general purple centrifuge tube with a loose cap and a yellow biotube with a membrane cap. These results would help conclude that there was not much need for the more expensive membrane caped yellow Biotubes. The Green and Orange Flasks used were generally more clumpy and had much lower density rates compared to the flasks. Overall, it would appear that not only are the Biotubes a better option but also that the Purple, cheaper Biotubes , had the best cells/mL density.



Introduction

Sf9 cells generally have a doubling time of 24-30 hours. They are Spherical shaped contained from Insect cell lines. The cells grow in a medium ESF-921 which has been donated from Expression Systems. Sf9 cells generally grow better in a suspension culture but can also grow in a monolayer.

Cells generally grow slower in temperatures under 26 degrees C and increase the doubling times of the cells between 28 and 30 degrees. According to this statement 27 degrees is the generally used temperature to grow Sf9 cells. Anything above 30 degrees and the cells should not be used, they decrease viabilities and are no longer healthy and may have degraded the cells.

Results and Discussion

The Yellow Biotubes were initially compared to the Purple Biotubes because of cost differences. The Yellow Biotubes followed the similar pattern of the Purple Biotubes in the growth curve. However the Purple Biotubes, on average, reached a much higher density than the other vessels. The Yellow and Purple Biotubes followed a similar pattern as was expected in any growth curve of Sf9 cells. The relative time length to meet the maximum density for cells were similar between the Purple and Yellow Biotubes, concluding that this was not to much of a differential factor in the benefits between the to tubes.

As for the flasks they did not reach the densities that the Biotubes reached. The Green Flasks had a problem with clumping, making counting, where the density may have been the highest, very difficult. The Orange Flasks did not clump as much as the Green Flasks but they didn't thrive to the high quantities that the Biotubes reached. The Green Flask also took the longest to reach the highest density it could which would be beneficial if the cells didn't clump so easily.

Based on the data from the graphs above and the table representing the Maximum Density Summary, the Purple Biotubes represented the best option for growing Sf9 cells at 27 degreesC. It represented the highest Sf9 cell count, very similar data between trials and an average amount of time to hit the highest density.

References

Life technologies, invitrogen (2013) Insect Cell Lines Manual, Document Number 25-0127 Catalog Numbers B821-01, B825-01, B855-02.

Methods

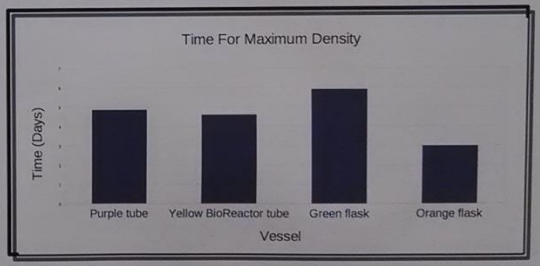
All experiments were conducted in the WSU Biology Department Animal Cell Culture Facility using good aseptic technique. Cells were cultured in the absence of antibiotic to allow for rapid detection of contamination, which was not encountered.

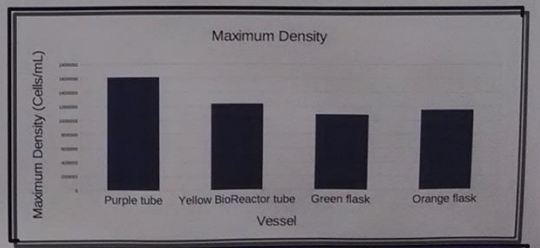
The experiment was set up so that each day the tubes could be counted. From there, mapping the counts of Sf9 cells and the time of day until the cells started to die off. We could the calculate the viability of the cells

Each tube/flask was set up with 20mL of ESF 921 medium from Expression Systems, with a starting Sf9 cell count of .5*10^6 cells/mL. Samples for cell counts were done by taking .45mL of the cells and .05 mL of Tryphan Blue in a microcentrifuge tube, and counted on a hemacytometer. 2 counts were taken per sample to calculate the average density of the vessel.

The density of the vessel was taken by:

(the average count on the hemacytometer)*1.1 *10^4





Future Work

Multiple trials need to be completed to determine whether the data is reliable and a demonstration of how the Sf9 cells will continue to work between different times of the year. Different factors such as weather and dry air may play a huge role in these experiments based on the the growing conditions. These may have factored into some of the data on the early trials starting in November up to the latest trials starting in March.

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ABSTRACT

Reference/Citation: Godek SF, Bartolozzi AR, Burkholder R, et al. Core temperature and percentage of dehydration in professional football linemen and backs during preseason **practices. Journal of Athletic Training. 2006; 41(1): 8-14.**

Clinical Question: How does the hydration status of an athlete affect the core body temperature in relation to heat related illness?

Data Sources: Studies published in English were identified through database searches on PubMed, Academic Search Premier, and EBSCOhost (2007-2014) using the terms hydration status, core body temperature, heat related illnesses, and exercise. These terms were **used in a variety of combinations in the search to find suitable articles.**

Study Selection: Studies were included that provided participant eligibility criteria and, therefore, could be assessed using the Physiotherapy Evidence Database (PEDro) scale. Studies were selected based on hydration status data and its correlation to core body temperature. Selection was also based on how core body temperature was measured and whether it was affected by outside measures.

Data Extraction: The abstracts that were located through the search strategies were reviewed, and potentially relevant abstracts were selected. At least 3 outcomes that were measured pre and post exercise had to be reported such as changes in core temperature (Tc) over time, group differences in Tc and %DHY and the relationships between Tc and %DHY. Despite reports of a direct relationship between hydration status and Tc, the inability to detect a correlation in field studies should not be viewed as unusual, particularly at mild to moderate levels of dehydration.

Main Results: Statistically significant changes were observed within Division II football players during a singular pre-season practice. Outcomes included gastrointestinal temperature (ºC) pre-practice 37.35 + .034 and post-practice 37.89 + 0.49(p<0.0001), urine-specific gravity pre-practice 1.009 + 0.008 and post-practice 1.020 + 0.001 (p<0.0001) and body weight (kg) changes pre-practice 84.90 + 7.85 to post- practice 83.97 + 7.62 (p<0.0001). There was a noted linear trend in core temperature for Linemen and Backs during pre-season practice and maximal core temperature was also higher in Lineman (38.65 + 0.48ºC) than Backs (38.44 + 0.32ºC). As core body temperature rose participants consuming cold water had significantly (p=0.024) smaller rises in core temperature (0.83º) compared to room temperature water (1.13º). Drinking cold water can significantly mediate and delay the increase in Tc during a practice.

Conclusions: Considerable controversy regarding fluid replacement during exercise exists as the hydration status of an athlete is an important aspect of preventing heat related illnesses. However, maximal core body temperature is not associated with sweat rate in Division II football pre-season practices and therefore should not be the single greatest factor when dealing with prevention of heat related illness. The most influential factor affecting the rise in core temperature is exercise intensity and/or the inability to dissipate heat.

Key Words: hydration status, heat related illnesses, core body temperature, exercise

INTRODUCTION

- The body's hydration status plays a significant role in the body's core temperature regulation
- The body's core temperature is the biggest component in heat related illnesses and being able to tell which heat related illness is present in an athlete
- There have been many studies on what has the greatest effect on the core body temperature when exercising in the heat and humidity
- Hydration status of a patient and how to rehydrate a patient after practice has become a large topic that has been cropping up in the field of Athletic Training
- The body's hydration status plays a significant role in the body's core temperature regulation
- The body's core temperature is the biggest component in heat related illnesses and being able to tell which heat related illness is present in an athlete
- There have been many studies on what has the greatest effect on the core body temperature when exercising in the heat and humidity
- Hydration status of a patient and how to rehydrate a patient after practice has become a large topic that has been cropping up in the field of Athletic Training
- Voluntary fluid intake and sweat responses, even when athletes do the same exercise at the same time in the same environment vary between individuals.
- According to research, if athletes allow themselves to become dehydrated during exercise, they will experience reduced sweat rates and elevations in core body temperature, which increase their risk of developing a life threatening heat disorder
- Although some research states that hypohydration is not associated with increases in core body temperature to levels that would be considered excessive
- Core temperature increases with increasing water deficit indicates that physiologic adjustments are both necessary and effective for maintaining heat loss when sweat rate and skin blood flow are reduced
- Hydration status of a patient and how to rehydrate a patient after practice has become a large topic that has been cropping up in the field of Athletic Training
- Exertional heat illness occurs when the body is unable to effectively cool itself during exercise and lacks the ability to properly replenish the energy spent on exercise
- Dehydration, measured by 1–2% of the pre-activity body weight, disturbs physiologic function and increases the risk of developing exertional heat illness
- Research has investigated the impact of water temperature on performance measures as well as core temperature regulation to determine the ideal fluid choice for optimal exercise performances
- Pre-hydrating and acute cold exposures are accompanied by concomitant increases in diuresis, which may limit their usefulness prior to prolonged event.
- If athletic trainers can prevent heat related illnesses by properly hydrating their patients, then preventing heat related illnesses just got a lot easier

CLINICAL QUESTION

How does the hydration status of an athlete affect the core body temperature in relation to heat related illnesses?

DATA EXTRACTION

- Randomized cross-over study design
  - The randomized cross-over design is beneficial as it is easier to control outside biases
- Body weight measured before and after activity
  - The body mass weighing looks for differences in water weight lost throughout activity
- Body temperature measured by:
  - Ingestible thermometers, Rectal thermometers, Skin temperature
  - Body temperature is useful to determine how the body reacts to stresses placed upon it during activity
- Fluid intake measured during activity
  - Measuring fluid intake is useful to determine how fluid affects body temperature during activity
- Urine specific gravity measured pre-activity
- Urine output measured post-activity
- Heart rate and blood pressure measured pre/during/post activity

MAIN RESULTS

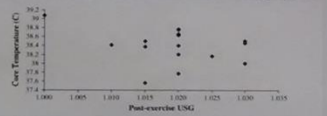
Changes Observed During Practice Session (T_{GI} = Gastrointestinal Temperature; USG = Urine Specific Gravity

	Pre exercise	Post exercise	*t*	*p*
T_{GI} (°C)	37.35 ± 0.34	37.89 ± 0.49	8.23	<0.0001
USG	1.009 ± 0.008	1.020 ± 0.001	7.58	<0.0001
Body weight (kg)	84.90 ± 7.85	83.97 ± 7.62	9.25	<0.0001

Batchelder BC, Krause BA, Seegmiller JG, Starkey CA. Gastrointestinal temperature increases and hypohydration exists after collegiate men's ice hockey participation. *Journal of Strength and Conditioning and Research.* 2010; 24(1):68-73.

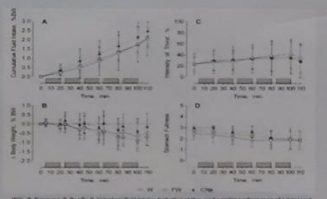
- As core body temperature increases, the total body weight in kg decreases

Correlation Between The Change In Urine Specific Gravity (USG) And The Change In T_c (r=0.31)



Batchelder BC, Krause BA, Seegmiller JG, Starkey CA. Gastrointestinal temperature increases and hypohydration exists after collegiate men's ice hockey participation. *Journal of Strength and Conditioning and Research.* 2010; 24(1):68-73.

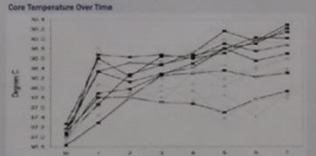
- As core body temperature increases, the urine specific gravity increases as well



Wilk, B. Timmons, B. Bar-Or, O. Voluntary fluid intake, hydration status, and aerobic performance of adolescent athletes in the heat. *Applied Physiological Nutrition Metabolic.*

- A = The better tasting the fluid, the more likely that subject was to replenish the fluid lost
- B = Decreased thirst
- C = Lower loss of body weight during exercise)

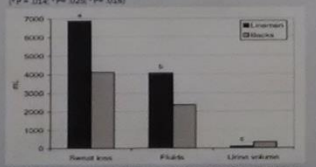
Core Temperature Over Time



Godek SF, Bartolozzi AR, Burkholder R, et al. Core temperature and percentage of dehydration in professional football linemen and backs during preseason practices. *Journal of Athletic Training.* 43(2): 8-14.

Total Volume Of Sweat Loss, Fluids Consumed And Urine Volume Produced In Morning And Afternoon Practices Combined

(* P = .014; † P= .025; ‡ P= .018)



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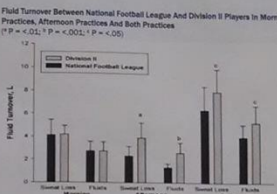
Fluid Turnover Between National Football League And Division II Players In Morning Practices, Afternoon Practices And Both Practices

(* P = <.01; † P = <.001; ‡ P = <.05)



Godek SF, Bartolozzi AR, Peduzzi C, et al. Fluid Consumption and Sweating in National Football League and Collegiate Football Players With Different Access to Fluids During Practice. *Journal of Athletic Training.* 45(2): 128-135.

