LOGOS

A Journal of Undergraduate Research

EDITORIAL STATEMENT

LOGOS: A Journal of Undergraduate Research is dedicated to the publication of scholarship and artistry by undergraduate students (or undergraduate students coauthoring with faculty) of Missouri State University. It is open to submissions from all undergraduate students at the university and conforms to the highest standards of scholastic integrity in a blind, peer-review process conducted by distinguished undergraduate students and faculty.

LOGOS is sponsored by the Missouri State Honors College, with faculty oversight and governance provided by a Faculty Advisory Board. The journal is produced by a managing editor, a chief editor, associate editors, and a small student editorial board, all of whom are part of the Honors College.

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Dedication

In Memory of Kyle Chown (1993-2014): A dedicated student, aspiring researcher, and a friend to many.

REFLECTION IN HONOR OF KYLE CHOWN

"My name is Kyle Chown and I have cancer, but this fact does not define me…" with these introductory words written in an autobiography assignment in my UHC 110 Freshman Seminar class in the fall of 2012 Kyle introduced himself to me. The goal of the autobiography assignment focused on each student initially introducing themselves by focusing on one thing or aspect that they believed helped to best define them as an individual.

His essay served as an excellent introduction to Kyle as a brilliant, thoughtful and compassionate young man. I became quickly struck by how maturely Kyle presented his battle with cancer, and how very hopeful and positive he remained about his future academic career.

What impressed me even more about Kyle was his indefatigable drive and desire to get as much out of every day and every interaction he had. He very quickly became passionate about getting engaged in undergraduate research on and off campus. More than any other student that fall semester he embraced the idea of starting on a research project as soon as he could. I remember receiving an excited email in October from Kyle mentioning a possible research opportunity that he had pursued on his own at Mercy Hospital. He wrote, "I met with Dr. Whetstone, a neuropsychologist from Mercy Hospital, this morning to interview for a possible shadowing/research position with him." He continued with passion about how well his meeting had gone and added, "I even got a chance to talk to one of his partners as well." Kyle concluded, very thoughtfully, "While the opportunities there aren't as broad as they may be for a graduate student, they are both very willing to have me do a variety of things with them." Apparently, these healthcare professionals had been very impressed with Kyle's passion and drive and offered to allow him to observe patient appointments, help out in testing and consultations, as well as allowing him to engage in reading neuropsychological material that they offered to direct him in interpreting.

I also remember on another occasion when a student had come to the Honors College with a serious life threatening health issue and Kyle very quickly offered to speak with her, so that he could, in his own words, "help give her the courage" to go ahead with the procedure she so feared. That was just like Kyle: thinking of others and always trying to find a way to help those around him deal with difficult situations. Kyle gave so selflessly of himself, his time, and his energy to all who surrounded him.

Kyle kept his own spirits high, even during the final months when he was battling his cancer even harder. I remember how despite his illness, up into the final weeks of his last semester at MSU, that Kyle still inspired others.

There are many students, faculty and other friends here on and off campus that will miss Kyle Chown. His friends and fellow Scholars House residents will miss their long conversations, and his sense of humor. His jokes and his company comforted many with their own problems.

I myself came to know Kyle fairly well during his brief time here at MSU. Through my interactions with Kyle, more than anything else, I will miss his inspiration and his passion for life. I have known few people who had more passion for living life than Kyle Chown. Kyle touched the lives of so many people at MSU, more than I think he even realized. Kyle will be dearly missed by all who knew him. My sincerest condolences go out to his friends and family, for he was taken from us too soon.

John F. Chuchiak IV, PH.D.
Director of the Honors College
Professor of Colonial Latin American History

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Shaylynn Rackers

Fresh Aire

Abstract

"Colorful, transparent, and overlapping shapes": this was the requirement for a painting project in my design class. I struggled to come up with an idea that I actually liked during my sketchbook brainstorming session. While glancing aimlessly around the classroom, I decided to choose one small thing to use as a specific source of inspiration.

Before I came to class that day, I had been listening to the song "Interrupted Thought" on the album *Fresh Aire II* by Mannheim Steamroller. This group is best known for their instrumental Christmas music featuring a mix of classical, jazz, and rock themes, and their *Fresh Aire* albums are musical studies of the four seasons. By the end of that brainstorming session, I chose to base my project on the song Interrupted Thought.

I didn't want to simply make a painting inspired by the emotion of the song; I wanted to paint the song itself. Whenever I listen closely to music, I translate the whirling melodies and sturdy rhythms into colors, shapes, textures, and movement. The best analogy for this mental movie is a colorful animation on an infinite, three-dimensional blackboard. It's just one of the ways that I remember music. That morning, the Fresh Aire album had struck me with the clearness of the visuals it inspired, and I started to experiment in my sketchbook with the ways that I could express my mental movie as a two-dimensional painting.

The painting features highlights from the first thirty-three seconds of Interrupted Thought. The large concentric circles represent the rising crescendo of the cornet, and the starburst shapes are the twinkling of the celeste. Squares and circles—the piano—dance across the rest of the paint, while the almost neon gradient in the background reflects the electronic sounds in the song.

There is no way to capture the fullness of music using a paintbrush, but this painting, named Fresh Aire after the Mannheim Steamroller album that inspired it, is a small window into the beauty of song as I picture it.

Shaylynn Rackers will be a sophomore at Missouri State University in the fall of 2014. She is studying graphic design and illustration, and is also interested in pursuing her interests in English, literature, metalwork, and new media. A sense of wonder and attention to colorful details inspire Shaylynn's artwork. In her spare time, she runs the blog and online store "Shealynn's Faerie Shoppe," focusing on art, jewelry, and celebrating geeky passions.

Jessica Ball

Mattise, Prince of the Fauves: Color, Criticism, and The Open Window, Collioure

Abstract

This paper discusses the events that influenced Matisse in establishing the Fauve movement in the early 20th century. *The Open Window, Collioure*, shown at the 1905 Salon d'Autumne in Paris, was among the first of Matisse's Fauve paintings and exemplifies the ideals of Fauvism. The Fauves, led by Matisse, emphasized construction by colored surfaces and considered subject matter unimportant in their work. These artists were received unfavorably, and *The Open Window*, in particular, was the recipient of negative criticism at the Salon. The Salon was only one of several instances in which Matisse experienced failure and humiliation in his lifetime.

Introduction

On New Year's Day, 1871, German soldiers marched through the textile town of Bohain, France, located in the northeastern part of the country. It was an event that occurred twice in the life of the 2 year-old Henri Matisse and, as an adult, Matisse never quite escaped the failure and humiliation of his youth due to the German invasions. Disappointment and shame became a pattern in his life: he finished law school only to suffer from appendicitis and, when he decided to become a painter, he received scathing reviews. The Fauve period in particular was a time in which Matisse was met with heavy criticism, and *The Open Window, Collioure* painting was among his first Fauve paintings. It exemplifies his distortion of color and was received as a failure at the 1905 Salon d'Autumne in Paris.

Color Inspiration

Henri Matisse was the son of store owners. His father and namesake, Emile Hippolyte Henri Matisse, came from a family of weavers. His mother, Anna Héloïse Gérard, belonged to a family of tanners, furriers, glove-makers, leather-dressers and skin-merchants. That they made a home in Bohain was thus fitting: the town had a history of producing silk-weavers whom had become skilled workers under the tutelage of linen-weavers such as Henri Matisse, the painter's great-grandfather.[1]

Matisse's first experience with painting was with his mother, who was an accomplished painter on porcelain. He was inspired by her color sense. Later, when he made painting a career, he was inspired by three artists in particular who were dissatisfied with Impressionism's reliance on sensory effects. Georges Seurat, Vincent van Gogh, and Paul Gauguin had begun to use color in new ways, painting with intellect and emotions, as well as the eye, in the late 1880s. The three influenced Matisse's evolving approach to color.

Collioure and the Birth of Fauvism

In 1905, Matisse moved south, following in the footsteps of van Gogh and Gauguin, to paint in Collioure. Though many of the defining characteristics of Fauvism were already present in his work by the end of 1901,[2] it was in Collioure that Matisse created Fauvism. He had begun to experiment with a new way of rendering things, along with other artists, and to move away from the constraints of naturalistic description. His exposure to the light of the Mediterranean in 1898 triggered the initial eruption of color in his paintings, which led to his allowance of colors to negotiate freely, on their own terms.

Upon his arrival in 1905, Matisse realized his goals for painting were to construct with colored surfaces and search for more color intensity.[3] He no longer believed subject matter was important, and Collioure was the perfect place to feed Matisse's hunger for bold, synthetic compositions of pure color. Paul Soulier, a local wine-grower who became Matisse's friend, wrote that the secret of the town lay in its light and color. "It is this intense light, this perpetual dazzlement, that gives a northerner the impression of a new world,"[4] he said of the town.