CONCLUSIONS

- Hydration status and restrictive clothing impeded appropriate heat dissipation and strained athletes thermoregulation systems which leads to an increased core body temperature and possible heat related illnesses
- Hyperhydration decreases cardiovascular and thermoregulatory stress on the body
- Core temperature is not necessarily associated with either percentage of dehydration or sweat rate
- Replacing large daily sweat losses with hypotonic fluids may predispose athletes to low blood-sodium levels
- Players that get water only during water breaks replaced the same volume of fluid as those players that had constant access to both water and sport drinks
- No link can be found between body mass loss and core temperature or the development of hyperthermia in the field

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Introduction

- 25.8 million people in the U.S. have diabetes[1], 3 million live with Type 1 diabetes[6]
- Diabetes is the 7th leading cause of death; death is twice as likely for people with diabetes[1]
- Management can affect emotions such as anxiety, stress, anger, depression, and denial[1]
- Despite the increased risk, diabetes can be controlled and risks minimized by adherence to self-care behaviors[2]
- A lack of social support and presence of stigma are theorized to have a negative effect on adherence[3]
- Higher self-efficacy is associated with higher self-rated adherence[4]
- The self-as-doer identity (i.e., the degree to which individuals perceived themselves as the doer of their behaviors) predicted greater frequency of exercise, insulin adherence, eating a healthy diet, and foot checking[5]
- Research on how stigma and a self-as-doer identity affect individuals with diabetes is limited

[1]America Diabetes Association, 2011; [2]American Diabetes Association Standards of Medical Care in Diabetes, 2011; [3]Bandura, 1996; [4]Senécal, Nouwen, & White, 2000; [5]Brouwer & Mosack, 2013; [6]IDRF, 2013

Hypotheses

- Social support, self-efficacy, and motivation will have a positive relationship with self-care behaviors
- Stigma will have a negative relationship with self-care behaviors
- Social support, self-efficacy, and motivation will predict an increase in self-care behaviors
- Stigma will predict a decrease in self-care behaviors

Methods

Participants

- 166 Participants
  - 134 Women; 31 Men
- Ages 18-64 years old
  - (*M*=30.99, *SD*=10.71)
- Diagnosed for an average of 16.87 years (*SD*=11.30)
- 89.8% Caucasian, 2.4% African American, 2.4% Biracial, 5.4% Other

Procedures

- Participants completed an online survey

Analysis

- Pearson's correlations
- Multiple linear regressions

Measures

- Demographics
- Summary of Diabetes Self-Care Activities[1]
- Self-as-Doer Diabetes[2]
- Treatment Self-Regulation Questionnaire[3]
- Diabetes Care Profile (Social Support Subscale Only)[4]
- Stigma Scale for Chronic Illness[5]
- Diabetes Self-Efficacy[6]

[1]Toobert, Hampson, & Glasgow, 2000; [2]Brouwer & Mosack, 2013; [3]Williams, Freedman, & Deci, 1998; [4]Fitzgerald, Davis, Connell, Hess, Funnell, & Hiss, 1991; [5]Rao et al., 2009; [6]van der Bijl & Shortridge-Baggett, 2001

Results

- Support needs, support attitudes, and support received were not significantly correlated with self-care behaviors
- Stigma was not significantly correlated with self-care behaviors
- Autonomous and controlled motivation were significantly correlated with self-care behaviors
- Self-efficacy and self-as-doer identity were strongly and positively correlated with self-care behaviors

Means, Standard Deviations, and Correlation Coefficients

Variables	M (SD)	1	2	3	4	5	6	7	8
1.Self-Care Behaviors	4.64 (.93)								
2. Self-as-doer	3.37 (.54)	.48**							
3. Support Needs	3.10 (1.15)	-.12	-.18*						
4. Support Received	3.11 (1.14)	.05	.18*	.28**					
5. Support Attitudes	3.90 (.82)	-.14	.14	-.06	.35**				
6. Self-Efficacy	4.05 (.64)	.59**	.43**	-.11	.17	.06			
7. Stigma	1.84 (.69)	-.07	-.08	.19*	-.13	-.41**	-.19*		
8. Controlled Motivation	34.48 (8.92)	.17*	.18*	.33**	.47**	.03	.13	.13	
9. Autonomous Motivation	31.91 (5.82)	.27**	.38**	.05	.33**	.07	.26	-.08	.52**

*p<.05, **p<.01

Regression Analyses for Predicting Self-Care Behaviors

	B	*SE*	β	sr^2	p
Self-as-Doer	.42	.14	.25	.05	<.01
Support Needs	-.06	.07	-.07	.004	.37
Support Received	-.02	.10	.02	.0002	.84
Support Attitudes	-.25	.11	-.22	.04	<.01
Self-Efficacy	.60	.11	.43	.15	<.001
Stigma	-.08	.01	-.06	.0027	.47
Controlled Motivation	.01	.01	.06	.002	.53
Autonomous Motivation	.01	.01	.07	.003	.44

- All factors contributed approximately 43.1% of the total variance in self-care behaviors, R^2 = .431, $\Delta F(8,111)=10.51$, p<.001.
- Self-efficacy, support attitudes, and self-as-doer identity were significant individual contributors
- Self-efficacy was the strongest individual contributor

Discussion

- Overall, hypotheses were partially supported. Results suggest that support attitudes, self-efficacy, and a doer identity may help individuals with diabetes adhere to a treatment regimens
- Health care providers might consider interventions focused on developing a self-as-doer identity for self-care behaviors and building self-efficacy related to diabetes care. Additionally addressing attitudes about support might also improve self-care behaviors
- Contrary to our hypotheses, diabetes-specific social support needs and support received were not associated with self-care behaviors.
  - Perhaps general social support or support in other areas of life not related to diabetes self-care may be more beneficial for adherence to self-care behaviors
- Stigma was also not related to diabetes self-care behaviors, which is contrary to the hypotheses
  - Type 1 diabetes may not be seen as a stigmatizing disease due to the easily hidden self-care behaviors and that certain self-care behaviors are not stigmatizing, such as eating a healthy diet
  - Stigma may therefore not be as important of a concern in treatment adherence for diabetes as it is with other chronic illnesses.
- Future research might include using a different definition of social support and different recruitment methods. Researchers might also continue to explore causal effects of self-as-doer identity and self-care behaviors.

Funding for this project was provided by the WSU Undergraduate Student Research and Creative Projects Grant

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Abstract

Our goal for our project was to figure out what made Paperny decide to make an unethical decision and Andre make a ethical one.

Introduction

We interviewed Professor Andre about his ethical dilemma and compared it to Justin Paperny's unethical decisions.

Professor Andre

Professor Andre had been working in his Industry for 28 years when he was confronted with an ethical dilemma. He had a family to support and a mortgage to pay for, yet he still decided to resign. His values of religion, family, and reputation helped him make his decision.

Justin Paperny

Justin was fresh out of college and trying to make a name for himself when he took his opportunity to steal from his boss and participate in a Ponzi Scheme. Justin, once a student athlete with high principles, turned into a felon who served 18-months for fraud.

Dilemmas

Professor Andre was asked to fix the books at a previous employer. Justin was taking commonsion without his Senior Partner knowing, then got sucked into a Ponzi Scheme.

Conclusion

What we have concluded about the ethical dilemma between Justin Paperny and Professor Andre is that experience contributes to the most to an ethical dilemma. What we got out of our project was that even with similar upbringings, when an opportunity arises, experience help in determining which decision to make.

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Objectives

This study examined fish abundance and diversity in different habitat patches within a large floodplain river to determine:

- if there is a relationship between total number of individuals and gross primary production (GPP) or ecosystem size;
- if there is a relationship between number of species present and GPP or ecosystem size.

Methods

Study Area

Samples were collected between July and August 2014 in the Upper Mississippi River between Brownsville, MN and Alma, WI. The Upper Mississippi River is a complex, large river system with many branches frequently entering and exiting the main channel. Slackwater patches, areas of little or no flow are also abundant across the riverine landscape. Samples were taken from connected backwaters and floodplain lakes within the riverine landscape.

Sample Methods

- Fish were collected using a boat electrofisher and captured by net during three 4 - 8 min runs for each site.
- Catch per unit effort (CPUE) was calculated for each species within a site as well as the total number of species and CPUE for total number of individuals collected.
- Net primary production and respiration was calculated using the light bottle/dark bottle technique. Five-L cubitainers (n = 3) were placed in the water at each site 4 – 6 hr.
- Ecosystem size of each site was measured using ArcGIS and digital topographic maps provided by the Upper Midwest Environmental Sciences Center, US Geological Survey, La Crosse, WI.
- Linear regression analysis in SAS was used to determine if relationships existed.

Representative Study Site

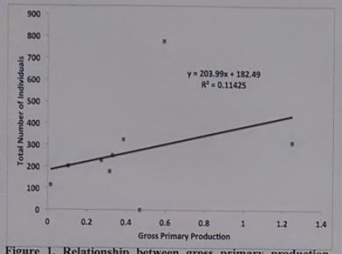

Figure 1. Relationship between gross primary production (mg O_2/L/hr) and the total number of individual fish caught (CPUE). Fish were collected in habitats in the Upper Mississippi River between July and August 2014. There was no significant relationship (p = 0.3105).

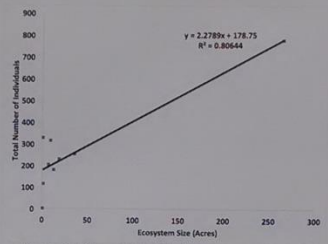

Figure 2. The relationship between ecosystem size (acres) and total number number of fish (CPUE). Fish were collected in habitats in the Upper Mississippi River between July and August 2014. The relationship was significant (p = 0.0010).

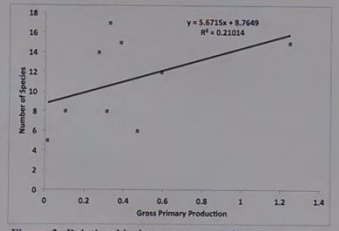

Figure 3. Relationship between gross primary production (mg O_2/L/hr) and total number of fish species. Fish were collected in habitats in the Upper Mississippi River between July and August 2014. There was no significant relationship (p = 0.1695).

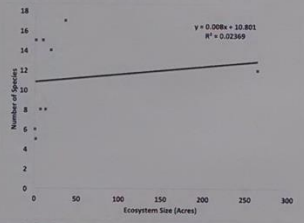

Figure 4. Relationship between ecosystem size (acres) and total number of fish species. Fish were collected in habitats in the Upper Mississippi River between July and August 2014. There was no significant relationship (p = 0.6925).

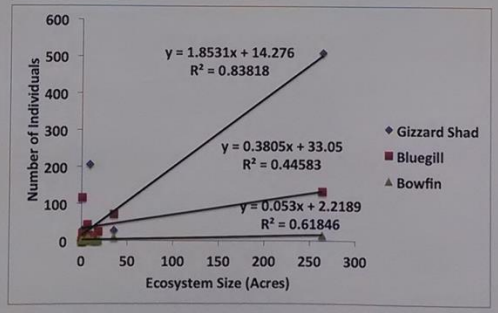

Figure 5. Relationship between ecosystem size and the CPUE of bluegill, bowfin, and gizzard shad. Fish were collected in habitats in the Upper Mississippi River between July and August 2014. These were the only species with a significant response to ecosystem size (p < 0.05).

Results

- No correlation was evident between gross primary production and the number of individuals present (Figure 1).
- There was a significant correlation between ecosystem size and the number of individuals present (Figure 2).
- No relationship was seen between gross primary production and the number of species present (Figure 3).
- No relationship between ecosystem size and the number of species present (Figure 4).
- There was a significant correlation between ecosystem size and the CPUE of bluegill, bowfin, and gizzard shad (Figure 5).

Conclusions

- The lack of a correlation between GPP and number of species and total abundance of fish indicates that productivity is not a driver of community structure. Productivity has also been shown to not influence food chain length in aquatic ecosystems (e.g., Vander Zanden & Fetzer 2007).
- We hypothesized that the number of species would increase with ecosystem size through greater availability of niches. This was not the case, as evidenced in the lack of correlation between patch size and number of fish species present. Instead, total number of individuals increased for species commonly found in slackwater patches.

Two possible reasons for a numerical response to ecosystem size are: (1) greater patch size leads to greater availability of resources; and (2) another physical attribute accounts for changes in species composition. Ecosystem size has been attributed to longer food chains (Post 2000) but increased niche availability was proposed as the primary causal mechanism. As we describe, our study does not support this. More likely, a combination of size and the physical complexity (e.g., measures of habitat morphometry) form the basis of shaping community structure. Large patches can be either quite simple or complex depending on the range of depths present and other structures (different substrate types, woody debris) that define their character. Examination of these features along with measures of community composition are needed to better understand the nature of riverine landscapes.

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Acknowledgements

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Abstract

Invertebrates play an important role in the soil. They help with the decomposition process and help with soil aeration, along with many other services. The purpose of this research was to determine the soil diversity and abundance of Invertebrates in selected areas around the Winona State University campus. It was hypothesized that species diversity and abundance would be highest at locations which are not affected by pesticides application or by soil compaction caused by high traffic areas (pedestrians, motor vehicles). Soil samples were taken from locations (n=4) on campus, and these included: west campus, IWC, Main campus and Garvin Heights. Samples (1 per location) were collected once in November, 2013 and later on (3 per location), during spring 2014. The soil invertebrates were collected from each soil sample using the Berlese Apparatus. The computation of species richness and abundance was pursued through an employment of the Simpson index of diversity. A presentation of the findings from this study will be provided with this poster and with more discussion and implications for the importance of biodiversity in soil systems.

Introduction

Soil invertebrates relationship with soil hasn't received much attention until more recent years. In fact, without the organisms, the soil wouldn't be anything like it is today (Lavelle et al., 2006). Soil invertebrates are needed in the soil to help with soil aeration and decomposition. These soil organisms play an important role in "recycling" plant and animal debris, where in many cases the organic matter released from the decomposer is often consumed many different times by different organisms in the soil (Nardi, 2003). The organic matter being released from the decomposers will eventually transform into Humus—an important part to maintain healthy soil. Humus is made up of plant materials that are hard to digest, like cell walls, and also bacteria from the digestive tract of these decomposers. Humus contains nutrients along with water and attaches to minerals which make it easy to reach plant roots. The higher the population and diversity of organisms in the soil, leads to healthier and a more functional soil food web, since organisms play different roles in the soil (Nardi, 2003).

Materials and Methods

Soil was sampled once during fall 2013 and three times during the spring 2014 semester. All samples were approximately 16 ounces of soil, which were placed into the Berlese Apparatus shown in Figure 1. Soil was dried using the heat lamps, and invertebrates in the soil would go through a filter into 70% ethanol container. Samples were then observed under microscope and counted based on the number of species and population of each. Simpsons Index was then used to calculate diversity.

Figure 1. Berlese Apparatus

Data

Fall 2013		
Species (i)	Abundance (n)	Relative Abundance (Pi)
White Mite	11	0.145
Spider Mite	10	0.132
Nematode	10	0.132
Brown Mite	14	0.184
Springtails	18	0.237
Ant	5	0.066
Flies	6	0.079
Small Worm	2	0.026
Total	76	

Spring 2014 (Sample 1)		
Species (i)	Abundance (n)	Relative Abundance (Pi)
White Mite	12	0.176
Spider Mite	16	0.235
Nematode	11	0.162
Brown Mite	13	0.191
Springtails	13	0.191
Ant	0	0.000
Flies	0	0.000
Small Worm	3	0.044
Total	68	

Spring 2014 (Sample 2)		
Species (i)	Abundance (n)	Relative Abundance (Pi)
White Mite	11	0.196
Spider Mite	19	0.339
Nematode	3	0.054
Brown Mite	16	0.286
Springtails	4	0.071
Ant	0	0.000
Flies	0	0.000
Small Worm	3	0.054
Total	56	

Spring 2014 (Sample 3)		
Species (i)	Abundance (n)	Relative Abundance (Pi)
White Mite	21	0.313
Spider Mite	13	0.194
Nematode	1	0.015
Brown Mite	21	0.313
Springtails	8	0.119
Ant	0	0.000
Flies	0	0.000
Small Worm	3	0.045
Total	67	

Table 1. Abundance of species at all locations.

Garvin Heights Species				
Species (i)	Abundance (n)	Relative Abundance (Pi)	Mean	Standard Deviation
White Mite	3	0.188	1	
Spider Mite	8	0.500	2.666667	
Nematode	0	0.000	0	
Brown Mite	4	0.250	1.333333	
Springtails	0	0.000	0	
Ant	0	0.000	0	
Flies	0	0.000	0	
Small Worm	1	0.063	0.333333	
Total	16		5.333333	1.72

West Campus Species				
Species (i)	Abundance (n)	Relative Abundance (Pi)	Mean	Standard Deviation
White Mite	7	0.117	1.75	
Spider Mite	11	0.183	2.75	
Nematode	7	0.117	1.75	
Brown Mite	8	0.133	2	
Springtails	19	0.317	4.75	
Ant	4	0.067	1	
Flies	1	0.017	0.25	
Small Worm	3	0.050	0.75	
Total	60		15	15.44

IWC Species				
Species (i)	Abundance (n)	Relative Abundance (Pi)	Mean	Standard Deviation
White Mite	6	0.143	1.5	
Spider Mite	11	0.262	2.75	
Nematode	9	0.214	2.25	
Brown Mite	7	0.167	1.75	
Springtails	6	0.143	1.5	
Ant	0	0.000	0	
Flies	0	0.000	0	
Small Worm	3	0.071	0.75	
Total	42		10.5	[illegible]

Somsen Hall Species				
Species (i)	Abundance (n)	Relative Abundance (Pi)	Mean	Standard Deviation
White Mite	8	0.222	1.6	
Spider Mite	7	0.194	1.4	
Nematode	3	0.083	0.6	
Brown Mite	6	0.167	1.2	
Springtails	4	0.111	0.8	
Ant	1	0.028	0.2	
Flies	5	0.139	1	
Small Worm	2	0.056	0.4	
Total	36		7.2	1.8

SLC Garden Species				
Species (i)	Abundance (n)	Relative Abundance (Pi)	Mean	Standard Deviation
White Mite	31	0.301	7.75	
Spider Mite	21	0.204	5.25	
Nematode	6	0.058	1.5	
Brown Mite	29	0.282	7.25	
Springtails	14	0.136	3.5	
Ant	0	0.000	0	
Flies	0	0.000	0	
Small Worm	2	0.019	0.5	
Total	103		25.75	14.2

Table 2. Comparison of species by location to determine their diversity and abundance.

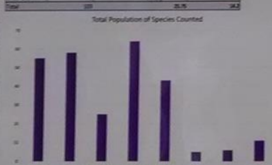

Figure 2: Species populations counted through all samples.

Index of Diversity	
Location	Probability
Garvin	0.692
West	0.827
Somsen	0.867
SLC Garden	0.774
IWC	0.832

Table 3. Simpson's Indices of Diversity from all sampled locations.

Results and Discussion

The total number of species found each time samples were taken were fairly similar to each other (Table 1). Total populations were highest when samples were taken in fall 2013, which could be explained by the change in seasons. During spring, samples were taken in late March and Early April. The ground was thawing from the cold winter. During the winter months, the organisms would be found further down in the soil (Brower et al., 1998). This situation can affect the populations found in the soil sample, since soil was only sampled from the upper 10-15cm of the top soil.

Based on the calculation of the Simpson's Index of Diversity (Brower et al., 1998), Winona State University Main Campus locations sampled near Somsen Hall had the greatest species diversity(Table 3). While this was the highest value, the IWC Garden and West Campus also had a high diversity. On the other hand, the soil samples from the SLC Garden had the highest mean value of invertebrates(abundance), averaging about 26 organisms per sample. This result is much higher than those of many other locations, with the next highest being the West Campus (15 organisms followed by 10 at the new IWC Garden),(Table 2).

A comparison of the data suggested that the Index of Diversity does not seem to have a strong correlation with species abundance(Brower et al., 1998). For example, the samples from Somsen Hall had the highest Index of Diversity (.827). However, they also had the second lowest mean of species abundance (7.2). Samples from Garvin Heights also had a low mean species abundance (5.33) and differed from the samples from Somsen Hall by having the lowest Index of Diversity (.692)(Table 2 and 3).

When looking at the overall data of species abundance for every taxon described in this study (Figure 2), the soil samples from all Winona area locations had highest population abundance of Brown and/or Red Mite (Orbatid Mite), followed by Spider Mites and White Mites (Nardi, 2003). Five of the eight species of soil invertebrates found in all soil samples were commonly found in all samples (Figure 2). Diverse species of mites are ubiquitous in soil as they play a major role in the decomposition processes of soil organic matter(Nardi, 2003).

Conclusion and Recommendations

The species abundance on the Winona State Main Campus was lower than the abundance on West Campus and the Gardens (SLC and IWC). Results showed that the SLC garden had a higher abundance than the garden at the IWC. Because the IWC Garden was constructed in 2013, the young plant community established there may not have had sufficient time to generate stable organic matter that in every topsoil becomes the focal component for attracting soil invertebrates. Therefore, with good soil care and management over time, also the IWC may likely reach a higher abundance and diversity of organisms as the native plant community becomes better established. Because pesticides have been used on Main Campus in the past(B. Borsari, personal communication), it may take much longer for the population near Somsen Hall to increase in numbers and diversity. The use of any chemicals should be avoided to maintain a healthy soil, and the walking paths around campus should be encouraged to avoid soil disturbance and compaction. However, both the effects of chemicals on the soil as well as compaction by pedestrians could provide viable research questions for further studies to be conducted about this topic.

Acknowledgements

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Abstract

This study investigated the ethical tension of denying services to those in need often experienced within non-profit organizations. Data was collected from 5 questionnaire responses (n=5) through use of an edited version of two established ethical questionnaires. The responses revealed themes of honesty, respect and confidentiality in ethical decision making. Research into the philosophical standpoints of deontology and utilitarianism are used to evaluate narrative responses to ethical questions.

Introduction

In my prior experience within non-profit organizations, I witnessed an ethical duality consisting of deontology and utilitarianism. Deontology is an ethical theory that places "emphasis on the relationship between duty and the morality of human actions" (deontological, n.d.). Deontology in non-profit organizations is present in the duties of the employees and volunteers to the people that the organization is set up to help. There are clear right and wrong guidelines for the employees and volunteers to follow in the forms of rules, regulations and policies set in place by the non-profit organization. Utilitarianism is an ethical theory that "seeks the greatest good for the greatest number of people (Ferrell, Fraedrich, & Ferrell, 2013). In a non-profit organization utilitarianism can be seen most clearly in how the organization will try to get the most use out of the limited resources that they possess. For example food shelves often ask for monetary donations because they have deals in place with food distribution centers that get them more food than if the individual donated food. These two ethical theories often contradict each other. for example with deontology one would not be able to go against the code of conduct but with utilitarianism if not following the code of conduct created more "good" for more people than it would be alright to break the code of conduct.

Method

With permission I gave a questionnaire to eight ORC employees. The questionnaire was an edited version of two previously established ethical questionnaires. The employees given the questionnaire were chosen because they have the authority to make decisions about clients and whether or not services will be provided for them. Data for this study was collected from five questionnaire responses (n=5).

Questionnaire

Please answer all questions to the best of your ability and with as much detail as you can.

1. Describe your own personal code of ethics?
2. What is your organizations code of ethics? Written? Unwritten? Is there a difference?
3. Are there any conflicts between your personal code of ethics and the organizations code of ethics?
4. What major ethical issues or dilemmas do you have to deal with?
5. Your organization was created to help adults with disabilities. Are there any instances in which YOU had to be the person to make the decision not to help?
6. What factors guided your decision to not offer/terminate services?
7. Are there any of these factors that you have no control over?
8. Were you equipped to make the decision to not offer/terminate services?
9. Did your decision follow organization code of ethics?
10. How does this align with the mission, your code of ethics and the organizations code of ethics?

Findings

Themes

In a review of the data I collected I found themes of respect, service and duty present in the employees' personal codes of ethics. The theme of respect for the purposes of this study is based on conducting business and interactions with honesty, integrity and respect. I found that this respect within interactions with clientele and coworkers to be present in 80 percent of the respondents. One respondent stated that "an employee needs to be honest to others and themselves". A definite trend in the data is that every respondent had some form of service or need to help other people as a part of their personal code of ethics.

The theme of duty was also in the data collected from the questionnaire. The importance of the work or some work related task was mentioned by every respondent. Confidentiality and professionalism in conduct being the two most referenced. In speaking with the executive director of the ORC I learned that confidentiality is mandatory under the "Health Insurance Portability and Accountability Act of 1996 (HIPAA)" (Summary, n.d.). As such confidentiality is emphasized within the organization. I believe that further research should be done to see if such emphasis could be the reason that confidentiality is present in the personal ethical code of several of the respondents.

Alignment of corporate and personal values

In conducting this study the thing that I found to be most interesting is that 80 percent of the employees that responded to the questionnaire believed that their personal code of ethics and the code of ethics of the non-profit organization were in alignment. Only one respondent stated that there was potential for conflict due to the fact that their own personal code of ethics is subject to alteration. That outside factors and personal experiences can influence their code of ethics; whereas, the codes of ethics of the non-profit organization were set by government and management. This high percentage of alignment suggests that either the non-profit organization is attractive to or attracts people with a similar ethical code.

Deontology vs. Utilitarianism

The original purpose I had for this study was to find how the ethical theories of deontology and utilitarianism present in this non-profit organization could coexist and whether or not they created conflict when it came to situations in which the employees had to make the decision either discontinue or deny services to individuals in need. Through the responses collected I found that the organization had solid guidelines in regards to such situations and that as an employee it was their duty to follow these guidelines. In this organization utilitarianism is mainly used in situations in which the employees have to decide if helping one client is worth the potential safety risk that client poses to themselves and others. However, it seems even this utilitarian decision not to help for the greater good of the rest of their clientele is made with a deontological bent as it is based on set guidelines that the employees have a "duty" to follow.

Limitations

The two main limitations of this study consisted of the scope and the size of the study. If I were to attempt this study again I expand the scope of the study to include more types of non-profit organizations. I would try to include food shelves and homeless shelters at the very least. I would also include as many non-profit organizations as I could to increase the size of the study in hopes of getting more responses. To this end I would also consider expanding the study to include non-profit organizations from states beyond Minnesota. Another limitation this study had been the inability to get the respondent to expand beyond yes, no or N/A responses for some of the questions.

Suggestions for Further Research

It is hoped that this study will be further investigated and will generate further interest in this and other related topics. In the future I hope that this study will be continued and expanded to include non-profit organizations beyond occupational rehabilitation. I believe that it would be beneficial to see if similar results are obtained in other social justice based organizations. I also hope that further research will be done in regards to the alignment seen in this study between the individual's personal code of ethics and the organization's code of ethics. Is it that individuals with particular moral and ethical standards are drawn to non-profit and social justice organizations or is it the organizations of this type seek to attract people with similar moral and ethical standards of the organization?

Conclusion

After analysis of the data the conclusion that I have come to is that for any truly definitive answers in regards to how non-profit organizations are able to function with the apparent ethical duality of deontology and utilitarianism further and more expansive study is required. While I am now more convinced than ever that the duality is present in non-profit organizations the study as it stands has only raised more questions for me.

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WINONA STATE UNIVERSITY

WINONA STATE UNIVERSITY GEOSCIENCE

Abstract

The Black Hills in South Dakota provide exposure of the southern Trans-Hudson orogen where the Wyoming and Superior cratons are sutured. The final suturing, local D3, is recognized as NW-striking shear zones and F3 folds that developed during left-lateral strike-slip, NE-side up transpression. The Nemo shear zone is a similarly oriented structure located in the NE Black Hills, two miles south of Nemo village, this shear zone overprints the Estes unconformity deforming the rocks in both the Nemo group below and the overlying Estes Conglomerate. This project quantitatively describes the strain and interprets shear sense from the boulder-size clasts present within the Estes conglomerate at this location.

This research mapped a 1.5 x .5 km area, adjacent and above the Estes unconformity, focusing on the Estes Conglomerate. At this location this unit is a matrix supported metaconglomerate containing clasts of iron formation and quartzite derived from the underlying Nemo Group rocks. Clasts range in size from pebbles to large boulders. Deformation associated with the Nemo shear zone flattened the boulders parallel to a NW trending, near vertical foliation. By assuming near spherical original clast shapes 3 dimensional strain ellipses are estimated from 2 dimensional outcrop views of 226 boulders in multiple viewing orientations.

Assuming no area loss, 72% of the boulders are flattened within the foliation with a stretch (S3) ≤ 0.6 measured in horizontal and vertical planes perpendicular to the foliation. Average stretches of the long axes (S1) in these orientations are similar and range from 1.6 to 1.8, with vertical orientations being slightly greater. When measured on vertical surfaces parallel to the foliation, 82% of long axes have S1≥ 1.4, and the axes' average rake is 72° down from the NW. The similarity in stretch for long axes in all three orientations supports triaxial strain with a significant flattening component. Asymmetry in sigma-shaped boulders on horizontal and vertical surfaces supports left-lateral strike-slip and NE-up displacement. Resolving the high angle between the long axes of the strain ellipse with transport direction based on boulder asymmetry is difficult; however, the strong flattening, shear sense, and orientation of the Nemo shear zone supports it is related to the regional D3 transpressional event.