Indeed, *The Open Window, Collioure* is viewed by scholar Hilary Spurling as a great example of Matisse's sense that paintings give viewers access to another world.[5] This world was, for Matisse, a place of mystery and possibility that he had first contemplated as a boy in Bohain, and the rich colors came from his new environment. Collioure's vibrant colors saturated his canvases.

The Open Window, Collioure

Matisse's painting *Open Window, Collioure* is filled with vibrant light, inviting the viewer into this other world. It is a vertical composition, with one window stretching nearly its full length. The window opens onto a view, which is composed of horizontal colors which are equally strong in saturation and brilliancy as the colors of the frame and wall[6] that outline the window.

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1   Hilary Spurling, *The Unknown Matisse*. (New York: Alred A. Knopf, 1999), 26.

2   Hilary Spurling, *The Unknown Matisse*. (New York: Alred A. Knopf, 1999), 234.

3   Carla Brenner, "Henri Matisse Color and Light," School Arts May 1991: 33, *Business Insights: Essentials*, Web, 4 March 2013.

4   Hilary Spurling, *The Unknown Matisse*.

5   Ibid., 305.

6   Carla Gottlieb, "The Role of the Window in the Art of Matisse," *The Journal of Aesthetics and Art Criticism* 22, no. 4.

The view through the window is that of boats in a harbor, beyond a fence which encircles a garden visible through a portal of open leaves.[7] The boats are painted with orange-red masts and blue hulls, two colors found again in the transom as well as on a larger scale in the walls. The flecks of green and purple seen through the window are also connected to colors in the room, dominating large swaths of the walls. These large blocks of color on the interior contrast with the short wavy lines or staccato brush-strokes of the outside world. The repetition of color, though, unites the interior and exterior.

The use of complementary colors, such as orange and blue, creates a sense of business in the center of the painting. The viewer's eye follows the path of colors, causing the eye to traverse the canvas surface again and again.[8] In addition to the crisscrossing colors, the areas of colors from opposite poles on the color wheel also add to the disquiet of the painting. This application of color, then, reflects Matisse's agitation at the time, and inspired his title as a 'wild beast' at the Autumn d'Salon later in 1905.

Even in the process of painting there was frustration: fellow Fauvist Raoul Dufy was later recounted as saying that Matisse was not satisfied with *The Open Window* for a time because he could not "catch the amazing brilliance of Mediterranean light."[9] This led to a moment of annoyance (and perhaps genius) in which Matisse broke all rules of Impressionism and strongly outlined the window frame in black.

Criticism of Fauvism

Matisse later explained that misery was the mood that had produced the Fauve explosion. This explanation came as a shock to many members of the public: people found it difficult to believe that layers of frustration lay behind the cheerful brilliance of such paintings as *The Open Window (1905)*.[10] This misery was a product of emotional and financial instability. In the spring of 1903, Matisse had experienced a low point, suffering from insomnia and a waning desire to paint. Money worries nagged at him, even as he sought escape in the vibrant town of Collioure, where he lived from hand to mouth, much like the locals.

The public's reaction did nothing to ease Matisse's emotional or financial state. When the public saw *The Open Window,* they reportedly doubled over in laughter to the disappointment of Matisse and his contemporaries. Matisse's painting became the 1905 Salon d'Autumne's main draw for spectators, who treated the whole show as a circus.[11] Art critic Louis Vauxcelles led these spectators: it was Vauxcelles that had given the name 'fauve' to Matisse on inspection of the Salon's room Salle VII that year. On noticing a couple of academic sculptures placed in the middle of works by Matisse (including *The Open Window, Collioure*) and others, Vauxcelles was heard to say the sculptures were "a Donatello among the wild beasts (fauves)."[12]

The group christened 'the Fauves' included artists Derain, Friez, Braque, Rouault, Vlaminck, and Marquet. Their paintings were made with stridently bright colors and simplified, yet expressive, forms. For much of the public their bright canvases of distorted forms and inconsistent proportions were like an invasion of barbarians, contrasting sharply with the more familiar, charming pictures from more popular artists.[13] The techniques of the group seemed to revolt against all discipline.

Another critic, Maurice Denis, joined Vauxcelles in expressing his distaste for Matisse. In his 1905 review of Matisse's Salon d'Automne exhibition entries, Denis wrote that even though his work was the newest, most vital, and most discussed of younger painters, Matisse had spoiled his instinctual gifts by adhering to theories like Neo-Impressionism. In addition, he believed that Matisse had erred in attempting to reproduce the pure act of painting, which meant painting outside of every contingency.[14]

Critics Gustave Coquiot and Charles Morice had articulated disgust for Matisse's work even before the 1905 Salon. Coquiot, as early as 1901, accused Matisse of 'eccentric deformations.' As of 1903, Morice described Matisse's forms as "useless, inexpressive, and ugly distortions betraying the denial of sincere effort."[15]

Matisse's fellow artists, too, shunned him. Picasso was vexed by Matisse's mastery of color, and his supporters ignored Matisse at a Montparnasse café around 1910, which Matisse never forgot. This was, perhaps, because of their different upbringings and styles. Picasso had been raised as a child prodigy encouraged by his artist-father and had always been made aware of his own

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7   Carla Gottlieb, "The Role of the Window in the Art of Matisse," *The Journal of Aesthetics and Art Criticism* 22, no. 4.

8   Ibid.

9   "Black Light," *Critical Quaterly* 51, (April 2, 2009).

10   Hilary Spurling, *Matisse the Master: A Life of Henri Matisse: The Conquest of Color, 1909-1954*, (New York: Alfred A. Knopf, 2005), 103.

11   Hilary Spurling, *The Unknown Matisse*, 331.

12   Ibid., 33.

13   Alexander Romm, *Matisse: A Social Critique*, (Kessinger Publishing, 2005), 33.

14   Catherine Bock-Weiss, *Henri Matisse: A Guide to Research*, (Taylor and Francis, 1996), xxiii.

15   Ibid., xxv.

greatness. Matisse, in contrast, was endlessly dissatisfied and had faced discouragement from the beginning. He was never surrounded by acolytes, as was Picasso.[16] In addition, Picasso pursued self-expression in terms of pure line, whereas Matisse preferred to express himself in terms of pure color. Matisse gravitated toward harmony, while Picasso habitually flirted with chaos.

Henri Edmond Cross was another of Matisse's contemporaries. His works were to be shown at the Salon in 1905, but Cross reportedly 'cried off' the list in room Salle VII. In a letter to Matisse he explained "I would prefer my submission which belongs with the softer harmonies this year, to be separated from yours…in a place that favours calm where it can hold its own, rather than being made to look even paler, which would certainly happen near you."[17]

Criticism continued and, at last, in 1908, Matisse felt compelled to defend himself. In his first essay, *Notes of a Painter*, Matisse shared his view of art and color. He wrote that there were two ways of expressing things—one was to show them crudely, and the other was to evoke them through art. He wrote that his chief aim was expression, and that "the chief function of color should be to serve expression as well as possible."[18] Therefore, he used color not as a method to represent the exact likeness of what he saw before him, but rather the sensations each object evoked.

Fauvism, then, was a time when artists asked themselves, "What do I want?" It rejected the ideas of Divisionism, and focused instead on construction by colored surfaces, pursuit of color intensity, the unimportance of subject matter, and the freedom of light.[19] As Matisse would say later, "My dominant colors, which were supported by contrasts, were eaten away by these contrasts, which I made as important as the dominants. This led me to painting with flat tones: it was Fauvism."[20]

After the Fauve period, critics looked upon Matisse's fauve works more favorably. In 1976, Charles Millard wrote a piece on Fauvism for The Hudson Review. While critics for years had condemned Matisse, 'prince of the fauves,' and his style of painting, Millard suggested that Matisse may not have been wholly Fauvist as many believed. He opened with naming the two late 19th century catalysts that led to Fauvism: two art tendencies permitting greater flexibility in the distribution of hue and value than before encouraged freer color in painting. By 1906, these accommodations of coloristic freedom and

naturalistic representation were almost at an end, and Fauvism pushed them as far as they would ever go in a last burst of energy. Matisse was among those who pushed for freer color in painting.