Background

The Black Hills in western South Dakota are the easternmost exposure of the southern Trans-Hudson orogen (figure 1). The Black Hills record three events related to the assembly of the North American craton (figure 2)(Allard and Portis, in submission)). The First, D1 is attributed to the accretion of the Yavapai to the south creating North directed recumbent folds. Paleoproterozoic rocks record deformation during two events associated with the Wyoming and Superior craton suturing (ca. 1780—1715 Ma) and were uplifted during the Laramide orogeny (80-50 Ma); the first, D2, resulted in N-NW striking upright folds from the collision with the superior craton (Redden et al., 1990), and the second, D3, involved folding and shearing along a NW-striking transpressional shear zone from the intrusion of the Harney Peak granite in the southern black hills.

The Estes formation was deposited above older Paleoproterozoic rocks separated by an unconformity, formed as part of a submarine fan adjacent to a growth fault in the area (Redden 1981) Proposed Deformational history of Nemo sequence rocks Pre D1, and depositional environment of the Estes formation (figure 3). Ongoing field-based research in the sheared rocks near Nemo, SD. (e.g.: Allard, 2010; Heim and Allard, 2011; Jenkin and Allard 2011) included mapping along the Estes unconformity where Heim and Allard (2011) describe significant shear strain in boulders within the basal conglomerate. The folding and shearing in this unit and others adjacent or along strike to the NW are interpreted as D3 deformation and related to similar deformation along strike to the southeast near Rockerville (Allard and Portis, in submission). Describing and quantifying the strain in the boulder conglomerate will quantify this shear deformation and further our understanding of shearing in the region.

Figure 1: Provencal map of the North American craton.

Figure 2: Deformational history of the Black Hills.
A: (D1) NW-directed fold, recumbent F1 folds
B: D2(D2a) SW-NE Compression refolding of F1 folds
C: D3(D2b) local cross folds refold F2 folds into vertically plunging folds NW-striking, near-vertical F3 axial planes
and D4(D3) Harney peak intrusion

Figure 3: Redden 1981
A: Deposition of Boxelder Creek and Benchmark Formations
B: Interpreted folding of the Nemo sequence before D1
C: Interpreted rifting and deposition of the Estes Formation
D: Continued rifting and deposition

Problem Statement

Figure 5: Boulder Asymmetry in the field. Field measurements include Shear foliation [illegible], Orientation of exposure, Boulder asymmetry, and Long Axis and Short Axis of Clasts.

The Estes meta-boulder conglomerate is located in the northeast Black Hills of South Dakota two miles south of Nemo. Located within a shear zone, the boulders are deformed due to the strain (figure 4). Previous work from Winona State students has identified a predominantly left lateral NE side up transpressional sheer in rocks to the north in Little Elk Terrane, and to the south near Rockerville (Allard and Portis, 2007; Allard and Portis, in submission). Field measurements include Sm foliation, strike and dip of exposure, boulder asymmetry, and the long and short principal stretching axes of clasts (figure 5). Detailed mapping and strain analysis of the conglomerate and the underlying Nemo sequence rocks, and comparing the shear deformation to concurrent research of the adjacent Benchmark Iron-formation by R. Hawkins and Blue Draw gabbro by B. Norwood, will help determine if the shear deformation preserved in these rocks is related to the same regional deformational event as expressed in the Little Elk Terrane and Rockerville or if the Nemo sequence was folded prior to D1 and the deposition of the Estes formation. These results are important to ongoing research at WSU and will add to the evolving theory of the assembling of this portion of North America.

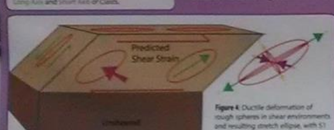

Figure 4: Ductile deformation of rough spheres in shear environments and resulting stretch ellipse, with S1 in the direction of transport.

Boulder Asymmetry

In simple shear, shear sense indicators can result from the movement as either Sigma or Delta grains (figure 8). Asymmetry in the Estes boulder conglomerate was identified by a previous student while mapping in the area (Heim, 2011), my goal was to confirm asymmetry throughout the unit and to identify transport direction.

First the average shear foliation must be calculated. The average of 54 S_m measurements was calculated at 147, 86(figure 6). Asymmetry in sigma-shaped boulders on vertical surfaces perpendicular to S_m always shows left-lateral strike-slip with NE-up displacement (figure 9). Asymmetry in horizontal exposure expressed predominantly left lateral displacement (Figure 10); thought, some localized right lateral sigma grains are located near the contact with the Benchmark Iron-formation (figure 14 & 15).

In vertical exposures parallel to foliation there is no asymmetry (figure 11), but we see that maximum stretch is not in the transport direction, it dips steeply down to the NW. Resolving the high angle between the long axis (S1) of the strain ellipse and transport direction based on boulder asymmetry is difficult; however, the strong flattening, shear sense, and orientation of the Nemo shear zone supports it is related to the regional D3 transpressional event.

Figure 8: Left lateral Sigma and Delta grains produced in shear environments

Figure 9: Vertical exposure perpendicular to foliation (left lateral)

Figure 10: Horizontal exposure perpendicular to foliation (left lateral)

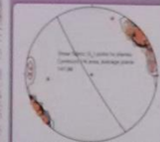

Figure 6: S_m Shear fabric poles of planes plotted in orange. Calculated Cylindrical Best Fit 147, 86.

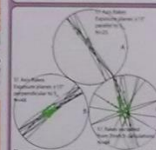

Figure 7: Vertical Exposure planes with rake data of longest axis, S1 Rake points plotted in green for each plane N=135.

Stretch

The stretch of boulders must be filtered by orientation of exposure before Stretch can be calculated, vertical orientation exposures ±15° parallel to S_m(figure 7A) and ±15° perpendicular to Sm(figure 7B), were used to calculate S1, S2, and S3. Assuming no area loss, 73 boulders were used to calculate stretch in vertical exposures with 64 boulders excluded due to the orientation of exposure (Figure 7C). 72% of the boulders are flattened within the foliation with a stretch (S3) ≤ 0.6 measured in horizontal and vertical planes perpendicular to the foliation. Average long axes (S1) of the Boulders are similar and range from 1.6 to 1.8, with vertical orientations being slightly greater. When measured on vertical surfaces parallel to the foliation, 82% of long axes have S1≥ 1.4, and the axes' average rake is 72° down from the NW (figure 7A). The similarity in stretch for long axes in all three orientations supports triaxial strain with a significant flattening component. the resulting boulders are not acting as strain ellipses like predicted (figure 4) instead they have been stretched perpendicular to the transport direction(figure 11) that was predicted and confirmed by sigma grains in the field. The resulting boulder shapes and principle stretching axes for a three dimensional ellipse (figure 12). To explain this data the boulders must not be deforming purely ductaly and instead are rolling as a result of subsimple shear (figure 13). The rolling paired with a large compressional force caused maximum stretching S1 in the direction of the least resistance, perpendicular to the compressional and transport directions.

Figure 11: S1 of boulders in Vertical exposure parallel with foliation, calculated average S1 rake of 72° down to the NW (figure 7A).

Figure 12: length relationships of boulders streching axes.

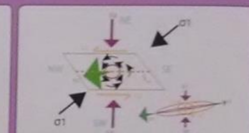

Figure 13: Strain resulting from subsimple strain rolling of clasts in left lateral shear. Viewed Up, S1 is perpendicular to the Poster, S2-S3 intersection plane is the poster

Right Lateral Shear

Figure 15: Horizontal, right lateral sigma grains, right lateral shearing, 13-EU-64H

The Iron-chlorite phyllite unit along the contact between the Estes boulder conglomerate and the Benchmark Iron-formation contains microtextures defined by a muscovite and chlorite foliation. At location 13-EU-64(marked by a white star), Right lateral shear direction is observed in both vertical (figure 14) and horizontal (Figure 15) Thin sections and displays right lateral "Z" folds in outcrop. This conflicts with the model of shear observed in boulder asymmetry. To explain this data, folding has been interpreted as the cause (figure 16(R. Hawkins, This Conference)). the Benchmark Iron-formation displays microfolding as right lateral "S" left lateral "Z", and constictional "M" folding within the foliation, implying the unit itself is folded. If this is the case then localized right lateral shearing would be expected inside of the compressional folding, reversing the movement direction locally within the shear zone.

Figure 14: Vertical, right lateral C-C' fabric defined by muscovite. SW side up movement, 13-EU-64V

Figure 16: Map shows interpreted folding from parasitic folds within the Benchmark Iron-formation. The [illegible] show the overall left lateral shear displacement, the red arrows show localized right lateral shearing due to folding, both are a result of compression due to σ1.

Conclusions

Flattening and shear in the Estes formation has deformed the initially roughly spherical boulders into ellipses that result from shear strain in a subsimple shear environment. S1 is perpendicular to both the compression and transport direction; this is perpendicular to what we expected. This means we cannot quantify strain accurately in the transport direction. The boulders instead of deforming ductily are rolling within the shear plane.

My findings show the boulders are deforming during the same deformation that has folded the underlying Benchmark Iron-formation and other Nemo sequence units based on microfolding and shear sense. Shear is interpreted as predominantly left lateral, NE side up transpression; though, localized right lateral "Z" folds and microtextures within the Iron-chlorite phyllite support evidence of F3 refolding do to shear during D3 (figure 2C, figure 16). This implies that the Nemo sequence was not folded prior to the deposition of the Estes, and above and below the unconformity have undergone the same deformational history.

Through the analysis of field data and observations, it is recognized that the shear recorded in the Estes Formation is equivalent to strain recorded above and below the Estes unconformity, as well as along strike NW in the Little Elk Terrane and to the SW in Rockerville. All these locations indicate predominantly left lateral NE-up transpression, suggesting that the structures are related to a larger overall structure (figure 17). The Nemo Shear zone is part of the much larger Dakotan tectonic Zone (Allard 2013) that had deformed much of the NE Black Hills rather than D3 being a minor event, it appears to be controlling most of the deformation in the region.

Acknowledgements

Winona State Research Fund, Winona State Student Travel Fund, my advisor Dr. Allard, lab assistance Luke Zwiefelhofer
Fellow research students Brock Norwood, Robert Hawkins, and my field assistant Chris Nicosia

Figure 17: Generalized map of the Black Hills showing interpreted D3 deformation and extrapolated Dakotan Tectonic Zone based on this and previous years field work

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WINONA STATE UNIVERSITY

Abstract

Ninety-seven percent of organizations in the United States are small businesses. Often ethical decision-making is only studied in large organizations. Since small businesses make up such as large percentage of the nation's workforce, it is therefore also important to understand the ethical decision-making within them. We gathered first hand data through administering an edited ethical culture questionnaire to employees of a small business in the restaurant supply industry. Data was collected from 8 questionnaire responses (n=8), which revealed the ethical context of the small business. We found respondents said that they had a sound ethical conscience that guided their ethical decision-making within the business.

Introduction

Small businesses are a vital part of the United States economic system. So vital that 97% of businesses in the United States are classified as such. The United States Small Business Administration defines a small business as an enterprise having fewer than 500 employees. There are almost 28 million small businesses in the U.S. that provide jobs for over half of the working population. The importance of small businesses cannot be understated, so why has the ethical decision-making within these organizations been often overlooked?

As students at Winona State University, our study of business ethics has mainly focused on the ethical decision-making within large corporations with more than 500 employees. These corporations often have a [illegible] code of ethics along with established corporate values that guide their employee's ethical decision-making. We have found that a strong code of ethics coupled with a definite ethical tone at the top fosters an ethical corporate culture within these organizations. With so much of the research pertaining to large corporations our group was determined to shed some light on the ethical decision-making within small businesses. The 50% probability that we would be working within a small business environment encouraged us to obtain understanding on the subject so we would be prepared for the small business environment upon graduation. We set out to determine if employees within small business demonstrate ethical behavior without a formal code of ethics. This paper illustrates our experience using a questionnaire based research method and our reflection on the data generated from the questionnaire. This paper analyzes the ethical decision making of an employee in the context of a small business environment.

Method

Through family connections made by a member of our research group we came in contact with a small business in the restaurant supply industry located in the Midwest. Due to confidentiality reasons the business's name will not be revealed we will be referring to the business that we are researching as small business A. Small business A conducts many business-to-business transactions, but is also open to the general public. Its primary customers are local restaurants in the upper Midwest region, supplying them with everything from kitchen equipment to bar stools. Many of the employees of small business A conduct hundreds of dollars in sales each day. After multiple conversations with the owner we were granted the ability to assess the ethical decision making within the small business A.

Once granted permission, we obtained an existing ethical decision making questionnaire and modified it to our specific needs. The questionnaire's purpose was to gather information on the ethical-decision making within small business A. The questionnaire was composed of 57 questions with five options, strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). A copy of the questionnaire can be found in Appendix A. On March 10th, 2014 we traveled to small business A to administer the questionnaire. Prior to handing out the questionnaire the employees were notified that the questionnaire was completely anonymous and optional, and that the business' name would not be revealed in our research. Once we presented the questionnaire to 15 employees we left an envelope for the completed surveys and left the premises to allow for unbiased responses. Upon returning approximately two hours later we collected 8 completed questionnaires, a 53% response rate. With 8 fully completed questionnaires (n=8), we returned to Winona State University to compile and analyze the data. The purpose of the trip was not only to administer the questionnaire but also to get a first-hand perspective of the unique culture within the organization. Successful completion of WSU's Human Subjects Education Module is required of all WSU students, faculty, and staff who conduct research involving human participants on or off campus. All protocols required for our research were met. The following section will provide an analysis of the common themes found within the questionnaire responses along with a discussion of our findings.