Yet Millard distinguished Matisse from the others labeled as Fauve by Louis Vauxcelles. Matisse, Millard believed, did not cleave to painting's figure tradition but to its most ambitious manifestation.[21] In this case, Millard referred to the representation of grouped figures (nudes, in particular) which Matisse began painting in 1907. Due to his admiration for Matisse's later work, Millard did not view Matisse's Fauve works as 'ugly' or 'useless.' He believed that Matisse did not conform to the style of which he was named the leader, and that Matisse moved in his own direction in the early 20th century. Therefore, Fauvism supported Matisse's quest toward the most meaningful color painting of the first half of the century,[22] for he abandoned the vibrant surfaces of the Fauve style after 1907 in favor of heavy lines and bold areas of color.

Marcel Sembat was another critic who did not laugh at Matisse's fauve works. In fact, Sembat lauded them. He believed Matisse was original without trying to be, and that all his fauve paintings were "ablaze with the joyous triumph of color."[23] He wrote this in 1920, when Fauvism had lost its menace and was more charming in retrospect.

These kind and more appreciative critiques, though, could never soften the harsh blows dealt Matisse in one of his weakest moments. Following financial troubles, insomnia, and a decreasing desire to paint, Matisse sought refuge in the Mediterranean, like Gauguin and van Gogh had before him. There he found inspiration in Collioure's colors and light. Yet his attempt to redeem himself by capturing that light and color proved futile. He would return again and again to the Salon d'Automne, to the peals of laughter his paintings inspired in Salle VII.[24] There he would be faced with his failure, not only as an artist but as a provider for his family, for none of his works (save *Woman in a Hat*) were sold.

Truly, Henri Matisse struggled as an artist. Unlike Picasso, a child prodigy, Matisse was endlessly discouraged and never surrounded by acolytes. The Fauve period and its accompanying criticism may have been the most difficult period for him. He used colors as a means to express the sensations of what he saw, disregarding the local color of objects. Many critics of the time condemned this application of color, the likes of which are found in paintings such as *The Open Window, Collioure*. The failure and humiliation of the Fauve

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16   Donal Stone, "The Achievement of Matisse," Review of *Matisse the Master: A Life of Henri Matisse: The Conquest of Color, 1909-1954*, by Hilary Spurling, *The Sewanee Review* 115, no. 1, (Winter, 2007) 154.

17   Hilary Spurling, *The Unknown Matisse*, 331.

18   Henri Matisse, "Notes of a Painter," *La Grande Review*, December 25, 1908.

19   Jack Flam, *Matisse of Art*, (Berkely and Los Angeles, California: University of California Press, 1995), 84.

20   Ibid., 202.

21   Charles W Millard, "Fauvism," *The Hudson Review* 29, no. 4 (Winter, 1976-1977), 557.

22   Ibid., 580.

23   Hilary Spurling, *The Unkown Matisse*, 366.

24   Ibid., 33.

period, then, was a continuation of that which Matisse had experienced as a child, listening to the marching feet of German invaders on the streets of the textile town of Bohain.

Jessica Ball aims to inspire others to their greatest potential in every aspect of her life, particularly through the visual arts. She is pursuing a BFA in computer animation at Missouri State University with a minor in art history and creative writing, in order to communicate messages of hope and motivation. One of her goals is to combine her passion for animation with her faith life.

BIBLIOGRAPHY

Benjamin, Roger. "The Decorative Landscape, Fauvism, and the Arabesque of Observation." *The Art Bulletin* 75, no. 2 (June 1993): 295-316.

Bock-Weiss, Catherine. *Henri Matisse: A Guide to Research*. (Taylor and Francis, 1996).

Brenner, Carla. "Henri Matisse Color and Light." School Arts May 1999: 33. *Business Insights: Essentials*. Web. 4 Mar. 2013.

Flam, Jack. *Matisse on Art*. Berkely and Los Angeles, California: University of California Press, 1995.

Gage, John. *Color and Meaning*. Berkeley and Los Angeles, California: University of California Press, 1999.

Gottlieb, Carla. "The Role of the Window in the Art of Matisse." *The Journal of Aesthetics and Art Criticism 22, no. 4* (Summer 1964): 393-423.

Matisse, Henri. "Notes of a Painter." *La Grande Revue*. December 25, 1908.

Millard, Charles W. "Fauvism." *The Hudson Review* 29, no. 4 (Winter, 1976-1977): 276-580.

Romm, Alexander. *Matisse: A Social Critique*. (Kessinger Publishing, 2005).

Spurling, Hilary. *Matisse the Master: A Life of Henri Matisse: The Conquest of Color, 1909-1954*. New York: Alfred A. Knopf, 2005.

Spurling, Hilary. *The Unknown Matisse*. New York: Alfred A. Knopf, 1999.

Stone, Donald. "The Achievement of Matisse." Review of *Matisse the Master: A Life of Henri Matisse: The Conquest of Colour, 1909-1954*, by Hilary Spurling. *The Sewanee Review* 115, no. 1 (Winter, 2007), 152-154.

Sweet, Frederick A. "Henri Matisse." T*he Art Institute of Chicago Quarterly* 46, no. 2 (Apr. 1, 1952): 30-34.

Trapp, Frank Anderson. "Art Nouveau Aspects of Early Matisse." *Art Journal* 26, no. 1 (Autumn, 1966): 2-8.

Whitfield, Sarah. "Fauvism, Paris." *The Burlington Magazine* 142, no. 1163 (Feb., 2000): 121-123.

"Black Light." *Critical Quarterly* 51, (April 2, 2009): 31-45.

Sarah Greenbaum

#EverybodyAllTheTime, A Collaborative Perfomance-Based Installation

Abstract

In November 2013, Missouri State University Senior BFA Dance major Sarah Greenbaum produced #EverybodyAllTheTime, a performance-based installation, in order to explore the experience of living simultaneously online and in the real world, through movement performed live and on video. This paper describes the process of producing this project, including the development of concept, proposal submission, research, rehearsal, and planning the event itself. This paper discusses the structure of the installation, gives an analysis of each performance, and describes the audience response to the show. #EverybodyAllTheTime succeeded as both a Senior Honors project and Final BFA Review, and received a good deal of positive feedback from the community.

Introduction

#EverybodyAllTheTime was a collaborative, performance-based installation shown at the ideaXfactory in downtown Springfield, MO as part of November 2013 First Friday Art Walk. The project served as my senior honors project as well as my final BFA Review. The project began in the summer of 2013 with a concept, and by its performance on November 1, 2013, developed into a funded, well-attended installation.

Concept

#EverybodyAllTheTime juxtaposed the performers' flesh-and-bone, real-life selves with the polished persona they create for themselves on the Internet. The work had two goals: first, to acknowledge that the way people portray themselves on the Internet is integral to the person they are in real life (and to how other people see them). Second, the work strove to assert the importance of real-life connections between individuals as opposed to online social networking, because there are benefits to forming meaningful, real-life kinships which cannot be replicated through or replaced by Internet interaction.

I was inspired to make this work because I live in a hyper-digital age where, in order to keep up academically, socially, and professionally, I must create various online profiles through which I present selected information about myself to massive amounts of people. In creating these profiles, I have the opportunity to edit and polish the information I share of myself. I can interact with others online as this mediated version of myself. Sometimes I get caught up in this online world and lose touch with the unedited, raw connections that can be attained in real life. It is important to me that I acknowledge my online persona as a part of who I am, but that I continue to live my life, first and foremost, in the flesh-and-blood world.

Process

The following section describes the process of producing #EverybodyAllTheTime, including the proposal submission, research, rehearsal, and pre-show preparation.

Proposal submission

In August of 2013, I submitted a proposal to the ideaXfactory for a performance-based installation that would become #EverybodyAllTheTime. In September, the ideaXfactory committee— including local artists Russ and Pam RuBert, Meganne Rosen O'Neal, and Gerard Nadeau, as well as Springfield's assistant director of public works, Jonathan Gano—informed me that they were interested in my proposal, and met with me to discuss logistics. The team was excited about my ideas, and provided me with suggestions. They requested that I hold rehearsals in the space so that the performance was a truly site-specific installation.

The ideaXfactory, located in downtown Springfield and launched in 2012, encourages artists to develop site-specific work. The space itself is an abandoned storefront on Boonville Road that belongs to the city of Springfield. The city has granted the ideaXfactory team use of this open space in order to encourage the creation of local art.

I had the chance to perform in this space in 2012 with Inertia, Missouri State's dance company, interacting with the Knitting Space installation by Art Of Space, a local group led by ideaXfactory committee member Gerard Nadeau, that creates installations at the ideaXfactory and throughout downtown Springfield using everyday materials like 2X4's and plastic bags. This experience introduced me to the space and to some of the ideaXfactory team.