Findings

While compiling the results and evaluating the data we wanted to determine if employees within a small business that did not have a formal code of ethics were able to make ethical decisions. We decided it was best to go through and pick out some of the trends we noticed with the responses and try to understand how this company can operate without a code of ethics. While gathering the data and compiling the results we noticed some similarities that presented themselves in the results from the questionnaire. The questionnaire we administered had 57 questions, 20 of these questions five or more respondents reported the same answers. The major trends we found included that company values its profits, stakeholders and investors, and employee loyalty. This aligns with chapter one of our textbook, describing the benefits of business ethics (Ferrell, Fraedrich, & Ferrell, 2011). This company and its employees see that the ethical decisions they make impact every area of the business. Throughout this business the employees have a good understanding of their personal ethics along with their co-workers perceptions of ethics. They believe in following the golden rule, and they also feel that managers and workers must have a cooperative relationship and understanding of each other to foster success. Another trend we found is these employees are willing to learn more about ethics to help them navigate ethical decisions or ethical dilemmas encounter in the business environment. With strong relationships between workers and managers the employees strive to create the best possible image for the company.

Social Responsibility

Another trend that we found includes social responsibility [illegible] responses the employees believed the company has a social responsibly to its customers and that they sh[illegible] th[illegible] to maximize this. This company believes in maximizing profits and giving back to society. This represe[illegible] of the [illegible] major levels of social responsibility located in chapter two (Ferrell, Fraedrich, & Ferrell, 2011). The one issue we found while analyzing the data is almost all responses said bending the rules at times is okay. Within a firm this should be unacceptable because this can affect their image. A company can hurt themselves if they bend the rules too much. This could develop a bad reputation for the business. Yet all eight respondents said they strongly agree when the question was asked "The business has a responsibility to society and its stakeholders." We concluded that the employees within small business A attempts to do the right thing a majority of the time, but they might have minor situations where they bend the rules as long as is doesn't have a major effect on the company.

Ethical Boundaries

We believe that since this company operates as a small business there is not a strong sense of governance present within the company. This is because the business is so small that management does not monitor the decisions the employees make. The employees make sporadic decisions because there is no ethical guidelines established within the company. Another trend we found in the data is that the employees of small business A feel they make the right decisions, but with no formal ethical guidelines the employees do not know what to do in certain situations. Three questions they all responded similarly to were, ethics are complex, it is hard to approach ethical misconduct, and ethics is relative to the person. We believe these responses indicate that there is no real guidelines for the employees to operate ethically. Certain employees act differently and have different ethical perspectives because there is no clear ethical code present within company.

We think that this company should begin to start forming an ethical code for the business to follow. The easiest way they can start doing this is by establishing legal standards all employees need follow. We also believe they should create ethical training program to teach the employees to navigate ethical dilemmas/decisions. Furthermore, with no formal code of ethics there is no standards for the decision making.

All respondents said they were ethical, but yet went on to say that ethics is relative, so what one person perceives to be right another person's view could be opposite. Small business A needs to establish a strong culture that sets standards as to what the employees should perceive as right and wrong. The employee's responses indicated that they were willing to learn how to instill ethics within the company. From our knowledge and learnings about ethics our team believes that to best create a sound ethical culture, this company needs to establish an "ethical tone at the top" starting with the owner. If the owner establishes an ethical tone then fellow employees have to abide by it. This ethical tone will then cascade down throughout the business creating an unwritten code of ethics. This will not only create a code of ethics for the company, but also continue to enforce and instill ethical decision making within the employees. A code is not good enough, they will just read over it and continue to do what they want. If the tone is set at the top, changes will be made and people will be held accountable for their decisions.

Opposing Views of Ethics

We found that there is opposing views of ethics within this company. The employees' realize that ethical issues are more complex than they thought. As the respondents reported, the greater the age the more ethical they have become. Research shows that the older you become and the more experience you have, the more likely you will be able to make the right ethical decision. According to Chapters 5-7 (Ferrell, Fraedrich, & Ferrell, 2011), the more experience you have on ethics, the more ethical person you will become. Also the respondents indicated that ethics is complex. This is where the company has a "Grey Area," we believe they showed signs of differing philosophies within the company. Some respondents showed that the company wants what's best for the greater good of the company. Which shows signs of utilitarianism. Yet, others said that ethics is relative to the person and that their needs to be a clear respected authority when reporting for work and duty. This was signs of deontology, therefore there are two clear differing views of how things work in the company. While both of these philosophies can work, it is hard to find a happy medium. As one manager's view may be deontology where they think that people need to be treated differently than others. Yet, another manager's view could be utilitarian by treating all employees equally. How do they find the area where these philosophies can coincide together to make the company function successfully.

Values

According to respondents all employees have a clear sense of the company values and ideas. These values are represented and communicate clearly with how they are running this business presently. Furthermore, all respondents reported that their managers are aware of the ethical culture within the company and that there is a general understanding of the culture among the employees. This leads us to believe that there is an unwritten code within the company. The employees also responded that within the company there is a clear way of how things get done. This makes us able to conclude that there is an unwritten code within the company where you learn the culture when you receive the job. This is a culture that is not clearly defined, it is something you learn by being around and in the company. We do not believe that this is the ethical way to go along with their business because there can be too many faults and with there being no clear cut direction there is always going to be different views ideas and opinions on all aspects of the business. While dissecting the culture and reading the responses we found that this company tries to work as an integrative culture (Ferrell, Fraedrich, & Ferrell, 2011). This means the company has a high concern for its people and performance. We believe this because all respondents said they agree to the question "profit maximization is an appropriate goal." Yet, throughout the questionnaire they were consistent with saying that the needs of the people must be respected and met. We found that when learning about ethics that it is very difficult to accomplish this style. We believe that this company is concerned more about the profit then its employees. We consistently saw profit being a more reoccurring theme than the care for people. Also they are a very compliance based company compared to value based. They focus on staying away from all legal aspects and don't teach employees to navigate the grey areas because the company doesn't even have a code of ethics so the whole company can be a grey area.

Discussion

From all of our findings we conclude that this company feels as if [illegible] company that makes ethical decisions. All respondents indicated [illegible] are ethical people and make ethical [illegible]. They also said they have sound personal ethics and believe their sound per[illegible] can guide their business decisions. The group has learned from experience, wri[illegible] far in the business world you need to be able to reinforce the company principles [illegible] company feels they are acting off of sound principles, but with no formal code of ethics [illegible] ethical policies it is easy for them to deviate from the ethical [illegible] wrong decision. We believe since in most small business there is no code [illegible] easier for small businesses to make the wrong decision and [illegible] times are [illegible] things in the "grey area." Small business A appears to operate ethically, distin[illegible] black [illegible] white, but with no guidance in place it easy for employees to f[illegible] into ethical "grey [illegible]." Small businesses are unable to operate ethical programs and training because they do not have the finances to do so. Small businesses employees rel[illegible] solely on experience and the defined culture around them. It is very hard to operate with no code of ethics but we think that it can be done if the company has individuals who were raised and understand the right from wrong in business decisions. With some ethical training we feel that the employees of small business A could improve their ethical decision making. It is possible for companies to operate without a code of ethics if there is a strictly defined ethical cultures. As one can see, the U.S. heavily relies on small business, with a business mind and the proper training and influences, we believe that it is possible to work under the conditions without a code of ethics. It is clear that companies have no problem working without a code of ethics while the U.S. is living in an environment with better educated and ethical business people.

Questionnaire

1. The business world has its own rules to follow?
2. Leading firms have honest, consistent standards?
3. The business world operates ethically?
4. I am an ethical person?
5. I want to learn tools for ethical analysis?
6. The type of employer-employee relationship within a firm is quickly sensed by outside visitors?
7. An effective manager does not need to respect workers?
8. Fair wages and good products are all that a firm should be expected to provide to society?
9. The business community has a responsibility to society and its stakeholders?
10. There are situations when sweatshops are appropriate?
11. Unethical conduct by a firm is the exception to the norm?
12. I follow the golden rule and respect others?
13. I strive to understand business ethics issues?
14. Salary and benefit packages are dictated by market realities?
15. A manager must communicate with subordinates?
16. Customer satisfaction is more important than price?
17. Doing the right thing may not be the right thing to do?
18. At times it is appropriate to harm society to make profit?
19. Ethics is mostly lip-service?
20. My business conduct is guided by my personal ethics?
21. Managers must be respected?
22. There are many perspectives for viewing ethical issues?
23. Effective results do not require motivated workers?
24. Business is a keystone of society?
25. Ethical firms do things how they ought to be done?
26. Stockholder needs are the primary concerns of a firm?
27. Legal requirements drive ethical behavior?
28. I bend the rules at times?
29. I want to know how to instill ethics at work?
30. Politics has no place in business decisions?
31. Managers must be leaders?
32. Responsible firms balance all stakeholder needs?
33. Environmental issues cannot dictate a firm's actions?
34. Globalization forces unethical behavior?
35. My opinion on ethics is changing?
36. Mutual understanding between management and labor is important?
37. Managers must be profit oriented?
38. Business should create standards that improve global conditions?
39. I see more unethical actions in the business world than I expected to encounter?
40. No one theory or approach explains ethical conduct?
41. Teamwork is vital on the job?
42. Managers cannot deviate on the procedures used to achieve organizational goals?
43. Profit is not paramount?
44. Workforce diversity does not help a business?
45. Managers give orders, workers follow them?
46. As I get older I am becoming more ethical?
47. My managers are aware of the ethical climate in my organization?
48. My view of ethics has changed since my first exposure in college?
49. Ethical conduct is profitable conduct?
50. Ethics is more complex than I thought?
51. It is not difficult to be a manager?
52. I am a religious person?
53. I do not really think about the culture in my firm?
54. Managers need many approaches to get the job done?
55. Ethical conduct is a relative concept?
56. Profit maximization is an appropriate goal?
57. A businessperson must separate business ethics from personal ethics?

References

Ferrell, O., Fraedrich, J., & Ferrell, L. (2011). *Business Ethics: Ethical Decision Making and Cases.* Mason: South-Western Cengage learning.

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Objective

The objective of this study was to assess the relationship between primary production of phytoplankton and the complexity of fish and invertebrate trophic structure in slackwater habitats of a large floodplain river.

Methods

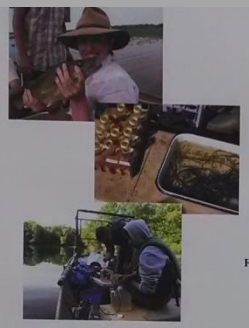
Study Area

The study area consisted of multiple backwater habitats off the main channel of the Upper Mississippi River between Brownsville, MN and Alma, WI. Samples were collected over a 36-d period from late July-August 2013. The sites were associated with varying types and abundances of riparian vegetation, including large trees, tall grasses, and patches of deep mud. Aquatic vegetation was present at each site and flourished.

Sample Methods

- Fish were caught in three 4 - 8 min runs using a timed boat electrofisher, with all fish identified and counted.
- Benthic invertebrates were sampled using dip nets and were sorted in the field and frozen until they could be identified to genus in the laboratory.
- Phytoplankton net primary production and respiration were measured using the light bottle/dark bottle method. Three pairs of 5-L cubitainers were left in the water for 5 - 8 hr. Initial and final dissolved oxygen concentration was used to calculate net primary production and respiration. Temperature measurements indicated there was no container effect. Net production and respiration were summed for gross primary production (GPP).
- The number of guilds present and the number of species per guild were determined for each site for both fish and invertebrates. The functional feeding guild of each taxon was determined based on published accounts of dietary preferences.
- Linear regression was used to examine the relationships between gross primary production and the number of guilds and the number of species per guild for both fish and invertebrates.

Representative Study Sites



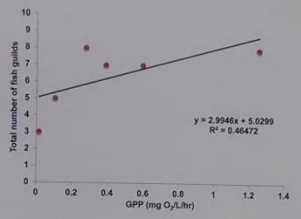


Figure 1: The total number of fish trophic guilds vs GPP (mg O_2/L/hr) in slackwaters of the Upper Mississippi River, July-August 2013. There was no significant relationship (p = 0.135).

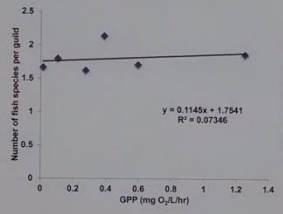


Figure 2: The total number of fish species per guild vs GPP (mg O_2/L/hr) in slackwaters of the Upper Mississippi River, July-August 2013. There was no significant relationship (p = 0.603).

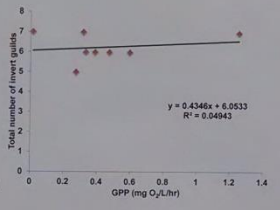


Figure 3: The total number of invertebrate guilds vs GPP (mg O_2/L/hr) in slackwaters of the Upper Mississippi River, July-August 2013. There was no significant relationship (p = 0.596).

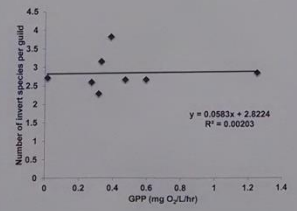


Figure 4: Total number of invertebrate species per guild vs GPP (mg O_2/L/hr) in slackwaters of the Upper Mississippi River, July-August 2013. There was no significant relationship (p = 0.915).

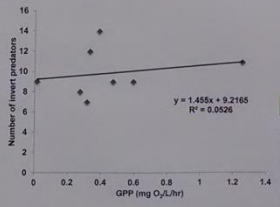


Figure 5: Total number of invertebrate predators vs GPP (mg O_2/L/hr) in slackwaters of the Upper Mississippi River, July-August 2013. There was no significant relationship (p = 0.585).

Results

- The total number of fish guilds was not significantly correlated to GPP (Figure 1).
- The number of fish species per guild was not significantly correlated to GPP (Figure 2).
- The total number of invertebrate guilds was not significantly correlated to GPP (Figure 3).
- The number of invertebrate species per guild was not significantly correlated to GPP (Figure 4).
- The total number of invertebrate predators was not significantly correlated to GPP (Figure 5).