The ideaXfactory received an Art Place America grant for 2013-2014, a prestigious $200,000 grant allowing the team to accept and fund proposals from local artists for site-specific work that engages the community. An exciting benefit of producing #EverybodyAllTheTime at the ideaXfactory was that it came with a stipend from this grant money, giving me a budget to create the piece, which covered the cost of materials and included stipends for each of the collaborators on the project.

Research

I began research for this project before submitting my proposal in August, and increased my research after the proposal was accepted. I utilized many sources on both performance art and society's relationship with technology today, including books, blogs, scholarly articles, and videos. There were two sources that were especially influential: a TED talk given by Sherry Turkle and a blog article written by Andy Horwitz of Culturebot.

Turkle's TED talk was based on her book, *Alone Together*, which discusses society's increased dependence on technology and social media as a replacement for meaningful relationships. She emphasizes that we are learning to "expect more from technology and less from each other." For example, we may feel more satisfaction from a notification on social media than we do from bumping into an old friend in person, because we are more comfortable dealing with each other "at a distance, in amounts [we] can control"—we want to interact with others, but on our own terms, when it is most convenient for us.

Turkle goes on to assert that "the moment people are alone, even for a few seconds, they become anxious, they panic, they fidget, they reach for a device." I see this habit manifest in almost every social situation, from sitting on the bus to spending time at a party. People simply do not sit still, and they certainly do not make small talk with strangers. They check their phone for texts and social media updates; if this has been done recently enough for there to be nothing new, they play a game or initiate a text conversation.

Andy Horwitz's blog article, Territorial Pissing, was published on his website, Culturebot, in September 2013. The article addresses issues similar to those explored by Turkle. Titled after a Nirvana song, the article discusses the most recent generation groups: Baby Boomers, Gen-X, and Millennials, and the way modern technology affects these groups.

In the article, Horwitz suggests that the biggest challenge of the Internet era is "re-learning the importance of being together in real life, in small groups of good friends; of remembering that the mediated world distorts and deludes, that it is valuable for distribution, but not necessarily for depth." I am captivated by Horwitz's idea that we have forgotten how to be together in real life, and, especially, in small groups. I find that when I spend time in a small group, or even with one other person, our smartphones are not far away. They sit face-up on the table, they rest in our pockets or laps, or we hold them in our hands. When there is a lull in conversation, we pull them out, or they pull us in with a buzz alerting us to a new notification. We are still physically with the people or person, but we are also with our phones. Along with my other research, Horwitz's article and

Turkle's TED talk gave me a jumping-off point for developing the concept for #EverybodyAllTheTime.

Rehearsal

After casting #EverybodyAllTheTime, I made a twice-weekly rehearsal schedule which ran through October until the performance on November 1. We rehearsed for an hour and a half on Sunday mornings and two hours on Wednesday nights. This relatively short rehearsal period called for a lot of pre-rehearsal preparation on my part, and even more focus and commitment from my cast: Alec Brown, Jaime Daniels, Gavin Juckette, and Kahrya Vaughn . Luckily I was able to achieve both of these things in order to create the work in just over a month.

Our first rehearsals consisted of developing ten gestures on which the piece was based. We compared our relationships with social media, and our friends' social media habits. Specifically, we focused on how our "real life" relationships—those that take place face to face, in real time—are affected, for better or for worse, by our relationship with (and dependence on) social media. We discussed the aforementioned quotes from Turkle and Horwitz throughout our process.

I was pleased that between rehearsals, I received texts from my cast with observations relating to my concept for the show, meaning that they were thinking about the piece outside of rehearsal. With all of this research in mind, we created ten short, repeatable gestures that flowed fairly easily from one to the next.

The gestures we developed ranged from the literal to the abstract. For example, we made note of a common trend in staged photograph stance: hips pressed against a friend, torso spiraling away from the hip, shoulders pressed back. We adapted this stance into a gesture as a literal representation of the trend in physicality manifested online. In contrast, we created an abstract gesture describing the exhaustion felt after staring at a screen for an extended period: arms move from folded across the chest, to above the head, elbows straight, at a 45-degree angle with wrists broken, finishing collapsing arms on an exhale.

We did not spend an exorbitant amount of time developing our ten gestures; we simply took turns suggesting movements, keeping our previous discussions in mind. Some gestures we kept as is, while some we tweaked to fit better with the series. Each performer chose a unique order to perform these gestures.

After gestures were chosen, we developed the first section of the piece: individual exploration of these ten gestures. I asked the performers to repeat their ten-gesture phrase ten times, exploring one of the gestures for about a minute

each time they repeated the phrase. This way, each performer explored and improvised with each of the ten gestures in their own unique pattern. For example, one performer might start on gesture 7, exploring it for one minute. Then, that performer would move through gestures 8, 9, 10, 1, 2, 3, 4, 5, 6, 7, and explore gesture 8 for one minute, and so on. Another performer might start at gesture 3, another at 5.

Once this initial section was developed, we used it as a warm-up for future rehearsals, as it allowed the performers to thoroughly explore the possibilities within the gestures while refreshing their focus on the concept of the piece.

For the second section, we created the partnering and group sections by exploring different ways to share weight while executing gestures. I asked the performers for their ideas, and we experimented until we found several ways to interact with each other while performing the gestures. Some of the group work allowed for the gestures to be evident in the movement, such as leaning back-to-back or side-to-side. Other group work distorted the gestures to the point that they were no longer evident in the movement, although the feeling behind the gesture was still present. For example, two performers crouched side-by-side, while a third lay on her stomach across their backs. The two crouching performers bent and straightened their legs, giving the laying performer a floating quality. This weight-sharing activity was inspired by a gesture with a similar breath pattern: the performer inhales with arms raised, and while exhaling, brings her arms down. In the end, the partnering did not resemble the original gesture, but delivered a similar feeling.

I brought planned movement patterns and choreography into rehearsal for the development of the third "everybody" section, but after giving choreographed movement to the performers, we collaborated to fully develop the section and adapt the floor patterns for each performer. The goal of the third section was to establish a feeling of detached unity, so I created many sections of coming together, breaking apart, and coming together again. My performers contributed their feedback and suggestions freely, resulting in the third section developing nearly as collaboratively as the first two.

Although the rehearsal period was short, I was able to produce the show that I hoped to make, primarily because of the focus and dedication of my performers. I was lucky to have a cast that was willing to try new things and eager to contribute their ideas.

Event planning
In addition to creating the piece itself, I coordinated the elements necessary to produce a show, starting with creating a production calendar. To create this calendar I worked backwards from the night of the performance, noting all of the tasks that needed to be done to make the show successful. Tasks included creating a rehearsal schedule, securing a DJ, recruiting a costume designer and working with her to develop costume designs, commissioning a poster design, printing and hanging posters, sending invitations to the event via mail and Facebook, creating and maintaining a project blog, writing an artist statement, writing a press release, recruiting a photographer and videographer, and purchasing food and drink for the reception. By breaking up the tasks week-by-week, I was able to complete these tasks in a timely manner with help from my family, friends, and advisors.

The Show
The following section summarizes the structure of the installation, gives an analysis of each performance, and describes the audience response to the show.

Structure of Installation
#EverybodyAllTheTime occurred on November 1, 2013, at the ideaXfactory, as a part of First Friday Art Walk in Springfield, MO. There were two performances: 7:30 PM and 10:30 PM. Each performance lasted approximately 35 minutes.

In order to explore the impact of living simultaneously in the online and real world, I featured five performers and five laptop computers in the performance. Each performer had his or her own performance space, delineated with black duct tape on the floor. Adjacent to each performer's space, a computer featured ten looping videos of the performer executing one of the ten gestures developed for the performance. Two other computers connected to projectors played a sixth video which featured videos of all the performers, and these videos were shown on the floor and ceiling of the space, respectively. As the screens played these videos, which were displayed simultaneously in order to evict the feeling of a collage, the performers explored their ten-gesture movement phrases in real time, experimenting with weight, balance, speed, and emotion.

After the performers finished exploring each of the ten movements, they began moving into performance spaces other than their own, traveling on paths taped on the floor that connected the different spaces. During this transition, each performer removed the draped, nude-colored layer of costume to reveal basic black undergarments. The nude garments were meant to represent the façade of our internet-selves; the black garments underneath suggested our basic, "real" selves.

In their new costumes, the performers interacted by inserting themselves into other performers' spaces. They experimented with weight sharing, unison movement, variation, and proximity. Meanwhile, the looping videos continued to play on the laptops.

The final section of the piece brought the performers together in clumped group formations and then sent them away from each other in an explosion through the space. They moved together and apart and together again, sometimes traveling around the space in smaller groups, sometimes moving individually.

The performance concluded with the performers walking off their taped lines to their computer and cell phone. They checked their phones, closed their computers, and met at the center of the performance space to take a bow.

Dress Rehearsal

The dress rehearsal for #EverybodyAllTheTime provided an opportunity to troubleshoot parts of the performance that needed to run more smoothly and to make final decisions on a few details about the show. I chose to work with a live DJ over recorded music to emphasize the spontaneity of real life and to encourage the performers to explore brand new ways to move in each performance. This rehearsal was only the second time the cast was able to perform with the DJ and music; one challenge for the performers was to incorporate the influence of the music with the movement. The addition of music helped smooth out transitions in the piece and gave energy to the movement.

One performance detail that the dress rehearsal solidified was the decision to wear sneakers for the second half of the show. The performers wore crew socks for the dress rehearsal, which caused problems with traction, especially when running in the second half of the piece. By putting sneakers on when the nude-colored costumes were removed, the performers were free to move without worrying about slipping. Another element we added to the performance was a bow. The performance ended with the performers checking their phones, but that was not a definitive-enough conclusion. We added a group bow, with the performers meeting in the center of the space in a circle facing outward, towards the audience, to clearly signify the conclusion.

The energy of the dress rehearsal was somewhat low, and the performers' focus, especially mine, was not as clear as it could have been. I was nervous about this rehearsal, and my nervousness disrupted my focus. The energy was low because the rehearsal took place in the middle of the day, so the lighting was not fully realized, and several of the performers had to come straight from class to the rehearsal. All of these elements interrupted the flow of the piece, resulting in a less-than-satisfying run-through.

First Performance

The 7:30 PM performance of #EverybodyAllTheTime was a good experience with a large, supportive audience. I announced at the beginning of the show that audience members were welcome to use social media tools (i.e. Instagram and Facebook) during the performance, and that they should be wary of the black tape lines on the floor, as performers would be moving along these lines. For the majority of the performance, the audience remained outside of the space, watching the movement from outside the perimeters of the black tape, although a few audience members crossed through the space briefly. The audience's positioning allowed most people to see everything that was happening throughout the performance.

The energy of the first performance was much higher than the dress rehearsal; the piece fed off of the energy of the audience and the performers responded positively to this added energy. The audience's approach to watching the performance was polite—they did not come very close to the performers, and they were hesitant to move across the space. Many audience members did interact with the performance by taking pictures and video. At the end of the performance, I received a number of compliments from audience members, as well as several questions about my theme and process for the piece. The general feeling in the space was positive.

Second Performance

The 10:30 PM performance contrasted the earlier performance because the audience spread themselves throughout the space freely—I deliberately neglected to warn them about the performers' use of the black tape lines to encourage more freedom of exploration, which proved successful. Audience members stood by the dozens around each of the performers' squares. When it came time for a performer to walk across the space on a tape line, the performer often had to navigate between audience members, or even tap an onlooker on the shoulder to gesture for them to step aside. It was difficult to see what more than two of the performers were doing at a time for the majority of the performance, because the audience was spread thickly through the space. Although I had hoped that the audience would insert themselves into the performance space, I had not anticipated the challenges that would arise from full-on audience engagement. Often, an audience member was so enraptured in one aspect of the performance (whether the audience member was using her phone to capture the show or simply watching) that she would not realize that she was in the immediate path of another performer. This problem mirrors one that social media produces in real-life situations: often, we are so enraptured in our phone that we miss things happening in our immediate surroundings.

The energy of the second performance was even higher than the first, due to the audience's unabashed willingness to experiencing the piece. There were people everywhere, and the majority of them were eager to view and participate in the performance by utilizing social media, or even by walking along the black tape themselves. At the end of the performance the feeling in the space was, again, very positive.

Comparing Performances
Although the two performances and the dress rehearsal for #EverybodyAllThe-Time followed the same floor patterns and included the same choreography, the three showings were each completely different. The inclusion and the temperament of the audience members affected the show dramatically. As a performer, the energy changed noticeably in each of these performances—the dress rehearsal lacked energy, the audience energized the first performance, and the second performance was hyper-energized, to the point that, for me, focusing became challenging. However, I was grateful to have an eager and engaged audience, and the second performance was closer to what I had imagined the installation would be.

Analysis
In #EverybodyAllTheTime, I strived to juxtapose who we, specifically the millennial generation, are in real life with who we are online, and how our online personae affect our relationships, on-line and off. I hoped to acknowledge the omnipresence of smartphones while emphasizing the importance of being physically together in order to achieve depth in our lives.

In the piece, the videos of the performers were reliable and constant. The audience knew what to expect from these videos, much like we know what to expect from our regulated, methodical interactions with each other through technology. In contrast, the performers explored the same movements executed on-screen in real time, both on their own and with each other. They varied the tempo, size, and mood of the movements in order to find new qualities within the movement. By doing so, they replicated the refreshing spontaneity of real-life interaction.

I am satisfied with my choice to use video in this way, but I would have liked the video to be more inclusive for the audience, and for the video to be more expansive. For example, the videos on the floor and ceiling should have been larger. All of the videos could have been longer, and perhaps, the video could have been interactive, giving the audience things to read and click through as they observed the performance.

I also would have liked there to be more contrast between the movements on-screen and in real life. Perhaps the video movements could have been more

robotic, and the real-life movements more brash, wild and bold. This way, the difference between on-line and real-life personas would have been more exaggerated and evident to the audience.

Audience response
I was grateful to have a warm, encouraging audience response to the show. Many audience members approached me after the performance to let me know that they enjoyed the piece. I was thrilled that I received equally warm audience feedback online through Facebook and Instagram. The following quotes came from Facebook friends who attended one of the performances of #EverybodyAllTheTime:

> *"This was one of the most exciting experiences I've had since being in Springfield."*
> – Maddie Bowdon

> *"What an amazing piece of art that challenged so many ideas from what we all portray on the internet to what crazy boundries one can push with their art"*
> – Sarah Petroff

> *"I have never been as engaged or as impacted by a dance performance as I was by #EverybodyAllTheTime. It was a great concept with great execution by very talented dancers"*
> –Nick Oswalt

Additionally, an audience member approached me a week after the performance to let me know that she took inspiration from my piece for her own senior project. She stated that:

> *"My entire idea for this paper proposal came from watching your show. I took notes the entire time trying to make sense of what I saw… people trying to create, being influenced be others, carrying others with their ideas and successes, joining together, falling apart - all without ever being able to leave their social media identity behind."*
> –Katie Schilmpert

Receiving positive feedback on this project was extremely rewarding, since I was able to see that the project affected people positively and made them think. That the feedback came from online and real life sources was important because of the theme of the project: the internet accolades are direct examples

of how we interact online, and the real-life feedback shows that we still have the capacity to communicate face-to-face. Both forms of feedback were beneficial. The online responses are visible not only to me, but to all of my Facebook friends, allowing others who may not have had the chance to see the show to know that it happened and that it was successful. The real life feedback was humbling because Schimpert and others who approached me had to be honest and vulnerable enough to let me know their feelings face-to-face. I am grateful to have received both types of feedback.

Conclusion

I am thrilled that I had the opportunity to create #EverybodyAllTheTime. I learned a great deal by working on this project as a choreographer, performer, and arts administrator, including time management, budgeting, collaborating with artists of other disciplines, and using dance and choreography as research. I enjoyed nearly every step of this process. I am lucky to be surrounded by such a supportive community of artists and friends, and especially grateful for my cast, collaborators, and advisors for helping me build the work. This piece successfully explored ideas relating to the juxtaposition of the real-life self and the online persona, but I believe that there is a lot more that can be done in the way of discussing this topic and discovering what it means for our society today. I plan to continue my research, through reading, researching, dancing, and choreographing, to learn more about my own relationship with technology and social media, and how it affects who I am as a friend, a daughter, a sister, and a student. I will use what I learned from #EveryboyAllTheTime as a foundation for future work that challenges and provokes both the audience and myself.

Works Cited

Carlson, Marvin. *Performance: A Critical Introduction*. New York: Routledge, 1996. Book.

Horwitz, Andy. "Territorial Pissing." *Culturebot*. 9 September 2013. Web. 1 October 2013.

Turkle, Sherry. *Alone Together*. New York: Basic Books, Perseus Books Group, 2012. Book.

This paper describes the theme and process of my senior project in pursuit of Departmental Honors in dance at Missouri State University. The project, called *#EverybodyAllTheTIme,* was a performance-based installation featuring myself and four other performers in a storefront in Springfield, MO. The goal of the project was to explore the ways that social networks and online interactions affect my generation's real life relationships.