Conclusions

- Gross primary production did not have a significant effect on the trophic complexity of fish and invertebrates at the selected sites.
- It was originally thought, according to the productive space hypothesis, that ecosystem complexity should increase along with increased levels of primary production, leading to greater food chain length (Post 2002).
- Our observations support many other studies that have suggested primary production is not a critical determinant of community organization in aquatic systems (Young et al. 2013). In comparison, terrestrial systems have been found to have increasing complexity in response to an increase in primary productivity (Post 2002; Takimoto et al. 2012). This could be because of feeding constraints in a size-limited aquatic environment (Young 2013).
- Other studies have compared ecosystem size, resource availability, and disturbance as possible sources of increased trophic complexity. In multiple studies ecosystem size has been found to play a larger role in community organization (Young et al. 2013; Post 2002). It is most likely a combination of multiple factors with differing levels of influence that cause variation in complexity (Post 2002).

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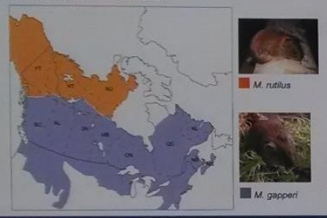
Abstract & Introduction

The southern red-backed vole (*Myodes gapperi*) inhabits the forests of the Hudsonian and Canadian life zones of central and southern Canada and the Rocky and Appalachian mountain ranges. The related northern red-backed vole (*Myodes rutilus*) inhabits northern Russia, Scandinavia, northern Canada, and Alaska. Previous phylogeographic analyses using mitochondrial and nuclear markers indicate the existence of repeated hybridization between these two species in limited zone of contact across Canada and Alaska. Notably, the hybrids appear to be self-sustaining and possibly displacing the parental lineages. Here, we further characterize the structural differences found in the mitochondrial cytochrome *b* protein among *M. gapperi*, *M. rutilus*, and their hybrids, using structural bioinformatics methods. We identified an amino acid substitution in the ubiquinone-binding region of the hybrid cytochrome b protein that is conserved across 119 other Arvicoline rodents' sequences. Using this as the paradigm of our data analysis, we constructed homology models of these proteins and further characterized their structural differences on an evolutionary and atomic level. These results will help to guide further research in this area by suggesting functional amino acid substitutions due to these voles inhabiting different environmental conditions.



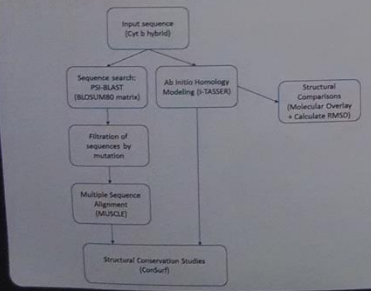
Methods

Sequence searches – Previous research has elucidated the presence of a cytochrome b mutation in the ubiquinone-binding region of the *Myodes* hybrid on residue 23 (Ala → Thr). A BLAST-related sequence search was performed with this protein sequence as input to determine if other Arvicolinae sequences contained this mutation. PSI-BLAST was used with a BLOSUM80 algorithm (*1*). Flexible multiple sequence alignments were performed using MUSCLE (*2*).

Molecular modeling – To gain insight on the structure and biochemical properties of these complexes in *M. gapperi, M. rutilus*, and their hybrid, we used molecular modeling approaches. Models were generated using I-TASSER, an ab initio modeling software, using the primary sequence as input (*3, 4*). Generated models of the cytochrome b were aligned individually using the Molecular overlay function in Accelrys Discovery Studio Visualizer 4.0 (*5*).

Structural conservation studies – The multiple sequence alignment was submitted to ConSurf (*6*). Result of this prediction were mapped out onto the 3D model of the hybrid protein to visualize structural conservation of individual residues.

Data flow: Visualization of project methods.



Results

Sequence Searching & Species Distribution – The initial alignment of the cytochrome *b* protein from *M. gapperi*, *M. rutilus*, and their hybrid (Figure 1A) revealed a residue change (Ala23 → Thr23) in the ubiquinone-binding region (spanning from residue 15 – 40). Therefore we sought to investigate whether or not this mutation was conserved due to selective environmental and evolutionary pressures. This prompted us to search for other Arvicoline sequences containing the same mutation. BLAST-related sequence searches returned 500 Arvicoline sequences of which 119 contained the Ala23 → Thr23 mutation (Figure 1B). Using these sequences, we reported the species and geographic distribution (Table 1).

Figure 1. **(A)** Multiple sequence alignment of cytochrome b proteins in *M. gapperi*, *M. rutilus*, and their hybrid **(B)** Multiple sequence alignment of 500 Arvicoline cytochrome b sequences. The WebLogo diagram *(7)* represents the alignment of the ubiquinone binding region of these proteins.

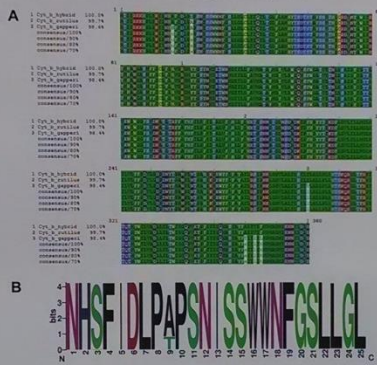


Table 1. Among the 500 sequences retrieved through the BLAST search, 119 sequences contained the mutation of interest. Table 1 lists the species and distributions of the filtered sequences.

Species	Common name	Distribution
Myodes gapperi	Southern red-backed vole	Canada, Northern United States
Myodes rutilus	Northern red-backed vole	Alaska, northern Canada, Scandinavia and northern Russia
Myodes glareolus	Bank vole	Europe, Asia Minor, Western Siberia
Myodes andersoni	Japanese red-backed vole	Japan
Blanfordimys bucherensis	Bucharian vole	Afghanistan, Tajikistan, and Uzbekistan
Microtus middendorffi	Middendorf's vole	Russia
Microtus ochrogaster	Prarie vole	North America (Rocky Mountains, West Virginia, Canadian Praries)
Microtus arvalis	Common vole	Eurasia
Microtus thomasi	Thomas's pine vole	Bosnia, Herzegovina, Greece, Macedonia, Serbia, Montenegro, Albania
Microtus californicus	California vole	California, Southern Oregon
Microtus californicus scirpensis	Amargosa vole	California, Southern Oregon
Microtus agrestis	Field vole	Western Europe, Siberia, Northwest China
Microtus savii	Savii's pine vole	France, Northern Italy
Microtus lusitanicus	Lusitanian pine vole	France, Portugal, Spain
Microtus duodecimcostatus	Mediterranean pine vole	France, Andorra, Portugal, and Spain
Microtus duodecimcostatus X lusitanicus	Mediterranean pine vole	France, Andorra, Portugal, and Spain
Microtus bavaricus	Bavarian pine vole	Europe: Austrian, Italian, and Bavarian Alps
Microtus tatricus	Tatra pine vole	Slovakia, Poland, Ukraine and Romania: Carpathian mountain range
Microtus multiplex	Alpine pine vole	Austria, France, Italy, Serbia and Montenegro, and Switzerland
Microtus longicaudus	Long-tailed vole	Western North American
Microtus subterraneous	European pine vole	Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Estonia, France, Germany, Greece, Hungary, Italy, Liechtenstein, Luxembourg, Macedonia, Moldova, the Netherlands, Poland, Romania, Russia, Serbia and Montenegro, Slovakia, Slovenia, Switzerland, Turkey, and Ukraine.
Microtus pennsylvanicus	Meadow vole	Canada, Alaska, and Northern United States
Microtus miurus	Singing vole	Northwestern North America
Chionomys nivalis	European snow vole	Southern Europe, Eastern Europe, and Southwestern Asia
Chionomys roberti	Robert's snow vole	Azerbaijan, Georgia, the Russian Federation, and Turkey
Alticola semicentus	Mongolian silver vole	Mongolia
Eothenomys smithii	Smith's vole	Japan

Molecular Modeling and Structural Conservation – To gain insight into whether these mutations resulted in structural changes in the hybrid protein, homology models were generated. These models were optimally aligned in order to calculate the root mean square deviation (RMSD) between each residue (Figure 2A – B). Results of this analysis revealed that these structures deviated slightly in the area spanning the ubiquinone-binding region (> 0.5 Å). However, these mutations may contribute to areas of the protein containing higher structural deviations from the *M. gapperi* and *M. rutilus*, as much as 2.0 Å for some residues.

Structural Conservation Studies

Figure 2. **(A)** Visual representation of structural comparison methods. Generated models were optimally aligned and RMSD scores were calculated. **(B)** RMSD scores, which represent the difference in the two superimposed structures based on Cα positions, were calculated for each residue to compare the distance in Å between the aligned structures. A structural alignment of the hybrid model was aligned with itself as a negative control.

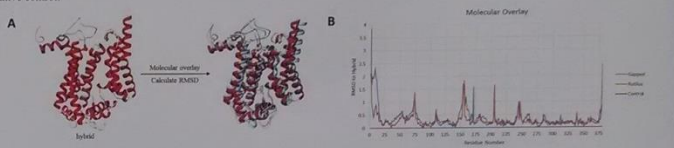
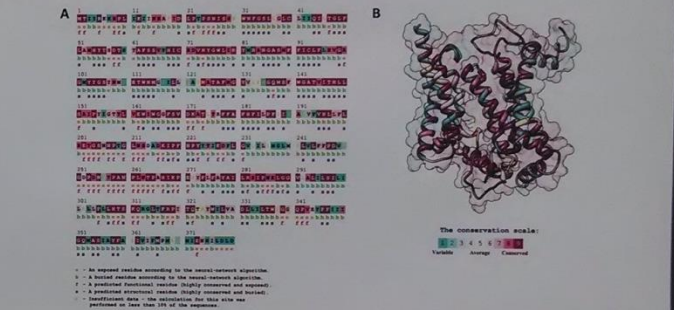


Figure 3. **(A)** Results of the ConSurf prediction reveal that the Thr23 residue substitution is potentially buried within the 3D structure of the cytochrome b subunit. **(B)** Results of the ConSurf prediction were mapped out onto the hybrid structural model in order to visualize the residue conservation within the context of its tertiary structure.



Structural conservation analysis suggests that the Ala23 → Thr23 mutation in the *Myodes* hybrid may in fact be a residue that is buried in the overall structure of the protein (Figure 3A). While this residue may not contribute to the overall function of the protein, the mutation may give rise to structural deviations in the protein that may alter its function as suggested by Figure 2B.

Summary

- Structural bioinformatics analysis and database searching reveal a structural mutation in the ubiquinone-binding region in the hybrid that is not present in the proteins of the parental species (*M. gapperi* and *M. rutilus*).
- This mutation is conserved across 119 other Arvicoline sequences with a wide-ranging geographical distribution.
- Molecular modeling and structural comparisons suggest that the mutations seen in the *Myodes* hybrid may account for structural deviations, and possibly altered or improved function.
- These inferences may provide insight into evolutionary pressures that may contribute to functional amino acid substitutions in the cytochrome *b* subunits of these voles.

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INTRODUCTION

Stress is associated with sympathetic nervous system output and the appearance of catecholamines in the plasma. Sympathetic drive results in an increase in heart rate, blood flow to skeletal muscle and bronchodilation as part of the fight or flight response. Norepinephrine promotes glucogenolysis to supply energy needed for the body's "fight or flight" response to stress.

Elevated blood glucose levels (BGL) are often associated with physical or psychological stressors in non-diabetic patients (Blair 1991). SNS stimulation could promote increased plasma glucose resulting from impaired insulin sensitivity or increased glycogenolysis.

Sudden exposure to cold temperatures stimulates the sympathetic nervous system. The cold pressor (CP) test is used to stimulate the sympathetic nervous system and to examine physiological effects of SNS stimulation (Desborough 2000). Typical cold pressor tests use a single arm immersion for 4 minutes prior to cardiovascular changes (Moro 2011).

Oral glucose tolerance testing (OGTT) is central to the clinical diagnosis of type 1, type 2 and gestational diabetes. Positive testing for diabetes can carry important implications for patient glycemic health, patient medical history, future insurance costs and the patients perception of wellbeing. Mental stress about these implications could result in increased SNS output and an artificially high blood glucose during OGTT. '

Misdiagnosis of diabetes due simply to stress about testing could be a life-altering implication. This study examined physiological affects of a modified cold pressor test on the glycemic response and cardiovascular function in the healthy 17-26 year olds. Three shorter 30 second ice bath immersions were used in order to permit study approval by the university IRB.

METHODS

This study was approved by the Winona State University Institutional Review Board. After completing a 12 hour fast, subjects signed consent forms and were assigned to the control (CO=43) or cold pressor (CP = 40) treatment group. 0 minutes began when the individual drank a 50g OGTT. Blood glucose, blood pressure, and heart rate were obtained at -15, 0, 30, 60, and 120 minutes. Blood glucose was determined induplicate using a finger stick and Reli On Ultima. Heart rate and blood pressure were determined using blood pressure cuffs and a finger heart rate monitor. Subjects in the CP group experienced a modified cold pressor test consistign of immersions of the left arm in an ice bath for 30 seconds at time -10 minutes prior to OGTT adminstration and 10, and 20 minutes post administration. Statistics were compiled using JMP Pro 10 with ANOVA (analysis of variance). Covariance was used to evaluate treatment, time, treatment x time, age, and weight. Differences were considered significant if $P > 0.05$. Data are expressed as mean ± standard deviation.