Bethany Kelly

The Creativity Conundrum in the Classroom

Abstract

This paper examines the manner in which creativity can be fostered in students. The current model of schooling students and evaluating success is inefficient and needs to be reexamined if students are to compete globally as adults. Although creativity is a mysterious idea, the origins and beliefs about it through history are explored. This exploration culminates in the modern workplace where practices of successful business grounded in creativity are considered. Practices from established companies like Pixar and Google are translated into an understanding of how creativity can be fostered effectively. These observations are then projected into the classroom where suggestions about how to reform the current educational standard are made. Some schools who have already started applying these types of practices will be discussed as new standard that schools should strive to meet.

Introduction

Think outside the box. Everyone has heard it, many have said it. I know that it was part of my vocabulary as a child, thanks to my mom. My mom was an excellent resource for learning how to think outside the box, (even if it was sometimes rather frustrating to have to think at all, much less outside the box). She would make me define the parameters of the box, then pick it up, step on it, get beneath it, shrink it…you get the point. It was time consuming. But all the while I was unknowingly building my ability to think critically. Looking back, I can see that it probably became annoying for some of my teachers, because I was constantly asking questions to define the box. Then I would essentially disregard all of that information and try to complete assignments in such a way that I deviated as far from the box as possible without actually eliminating the box. I can remember one example extremely well from college. It was a required art class, the first 3-dimensional one that students had to take. For every project, I made the assignment into an elephant. I found it diverting, a way to challenge the assignment even more, but I am fairly certain the teacher was exasperated by my incessant elephants. The other students found it amusing though, that I was solving the project in a way that went beyond just meeting the project's parameters. It was great as tool for learning, because at the end of the semester I truly understood elephants. I knew about their anatomy, the noises they made, their texture, the different varieties; I could explain just about anything about elephants.

Reflecting back on this and other educational experiences for this paper led me to the question of why my other classes were not as memorable as this one. I wondered why it seems that schooling essentially suffocates the creativity out of students, even in art. In the typical classroom, it is not acceptable for every student to have a different conclusion. Instead, they are expected to have results that are similar facsimiles of their classmates, according to the schooling that I have witnessed. As a pre-service art teacher, this worries me. I aim to discover how schools (or more specifically, I as a teacher) can help foster individual creativity in students. Then use the drive that students will have from their ingenuity as a base from which to teach technique. Right now, schools are going about instilling creativity unsuccessfully by teaching technique first. This is extremely tedious and uninspiring for most students. It is time to re-evaluate these efforts and make a change.

First, though, I should discuss the specifics of my educational experiences. My experiences being schooled are through the struggling public school system of the Midwest United States. This is a limited sampling, and is by no means the only type of schooling available or practiced. It is, however, the experience that I had and, for the most part it, was good. I did manage to make it to college and I can read, write, and do arithmetic competently, so the simple follow-the-rules end goal of education was reached. And, while I am excited that my role as the learner will soon transform into the teacher, I am disheartened by the current educational system. The standards, testing, and accountability that have become engrained in schools are of little benefit to the students when discussing creativity and motivation. "Students are taught that there is one right answer, it is in the back of the book, and don't look…and don't cheat" (TED Talk, 2010).This is absurd. Schools should be enlightening students as to how contagious it is to learn, not how essential it is to take tests. There are instances that there is a right or wrong answer, but society has come to a point that the influence of this type of thinking is no longer providing the experience or discipline needed by 21st century students. Instead, the focus should be on where students will end up when they graduate, and how those types of positions and environments will expect them to behave.

Business Models

The goal is to delve into the world of business for models of intellectual growth, sustained learning, and critical thinking. Taking the lead from major corporate empires that are based in creativity and innovation, teachers can support students' growth into productive and dynamic thinkers for the country. The advantage of using these corporate models is to encourage schools to consider working in ways similar to those that students will experience in the real

work force. Some examples of these work places would be companies like 3M, Google, InnoCentive, and Pixar. These businesses foster creativity through collaboration, critical thinking techniques and the crossing of disciplines (Lehrer, 2012). Another way that these companies nurture creativity is through planned and unplanned social interaction. They understand that there is a connection between the interaction of people and subsequent inventiveness (Uzzi, 2005). With these models, students learn to rely on sources outside of the teacher for information, most importantly, themselves.

Current Educational Practices

Before I get too far, I need to address some of the persistent trends in education. There are many things that the current educational system does that are ineffective or outdated. While dwelling on the negative aspects of the system will not serve to foster creativity in the students, it is important to understand why certain sustained practices, like grades and subsequent competition, are actually detrimental to student success (Kohn, 1999, p. 4). There are studies from respected psychological professionals like Alfie Kohn and Jerome Bruner, which have proclaimed this for years. However, those cries have fallen upon deaf ears, because administration prefers quantifiable data rather than qualitative learning. Real learning is difficult to measure though, and grades are not an accurate measure to determine learning. I could discuss the woes and downfalls of the educational ideology of grades. I would be good at it too, as I have experience with the tradition from both the giving and receiving perspectives. In my schooling ,I learned in a shallow way, meaning I learned that the letter I received on a test was more important than understanding the information. As such, most of my early learning was done through the processes of memorization and recitation. I was not internalizing the information. This is not uncommon in schools today because students do not see the relevance that material has in their lives, and thus care only about the grade because that has a definite relation to their perceived smartness or success.

Research indicates that grades destroy motivation, create a mindset of doing only the work that is absolutely necessary, and reduce the quality of thinking (Kohn, 1999, p.1). My experience supports these ideas and only recently have I begun to realize that there is more to learning than the ability to fill-in test sheets accurately. Actually, those around me who have seen this change encouraged me to write this paper on the failing institution of grades. However, that box has already been defined well by others and I am more concerned with how to encourage students to disregard grades and become independent thinkers. In the workplace that students will enter there is a new thought that the current system of pay-for-performance encourages the

repetition of what has worked in the past, at the expense of the exploration of untested approaches (Amabile, 1997, p. 22). In schools, this is one of the major downfalls of grades. Students know just what they need to do to get a grade and feel no need to be creative in doing so because generally any creative ingenuity is not readily rewarded. Some other facts that most literature agrees on concerning grades are that grades are doing nothing for students but making them shallow learners, diminishing their desire to learn, and creating a class of citizens who learn that getting the grade at any cost is better than learning (Kohn, 1999, p. 1). Grades also have a tendency to hold all learners to the same standard, which is rather ridiculous. Some students come into a class with significant experience and knowledge while others arrive in with no knowledge whatsoever. To punish one child because of their lack of experience is, among other things, cruel. It also sends the message that society is more concerned with the filling in of bubbles on a scantron and memorization of facts (which can be Google-d) than actual learning (TED Talk, 2010). But rather than focusing on negative attributes and ineffective practices, I have decided to focus my attentions on how educators, specifically art educators, can improve the methods of instruction to foster creativity while still working within the restrictions that have been defined by the administration. It can be done.

Creativity

Creativity is defined in a variety of ways. The voice that fits best with how creativity is conceptualized in this paper is Sir Ken Robinson and his definition of creativity as "the process of having original ideas that have value" (TED Talk, 2010). This goes beyond the mere act of using the mind, it implies that creativity is a verb, something that has to be practiced but more importantly, something that can be taught. If creativity in the art classroom is thought of like an exercise in sports, it becomes a whole new idea. Creativity is no longer strictly within certain people, it can be acquired through practice, which will take time. This may be why so many people feel they are not creative; they were never taught or given the time to strengthen those skills. In fact, we are all born with the skills to be creative. It is only after being schooled that our capacity for creativity is essentially destroyed (TED Talk, 2006). This shows that those who are creative are not so accidentally. Success is not accidental. It is instead a process, usually long and demanding, just like other forms of learning. This is something that teachers should be demonstrating for students. There will be failure, there will be mistakes, there will be tears in many cases (or at least in my case), but in the end those are essential parts of the learning experience. When this process is not taught, it makes creativity seem

like an unachievable notion to students, something that they will not be able to have for themselves. Instead, teachers and students should explore examples of great successes and see how they took creative chances and failed. People like Walt Disney, who was told that he lacked imagination; Van Gogh, who only sold one painting in his lifetime; or Babe Ruth who held the record for strikeouts for four decades. But, Ruth knew that "Every strike brings me closer to the next home run" ("50 Famously Successful People", 2010). So, although it is good to show students that failure is inevitable, it is also important to emphasize that commitment and persistence in their endeavors will produce results.

Another question that I formulated about creativity before discovering the corporate approaches to fostering creativity was where does it come from and how does it work? There are a wide variety of explanations about where creativity comes from, but often the testimonies by people who are considered creative show that the creativity came from something around them, not really from within them. Bob Dylan described it as a purging process, where the inspiration was all of a sudden present and then he just had to get it out of him, like vomiting (Lehrer, 2012, p.19). This view that creativity comes from elsewhere was also presented by author Elizabeth Gilbert when she described how in Ancient Greece and Rome creativity came from disembodied spirits and genius was another entity that lived with the artists and shaped the outcome (TED Talk, 2009). This took the responsibility off of the artist. This period in history also provides several other important pieces of the creativity puzzle, convergent and divergent thinking.

These two types of thinking, convergent and divergent, were related to Greek mythology by Fredrich Nietzche, when he noted that the Dionysian drive, or divergent thinking, is related to Dionysus (Lehrer, 2012, p. 64). This came about because Dionysus was the god of intoxication. This intoxication allowed people to free their subconscious and extrapolate ideas in surprising ways. The Apollonian drive however, would then impose order on the disarray from the Dionysian craziness, or unite the information (Lehrer, 2012, p. 65). In modern days, it has been observed that a back-and-forth between these two types of thinking generates the best results. Divergent thinking is needed when the problem is revealed, allowing the artist to find a range of solutions. Then convergent thinking is used to zero in on the solution that is most appropriate and refine it. Generally, the divergent thinking will then come back around to solve a new problem within the solution and so the process goes. This is why many artists spend years investigating ideas or one thought, just to feel like they are satisfied with the result of their investigation. It is a continual process in refinement and finding balance (F. Benzer, personal communica-

tion, September 17, 2013). This dialogue is something that many students may resist because schools generally concern themselves with convergent thinking strategies. In order to start helping students to think divergently on a regular basis will require them to reevaluate and recreate pieces. This ensures that they are truly working with their images and developing a relationship with them. This would be in direct contrast to some art programs where the idea is to have students make something to show that they understand a particular concept. Many artists might say that creating color wheels is not art, it is craft. Craft is when the outcome is known before the project is started, whereas art is when the outcome evolves as the work is completed (J. Carlton, personal communication, September 13, 2013). It is important to have students understand that art is like any other subject, that there will be revisions like in English, logic like in math, historical references like in social studies, and procedures like in science. Art is the place where all of those can culminate and create a complete picture of their lives.

WORKPLACE PRACTICES: COOPERATION AND COLLABORATION

After finishing the ideas behind divergent and convergent thinking as well as the tug-of-war that happens between the two, I will start with Pixar as the first business model. At Pixar, the creation of a product requires a long and arduous process of continual critiques and revisions. This allows for the divergent thinking that expands into new ideas and storylines as well as the convergent thinking that refines and thoughtfully molds those same stories into classic animations. It also uses another type of push-and-pull process that is essential to the success of the product. This process is collaboration. But it is not just that people are working together, people are learning from one another and everyone is engaged in the critique. This allows information to move in ways that are not common in school settings. In schools, information moves vertically, within the student. New knowledge is built upon the old knowledge, but rarely is that shared with others (Lehrer, 2012, p. 36). At Pixar, knowledge moves vertically, as the artists or technicians learn new skills, but information flows just as freely horizontally between the members of the company (Lehrer, 2012, p.195). This allows the ideas to expand exponentially beyond what individual artists or technicians could fathom. The critiques are not as persona and, because of this, the group is not looking to tear apart individual work, but build up the best product that they can as a group.

The research by West and Bettencourt (2010) that looked at environments of creative places like Pixar came up with another related explanation as to why creativity flourishes. The study set out to explore why places like The Village in New York were overwhelmingly more innovative than other areas in

the city and country. Their conclusion was that it was because of the collision of people, or the chance for interaction between them. Chance encounters, daily meetings, and routine connections between strangers and acquaintances were deemed "collisions" in the study. This phenomenon allowed for greater exchange and development of ideas. Others, like Delacruz, refer to this place of interaction as "The Commons," a place where people can meet and share ideas to help benefit all (Delacruz, 2011, p.8). It also helps individuals to find inspiration because more interaction creates more opportunity to formulate ideas which leads to greater performance. At Pixar, this type of environment is ever-present. The designers are not secluded when creating a character, having one person color it, someone else add sound, and another animate it, each in their own cubicle. Instead, all of these people are in constant contact. In fact, their meetings about the work that they are completing happen daily. The day starts with a focused critique, where all of the work from the previous day is looked at through a microscope. Each and every detail is considered and up for revision if it is deemed to be inconsistent with the message that is trying to be conveyed or the intentions of a particular character. This is collaboration at its finest, everyone is working together to create a spectacular product, not to show off their individual talent, but to show their collective ingenuity.

This process of collaboration is something that schools could be implementing easily. Most schools are already places where chance encounters happen in the hallways and cafeteria, daily interactions take place in the classroom, and routine connections occur at sporting and extracurricular events. It would probably not be very effective if educators started trying to make students talk about their academic endeavors instead of their social lives during these meetings. Actually, it would probably only lead to more ill-will. Instead, it is up to the teachers in their classes, and in the moment, to make the leap. In the classroom, it would be natural to have students share ideas/concepts about their work. This could in turn be evolved into a critique, with constructive feedback where students are having interactive dialogues with one another. Hopefully enthusiasm about their work and the work of others would filter into conversations in other settings. The point is that the knowledge and thought processes are moving beyond individual students and into a collective consciousness in the classroom and school. This creates a community that will foster interactions which develops ideas which leads to higher performance and creativity (Bettencourt & West, 2010, p. 912).

Workplace Practices: Interdisciplinary Understandings
Other companies, besides Pixar, have similar structures where collisions between people are seen as an essential part of the creative process. In other companies, though, the process can be more of uniting of forces across disci-

plines, rather than the unification of a predetermined team of players. In these other companies, like Apple, collisions are forced through the placement of offices and amenities. These collisions are meant to help people communicate and find resources for their projects. For example, I may not know who to turn to for a situation I am encountering, but the person I am talking to in line to get coffee might know the perfect person. This creates an environment that fosters interdisciplinary working.

InnoCentive is a web-based company that taps into this idea of interdisciplinary brainpower as well, but on a global scale. The company believes that, "Once you untether the search for solutions from an individual, department or company, amazing things happen. Problems are solved better, faster, and at a lower cost than ever before" ("What We Believe", 2013). This is a complicated way of saying that problems are posted on the internet, and anyone can solve them, usually for compensation. Anyone can participate, meaning that scientific problems may be solved by graphic designers, or mathematical problems by political scientists. The point is not that the solver has a background in the problem, but that they have a unique perspective. This allows them to ignore conventional wisdom and look at an overworked problem in a novel way. This process, or type of thinking, is called outsider thinking. One of the most common ways to produce this type of epiphany-like thinking is to travel. Travel is expensive, but even just traveling to the store and leaving the setting where the problem resides can be beneficial. It allows a sort of break from the constraints of the problem. This is something that teachers can translate into the classroom with ease. Rather than requiring students to stay seated and quiet, allow them to get up and talk with each other. Maybe stepping away from the work will allow the student to see it with new eyes upon returning. Or maybe speaking with a classmate about a problem they are encountering will allow the outsider classmate to help them reevaluate the situation. The bonus of this is that students are learning cooperation and interpersonal skills. If possible, it also might help to allow students to leave the classroom. The point is to get the student to vacate the space where the problem is so that they can open their minds to new possibilities and novel solutions to the problem. Sometimes students get so caught up in the problem that they fail to see the forest for the trees.

It is important for teachers to demonstrate the process of stepping back sometimes and seeing the whole picture. Interdisciplinary learning is one way for schools to help students do this. It is important that students learn to connect material because life is not broken into isolated subjects of information. The real world is more like the color spectrum than the color wheel. There are a myriad of colors to see, not just the primary and secondary that the color wheel proposes. In school, information is broken into specific classes that

cover predetermined material that the student is expected to know. Knowing does not imply that they learned the information, though, usually just that they memorized it. What should really be happening is the connection subjects and material, resulting in the internalization of meaning (Bain, 2012, p. 23) Rather than scientific information and historical information, there is an understanding about how events and decisions were influenced by the science and art of the time. This can be achieved, but it will be work for both teachers and students. It could require teachers to collaborate across subjects and grades. Interdisciplinary units could be devised that focus on a theme or period of time. Some schools do this, but usually for younger grades and the practice falls away as students progress. With this sort of curriculum, students learn information differently than the current model. They learn through repetition of material: the more a piece of information is covered the more likely it is to be remembered. Cornett agrees saying that "The brain is a neural network that works through connections. Learning depends upon accessing and forging brain connections, so connections need to be made across grade levels and among disciplines so that students see how the arts fit into the big picture of life from a variety of angles" (as cited in McClellan, 2002, p.18). They also learn because all of the information is connected. Furthermore, not only the information but the social and physical spaces where the information is learned are connected which touches on the influence of common grounds mentioned earlier (Harris, 2010, p. 30). Unfortunately, in some cases this sort of multidisciplinary cooperation or curriculum plan is implausible. However, in the art room it does not matter because art is the perfect room to bring together any and all subjects. Students who are interested in chemistry could use art principles to create characters out of elements on the periodic table. A student enthralled by poetry could learn about calligraphic techniques and illustration. The mathematically inclined student might be drawn to precise and consistent practices like origami. The possibilities are endless to help students find something that inspires them and learn more about it through art making and the lens of the visual world.