RESULTS

Figure 1: OGTT with cold pressor stimulus did not alter blood glucose levels relative to control (P=0.79)

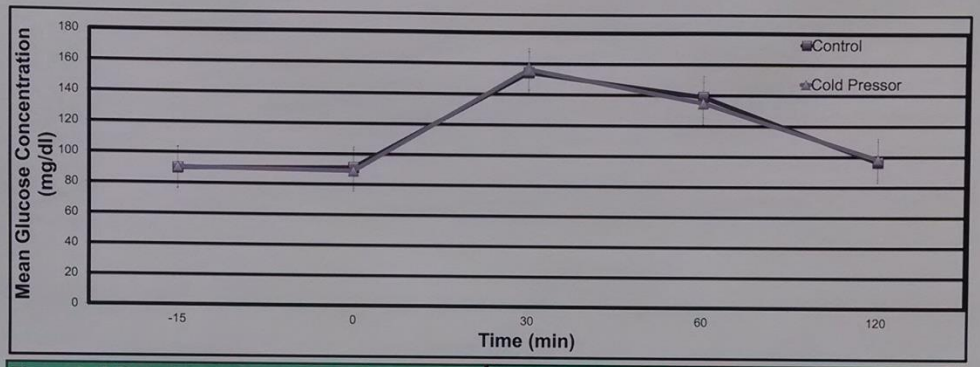


Figure 2: OGTT with cold pressor stimulus appeared to alter systolic blood pressure, but the difference was not statistically significant when compared with control (P=0.53)

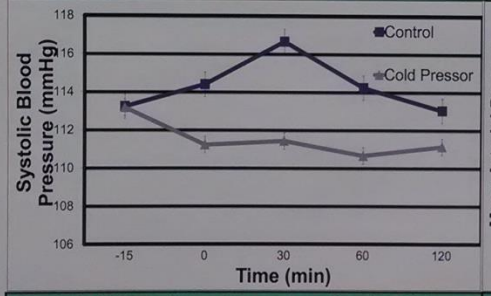


Figure 4: OGTT with cold pressor stimulus appeared to alter mean arterial pressure, but the difference was not statistically significant when compared with control (P=0.69)

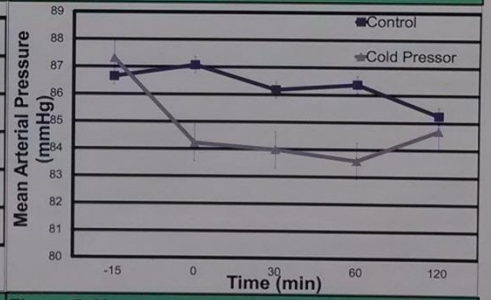


Figure 3: OGTT with cold pressor stimulus did not alter diastolic blood pressure relative to control (P=0.28)

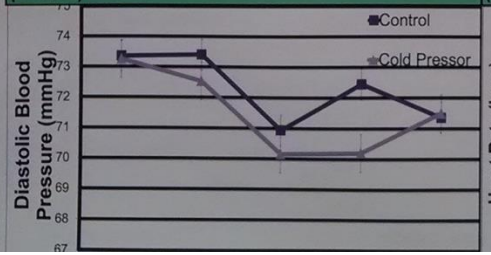
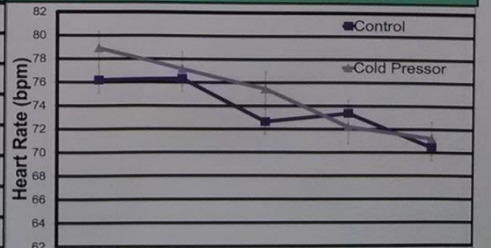


Figure 5: Heart rate decreased in the control and cold pressor groups with statistical significance (P=0.02)



SUMMARY

1.) OGTT with cold pressor stimulus did not alter blood glucose level relative to control. The cold pressor test did not have a statistically significant impact on glycemic response (P = 0.79).

2.) OGTT with a cold pressor stimulus did not alter systolic blood pressure, diastolic blood pressure or mean arterial pressure when compared to the control (P= 0.53, 0.28, and 0.69 respectively).

3.) OGTT with a cold pressor stimulus appeared to alter heart rate when compared to time (P=0.02). However, when compared to the control group, no statistical significance was seen.

CONCLUSIONS

The cardiovascular and glycemic response to a cold pressor stimulus was evaluated in a cohort of 83 healthy college subjects. Cold pressor test had no statistically significant affect on blood glucose, systolic diastolic or mean arterial pressure. OGTT with a cold pressor stimulus appeared to alter mean arterial pressure and systolic pressure but was not statistically significant when compared to the control group. Surprisingly, the experimental group exhibited a decrease in heart rate when compared to time, but no statistical significance was determined when compared to the control group. It is possible that the three 30 second ice bath immersions were not adequately stimulate the SNS enough to significantly alter the glycemic response. Future implications of this study may include utilizing longer ice bath immersions to induce a more robust SNS response.

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Abstract

Endophytic fungi in plants are believed to serve some mutualistic functions: drought and salt tolerance, nutrient acquisition, seed germination, and plant establishment. Could desert plant fungal endophytes be transferred to local heat-sensitive plants, thereby conferring heat-tolerance? The desert plants *Atriplex canescens* (four-wing saltbush) and *Larrea tridenta* (creosote bush) are normally colonized by dark septate endophytic fungi that cannot be eliminated by seed sterilization. Surface-disinfected seeds from both species were germinated on MS + 1 mg/L 2,4-D media, and upon germination, callus tissue formed on both root and hypocotyl sections. The presence of endophytic fungi in creosote callus was observed following staining of callus with 0.04% Trypan Blue. This was also verified by PCR using the fungal-specific primers Ured1 and Ured2. No fungal endophytes were detected in the four-wing saltbush callus by microscopy or PCR. The endophyte-infected creosote callus was then transferred to roots of two micropropagated tomato cultivars (*Lycopersicon esulentum*) which were aseptically wounded, then transferred to soil after one week. There was no measurable difference between the growth rates of tomato plants infected with the callus-endophyte-infected tomato plants and the uninfected tomato plants at 26°C, but continuing research will include monitoring the uninfected vs. fungal-infected tomato plants at elevated temperatures. "Endophyte-swapping" may be one alternative to genetically modifying plant species that are sensitive to environmental stresses, thereby circumventing the ethical baggage and health concerns that surround genetically modified plants.

Introduction

In 2008, scientists began swapping micoorganisms between plants in attempts to alter a plant's response to high temperature stress (Rodriguez et al. 2008; Barrow et al., 2008). By applying microbes from weeds grown in high-temperature environments, to sensitive plants, the treated plants survived extremely high temperatures, and required significantly less moisture. Drought, soil salinity, and increasing temperature are currently the greatest threats to agricultural sustainability. It is not the plant alone, however, that adapts to plant stress. It is the plant's symbiotic relationship with fungi and bacteria that allow it to tolerate environmental extremes. In Winona, the typical nursery plants sold for gardens and lawns are often not adapted to the high temperature stresses we've experienced in recent years. Many plants contain systemic fungal endophytes that are structurally integrated within the cells, tissues, and organs of those plants and contribute to heat tolerance. If the endophytes of southwestern plants could be used to infect temperate grasses and garden plants, we might expect to see an increase in temperature- and drought-tolerance in the infected plants. The goal of this study was to move fungal endophytes known to be present in two heat-tolerant desert plants (*Larrea tridenta* (creosote bush), and, *Atriplex canescens* (four-wing saltbush)) into temperature-sensitive local tomato plants (*Lycopersicon esulentum*).

Methods

Callus Initiation: Seeds from the heat-tolerant species four-wing saltbush (*Atriplex canescens*), and creosote bush (*Larrea tridenta*) were obtained from Plants of the Southwest, Santa Fe, NM. Seeds were surface-sterilized (Barrow et al., (2008) and used to initiate undifferentiated callus cultures in MS + 1mg/mL 2,4-D media, which served as sources of inoculum for unculturable endophytes. Heat-sensitive tomato seed (*Lycopersicon esulentum*) var. Beefsteak was purchased locally (Figs. 1 and 3)

Endophyte Transfer: To transfer the fungus to heat-sensitive tomato plants, tomato seeds were surface sterilized as for creosote and four-wing saltbush seeds, then plated on MS media minus 2,4-D at 26°C. After one week, the callus (containing the fungal endophytes) were pushed below the surface of the media near the tomato roots. After three weeks, tomato plants were transplanted from tissue culture into soil at 26°C (Figs. 4 and 5). Plants were covered with plastic bags to retain moisture for one week, then removed.

Microscopy: Creosote and Saltbush callus were stained with 0.04% Trypan Blue and observed by light microscopy (Fig. 2).

DNA Extraction, PCR, Electrophoresis: DNA was isolated from 200 mg of [illegible] tissue of each species according to [illegible] et al. (1993). PCR was performed using Ured1 and Ured2 fungal-specific primers according to [illegible] et al. (2008). PCR products were separated in [illegible] agarose gel with [illegible], stained with ethidium bromide, and photographed (Fig. 6).

Results

Fig. 1. (A) Four-Wing Saltbush and (B) Creosote Bush two months after planting of seeds

Fig. 4 (to left) One-week-old beefsteak tomatoes prior to infection with creosote callus.

Fig. 2 (above) Creosote callus stained with 0.04% Trypan Blue. Endophytic fungi present.

Fig. 5 Control and creosote-infected beefsteak tomatoes after infection and two week's growth in tissue culture.

Fig. 3 (above) Creosote callus on MS + 1mg/L 2,4-D media

Fig. 6 (above) Electrophoresis gel of creosote and saltbush callus PCR using Ured1 and Ured2 fungal-specific primers. Fungal Bands in rows 2-4 (creosote), no fungal bands in rows 5-6 (saltbush)

Summary of Results

- All creosote and saltbush seeds (on MS + 2,4-D media) germinated in one week. This contrasts with the uneven and low germination percentage that occurs is soil.
- The presence of endophytic fungi in creosote callus was detected in these heat tolerant plants (Fig. 2) and verified using PCR with Ured1 and Ured2 fungal-specific primers (Fig. 6). A single fungal DNA sequence of 225 bp was amplified from creosote callus by PCR. No fungal endophytes were detected in four-wing saltbush callus by either microscopy or PCR, but fungal endophytes have been reported for saltbush (Barrow et al. (2008).
- Neither the creosote (nor 4-wing saltbush endophytes, if present) had a significant impact on the size of the tomato plants. Every plant had the same average diameter at the base, was the same shade of green, and had a similar number of branches. While the control tomato plants and those infected with four-wing saltbush callus had a similar average change in height (4.38 inches and 4.26 inches, respectively) the tomato plants inoculated with creosote bush callus had a smaller average change in height (3.5 inches). (Data not shown).

Conclusions

Climate models continue to predict that plants will face increased drought, soil salinization, increased CO_2, and temperature fluctuations in the future, yet little money has been invested into determining the adaptive potential of the organisms at risk. Microbiome swapping is an alternative to genetically modified seeds. It might circumvent the ethical baggage and health concerns that surround genetically modified organisms, and unlike conventional plant breeding or recombinant DNA gene transfers, the results are immediate (Barrow et al., 2008). Further research will be conducted to monitor the control vs. fungal infected tomato plants at elevated temperatures.

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[illegible] [illegible]

Purpose

Due to a lack of literature by nursing professionals on reproductive environmental risks, the study was designed to evaluate the level of education provided to young adults by health care providers involved in prenatal care.

Design

Qualitative interviews were conducted with the student and faculty member in one rural county of the Midwest. The three providers were at three different settings.

The nutrition program and primary care providers served pregnant and pre-pregnant clients. The family planning served pre-pregnant client and rarely pregnant clients.

The interviews were recorded, typed and reviewed for themes. Internal Review Board approved processes and documents to assure privacy and protection of providers.

Literature Support

There is an increasing amount of evidence to support that certain environmental chemicals can cause harm to in utero development. Prenatal/preconception health professionals are in an ideal position to educate (Sutton et al., 2012).

Many women who are prenatal or pregnant are confused and unsure how to avoid heavy metals in food and are therefore at risk. Health care professionals should be aware of this when educating (Peters, Rhoades, Ezzell, Holland, & Weatherspoon, 2013).

Low level of confidence to teach about environmental risks among Public Health Nursing Directors (Polivka, Chaundry, & MacCrawford, 2012).

Research agenda for environmental health calls for new methods to translate information to health care providers and general public (Woodruff, Schwartz, & Giudice, 2010).

Qualitative Data

Themes	Educational Tools	Topics Covered	Patient Focus	Satisfaction with Current Educational Materials
Explanation	• Online Resources • Peer Mentoring • Handouts • One-on-one appointments	Environmental topics covered while educating clients	Client's focus during visits and health care provider's other educational topics	The providers satisfaction with the current materials they use
Quotes	CP1: "This is our manual that we give them. It coordinates with our childbirth education classes and our post partum (classes). They are all from the same series so they are able to go online and watch videos with this code and then it has this little section on environmental lifestyle factors." CP2: We have a couple of different smoking handouts we hand out... Minnesota does provide a really nice handout for fish.… We usually schedule half and hour per person approximately…very often for families we see them for the long appointment, give them their vouchers then they stop in for their quick 10 minutes, they get three more months and then by then it is time for their long appointment again" CP3: "many of our forms come to us from Planned Parenthood Federation of America which is then modified by Planned Parenthood of MN and then given to us and then changed...there isn't an environmental risk assessment… it's not something that is permanently engrained into our everyday business with patients… There are printed materials available"	CP1: "We just give a general overview... depends on their job descriptions. We always have them check their MSDS forms at work. We want to make sure if they are dealing with hazardous chemicals, what is it rated and then we discuss it with their provider… toxoplasmosis and listeria… chemicals in foods…mercury in fish.… Avoid anything that has harmful fumes like fuel, gasoline, cleaning fluids, paint, aerosol, pesticides, (and) insecticides" CP2: "I would say the biggest one we talk about is smoking. We ask specific questions about tobacco exposure… We ask illegal drug use questions but that's the only chemicals that we ask about. We talk about kids under 15 and pregnant women being careful about pollutants, (and) the mercury level in fish." CP3: "They do a health history form and there is very minimal information about environmental health. I know some of the social aspects are on there like smoke exposure things of that nature but things that are specifically environmental, we don't touch much on…If asthma is part of their health history, that's addressed but as far as things that may predispose them to… that's not on there… We are already focusing on seatbelt use, drinking, recreational drugs, (and) number of partners."	CP1: "Their biggest concerns are mostly can they hear the heartbeat yet or physical discomforts like nausea or sleeplessness. More of the exciting baby things like ultrasounds…I definitely feel like we are trying to educate them more than they are enquiring us." CP2: "So even that little bit of time I'm given to do the nutrition assessment maybe they don't have a house right now and so that's where mom's focus is. I spend very little time on nutrition assessment and (instead) we are going over housing options for the family." CP3: "Most of the time they are just like 'What do I do to get on the pill?' …or 'I'm on Depo, when should I stop if we are thinking of starting a family?'… a majority of our patients don't ask us"	CP1: "It works really well…our patients like it... It is pretty comprehensive. It really varies per job so I don't know everyone's different living situation so I don't know if we would be able to cover everything in great detail. I think it gives a basic overview and then we get a feel when we are talking to them and can find resources" CP2: "I would say no, that I wasn't satisfied with the materials, they were a little bit older, but they had a nice booth there (at conference) and I just thought this (smoking pamphlet) was really catching… if you know of some good handouts that are appropriate for this population, absolutely (send them)." CP3: "I think I would be interested to know more…. environmental health and what specifically would our target population of 15-24…should we be focusing on. What for environmental health should we be considering as something we are completely missing and doing a disservice to our patients."

Discussion

Health care providers in this Midwest rural area use various tools to educate women on prenatal health, but with very little focusing on reproductive environmental exposures.
Topics covered generally included smoking with only one provider expanding on other exposure risks. Patient focus seemed to be a barrier to many of the care providers as most patients had other priorities during visits.

Conclusions

Providers valued learning more about reproductive environmental exposure risks and were open to being provided with more education to pass on to clients.

Due to limited time, providers tended to be focused on client immediate needs such as housing, food insecurity, contraception, pregnancy viability, and nutrition vouchers.

Clients rarely initiated concerns about lead, mercury, pesticides, plastics, personal care products, cleaning products, or hazardous materials in the home.

Clients occasionally expressed concerns related to work exposure to one provider. Generally client concerns are limited to immediate needs and not reproductive environmental risks.

Materials the providers consistently used included smoking risks and were inconsistent with lead , mercury, pesticides, plastics, personal care products, cleaning products, or hazardous materials in the home.

Next Steps

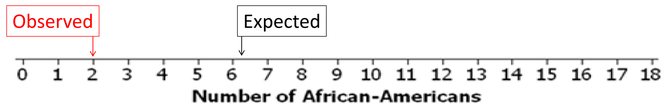
- ❖ Conduct future interviews in other counties to determine trends
- ❖ Initiate regional education on reproductive environmental risk for providers
- ❖ Consider new methods to reach pre-pregnant consumers about reproductive environmental risk
- ❖ Evaluate teaching materials for regional use on reproductive environmental risk
- ❖ Explore inter-professional collaboration

Example

Candidate Pool 25/74, 34%	
Hired 2/18, 11%	
Question of Interest	Is the hiring of head coaches biased against African-Americans?

Preliminary Questions

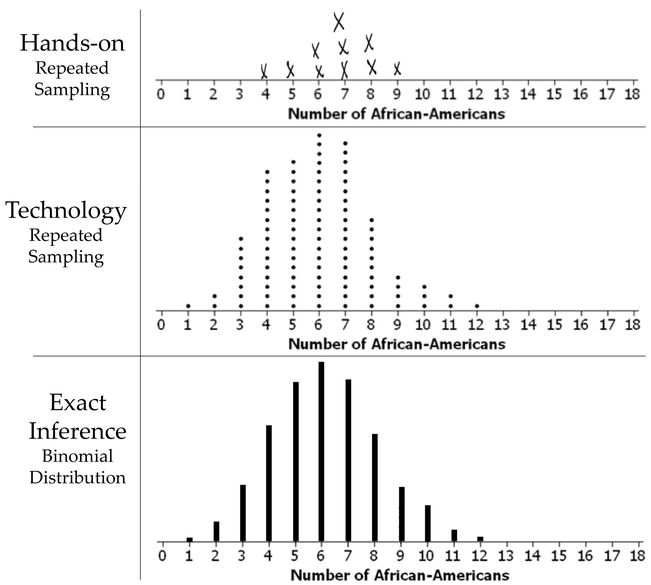
1. How many African-Americans should have been hired out of the 18 open positions?
2. Do we have to observe the expected value exactly in order to say that no bias is present, or is some deviation from the expected value acceptable?
3. At what point do you start to believe the hiring process is biased against African-Americans? Do you think observing 2 is "too much" deviation from what is expected in an unbiased hiring process?



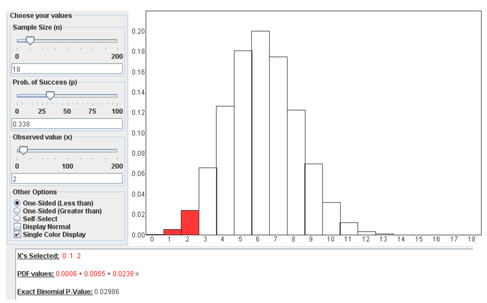
4. How much confidence do you have in your answer to the previous question?

Repeated Sampling & Exact Inference

5. What proportion of the outcomes resulted in 2 or fewer African-American hires?
6. Is this proportion small enough that you would consider such an outcome unlikely to occur by chance alone?
7. Would you say the data provides [no | moderate | strong] evidence that the hiring process is biased against African-Americans? Explain.
8. Do you have [less | same | more] confidence in your decision when using a larger number of repeated samples?



Situation	Outcome
Hands-on	$\frac{0}{10} = 0\%$
Technology	$\frac{3}{100} = 3\%$
Exact Inference	2.99%



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Assessment

Preliminary ideas

- Discovery of expected value without formulas (6/11 correct, 5/11 rounded to a whole number)
- Understanding that deviation from expected value is acceptable (5/11 correct, 4/11 said yes because "you cannot hire 6.12 African-Americans"
- Determination of unusual outcome (6/11 correct, 4/11 used a two-sided approach)

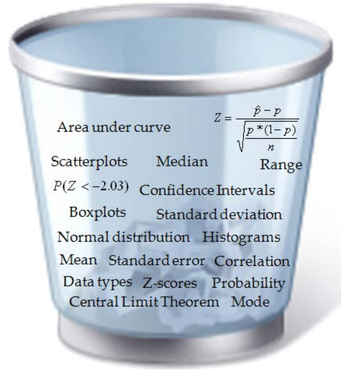
Understanding of the repeated sampling process

- Construction of population used for repeated sampling (Correct: 23/33)
- Representation of objects drawn from population (Correct: 29/33)
- Interpretation of dotplot (Correct: 25/33)

Intuitive Inference

- Counting of outcomes more extreme than observed (5/33 measured extremeness relative to observed outcome, 11/33 understood meaning of extreme or more extreme)
- Formal statistical conclusion (11/33 were able to write a correct inferential statement in context, 6/33 made a partially correct inferential statement)

Letting Go to Grow



The concepts of sampling distributions and inference are typically introduced midway through the course and are centered on normal theory methods. Cobb (2007) suggests putting the core logic of inference at the center instead. Many topics that typically precede inference for a single proportion are not necessary as this activity illustrates.

What is necessary is a basic understanding of the core components of a sampling distribution: repeated sampling, statistic, and distribution. The concepts of a p-value and its use as a measure of extremeness are naturally developed. These ideas are revisited several times throughout the course.

New Challenges

- Some students feel it is necessary to do repeated sampling for every example
- Some students may confuse the number of repeated samples with the sample size
- Relies heavily on the use of technology (e.g. repeating sampling, computation of binomial probabilities)
- Normal approximation to the exact test is not discussed which may lead to perceived deficiencies in future courses
- Confidence intervals based on exact methods are difficult

Conclusions

- Activities, such as the one presented here, can be used to introduce sampling distributions and their role in statistical inference early in the course
- These concepts can and should be revisited several times throughout an introductory course
- The activity presented permits students to discover the concept of a p-value and its measure of extremeness
- Exact tests (e.g. binomial) are a natural extension of the repeated sampling process and are accessible to introductory students with minimal mathematical background through the use of technology

References

- Rossman, A., Chance, B., and Holcomb, J. (April 2009), Causeweb Webinar, "Concepts of Statistical Inference: A Randomization-Based Curriculum." http://www.causeweb.org/webinar/teaching/2009-04/
- Cobb, G. (2007) "The Introductory Statistics Course: A Ptolemaic Curriculum?", Technology Innovations in Statistics Education: Vol. 1: No. 1, Article 1. http://repositories.cdlib.org/uclastat/cts/tise/vol1/iss1/art1

Motivation

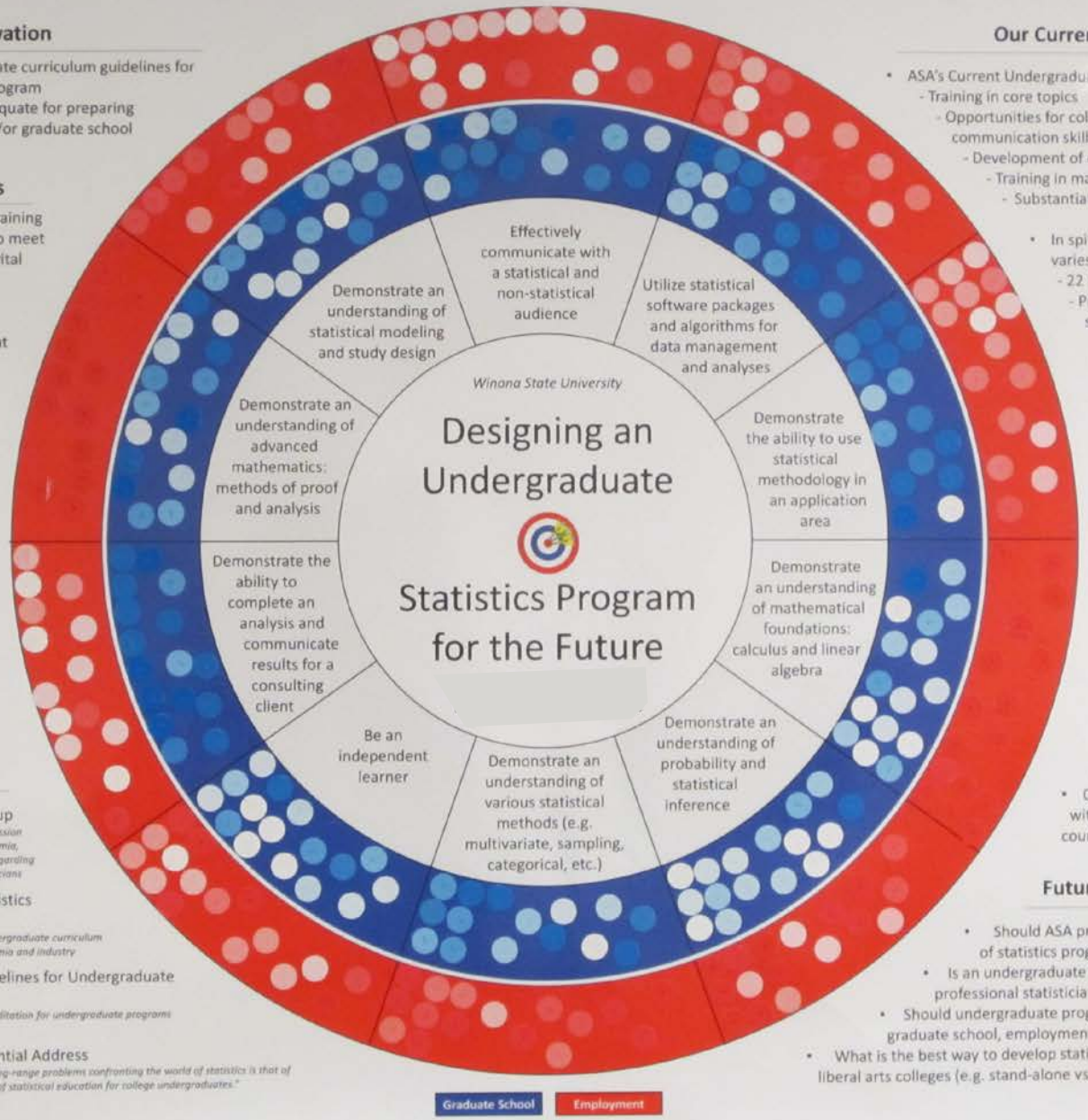
- Continue to develop appropriate curriculum guidelines for an undergraduate statistics program
- Ensure that outcomes are adequate for preparing students for employment and/or graduate school

Past Considerations

- Minton (1983) suggests that training undergraduates is necessary to meet the demands of industry and vital to the growth of our graduate programs.
- Higgins (1999) recognizes the need for training statisticians at the undergraduate level and provides specific suggestions for this curriculum.
- Hogg (1999) urges us to assess and improve the statistics curriculum, especially at the undergraduate level.
- Bryce et al. (2001) discuss the problem with the lack of consensus on the undergraduate curriculum.
- Moore (2001) states, "Our future depends on achieving a more prominent place in undergraduate education beyond the first methods course."

ASA's Progression

- **2010** — Education Workgroup
  Purpose: To facilitate a discussion among statisticians in academia, industry, and government regarding the training of future statisticians
- **1999** — Undergraduate Statistics Education Initiative
  - *Organized workshop on undergraduate curriculum*
  - *Representatives from academia and industry*
- **1986** — Committee on Guidelines for Undergraduate Statistics Curricula
  Investigated concept of accreditation for undergraduate programs
- **1950** — Wilks's ASA Presidential Address
  "... one of the most serious long-range problems confronting the world of statistics is that of establishing a sound pattern of statistical education for college undergraduates."



Our Current State

- ASA's Current Undergraduate Curriculum Guidelines
  - Training in core topics
  - Opportunities for collaboration and development of communication skills
  - Development of computational skills
  - Training in mathematical foundations
  - Substantial training in an application area
- In spite of these guidelines, curriculum varies widely at the undergraduate level
  - 22 programs were investigated
  - Programs were selected from schools of varying sizes and across several geographic regions
  - Program requirements:
    - Multivariable calculus: 17/22
    - Proof course: 8/22
    - At least one CS course: 15/22
    - At least one course in an application area: 5/22

Program Outcomes

- Several schools are faced with preparing students for employment and/or graduate school within the same program
- Several outcomes for a program such as this have been identified after reviewing ASA's guidelines and the past work of others. These are listed to the left.
- Outcomes were identified without specifically mentioning courses to allow for flexibility.

Future Considerations

- Should ASA proceed with accreditation of statistics programs to improve consistency?
- Is an undergraduate degree sufficient to be a professional statistician?
- Should undergraduate programs train statisticians for graduate school, employment or both?
- What is the best way to develop statistics programs at small liberal arts colleges (e.g. stand-alone vs. interdisciplinary) ?