Workplace Practices: The 15 Percent Rule and Drive

A final practice my investigations uncovered that businesses have begun to implement will scare some teachers, I think. It goes by several names: Innovation Time, Flexible Attention Policy, the Fifteen Percent Rule and Individual Time are a few of the labels companies used. In a commentary on motivation, Daniel Pink used the company Atlassian as an example of how this policy increases drive, satisfaction, and desire to learn (RSA, 2010). The practice essentially allows employees to take dedicated time to explore anything that they want, with the stipulations that it might help the company or community in some way and the information must be shared. So it is not just free time, but time to explore ideas and problems, some that would otherwise be considered outside of their field or area of expertise. At 3M it is called the Fifteen Percent Rule because that is the amount of time that is being given "off" to research new ideas. However, there are high expectations and the understanding that all of the knowledge acquired or information found will be shared with the company. This ensures that all information benefits the greater good and can inspire or help others with their research. In the classroom this would be fairly easy to implement. In some cases, there may already be time set aside for this type of work. The bell work at the start of each day could be used as an exploration time for students and then after the bell work, permit students to come together and share their inspirations and discoveries or trains of thought.

This individual time should not, in my opinion, be used as a treat or bonus exercise. It would defeat the purpose if only students who got their assignments done early were able to explore. Instead, it should be used as motivation and inspiration. Studies have shown that there are several factors that drive people, and last I checked students were people, no matter how young. These factors are autonomy, mastery and purpose (RSA, 2010). The problem is that school, as it is now, there is minimal autonomy. Usually the choices are irrelevant anyway; the students are allowed to choose if they want to draw the still life from the front or the side of the class. Instead, it would be more beneficial and more engaging for everyone if the students were allowed to choose the subject matter, or bring in props to draw. This way, they at least have some connection to the work that they create, rather than another arrangement of plastic apples and bottles. Mastery has to do with the desire to improve upon the current level of skill or knowledge (RSA, 2010). This can be aided through the lessons and lectures, but ultimately the student needs to see a reason to improve, which is where purpose comes in. When businesses use this model, the most successful ones strive not to have money as the purpose. Money is not a purpose to strive for; bettering the world and making a difference are purposes. Money does not keep employees engaged. In the school setting, grades are the equivalent of money. Grades really serve no purpose other than to show that a student can memorize and regurgitate information effectively. In *What the Best College Students Do*, these types of students are called strategic learners because they learn procedures, but do not understand information or the reasons why the procedures work (Bain, 2012, p. 7). This learning is from another time, more of an industrial and information based way of thinking. In fact, the International Baccalaureate Program did a study that revealed "The vast majority of students reported that they were motivated by altruistic or

humanitarian reasons rather than pragmatic reasons, such as improving their chances to get into a specific university" with grades ("New IB Research Examines," 2013). Schools should use this to their advantage rather than continuing to force grades as a means of incentive.

The reality, though, is that schools remain stuck in the bygone eras of industrialism and the information age. Unfortunately, the industrial and information ages have come and gone and the world has moved on to the age of conceptuality and creativity (TED Talk, 2010). These evolving models of commerce and business call for new methods of teaching and learning. Instead of teacher-based methods of instruction, which simply cover material, it is time to move on to student-based and student-led methods of instruction (Bain, 2004, p. 28). Teaching students how to construct their own meaning, how to learn from a process and not just complete activities for the sake of a product, and, most importantly, how to develop the skill to develop their skills should be the new goals. The idea of individual time is one way to start infusing these types of purposes into the classroom. Every student who walks through the art studio will not become an artist, but it is possible to teach them how to cultivate their skills of observation, dedication and self-reliance so that they can use those to better their learning elsewhere.

NOCCA, IB, and High Tech High School Models

Several educational institutions and programs are already set up to achieve these goals. New Orleans Center for Creative Arts or NOCCA is one such high school. Students at this school take classes that are specifically based in the arts that they are looking to pursue as professionals. It is not a school of diversion; it is a serious place that provides serious training in the discipline and commitment that it will take to be an artist (NOCCAtube, 2009). This allows students to mature as individuals and truly understand the material or master the skill being taught. Another aspect of instruction is that students are not taught by teachers who can create art but no longer do so. No, students are taught by educators who are still practicing artists. This lends a sense of genuineness to the instruction. "They can see that we are doing the same things that we are telling them to do, we might say that you have to spend ten hours on a drawing, and then they can go to a gallery and see a painting that we might have spent twenty-five hours on" (NOCCAtube, 2009). When teachers are still engaged in the struggles of creativity, it makes it easier to spot and discuss potential problems that students may be experiencing. It also serves as an example for students demonstrating the process of creativity as one that is time consuming, engaging, and rewarding.

High Tech High School, or HTH, is another school that is following the model of businesses. The school focuses on four main purposes: personal-ization, adult world connection, common intellectual mission, and teacher as designer ("HTH Design Principles," 2012). These principles focus on the student as an individual and the teacher as a facilitator, rather than the teacher as lord over all the minions. This allows for creativity to flourish. "The main section of the school, the Great Room, houses the student workstation suites where upper-school grades 11 and 12 students work on self-directed projects one-half of every day" (Pearlman, 2002, p.15). This goes right back to the Individual Time that businesses have started to give to employees to increase productivity. When students are given the opportunity to pursue and invest their efforts into a project that they find meaningful, the process of learning is successful. This school does not only that though, they also hit the other two business practices that I mentioned. Collaboration was one skill that I marked the benefits of in students' lives. At HTH "all high school students complete substantial internships in the world of work and service, where they develop projects that contribute to the workplace" ("HTH Design Principles," 2012). Students learn to interact with each other and the outside world, specifically the work place. This interaction not only prepares them for the experiences they will face when they enter the workforce, but provides a humanistic purpose for their learning. The students complete projects to benefit the community, not just acknowledge it, but really help the community to grow and become a better place. This is furthered through the other practice that I cited: interdisciplinary learning. The students are learning how to connect the information from different classes, acknowledging the real world is rarely broken into isolated classrooms. This allows them to take a more universal yet personalized approach to their studies. Students can really delve into a topic, studying the historical implications, mathematic processes, scientific discoveries and artistic creations associated with it. If schools started to follow this model, the country could become a place of creativity. Rather than a mass of students who know a trivial amount of information about a multitude of topics, there could be students who have a wealth of information about a select few topics but who know other students that can help them to find the answers to their questions because those other students are experts on those topics. Thus completing the circle with more cooperation.

Conclusion

Students are individuals and schools need to start treating them as such. Rather than an assembly line of classes that students move their way through, schools need to start creating more individualized opportunities for students. There is no need to educate all students the same way; they are not the same. They come in with diverse experiences and will move on to diverse jobs and life situations. It is time to move away from the age of industrialization in schools

and into the age of creativity and an intrinsic desire to learn. The examples I used were modified from businesses because that is where most students are ultimately going to wind up, so school should be preparing them for the realities they will face. Rather than pitting them against each other in useless competition, they should learn to collaborate. Students should be learning the skills to connect information and resources, so that they are able to make connections rapidly when they leave school. Grades should be guidelines for students, or eliminated altogether. Instead, evaluations should be on an individual level and used as a tool for improvement, rather than a means of degradation. If a student is lacking in one area, then schools should use that knowledge to help support them in achieving a better understanding. Instead, schools have gotten into the practice of passing students along and settling for ignorance instead of working with students to create understanding. If students were allowed to research topics that were of interest to them, within the curriculum of their classes, they would learn. Right now, many have no motivation beyond the marks on a page that purport to inform them of their learnedness. This is not a good message to send because once the grades are gone, there is little motivation to learn, which could be a scary prospect for society. Luckily, there are teachers out there who have found ways to inspire students and learning. Their ability to think outside the box when it comes to instruction has planted the seeds of what real learning can be. It is unfortunate that schools as a bureaucratic institution have chosen to direct their efforts towards more testing and standardization instead of following the examples set by the teachers. Ultimately, all of the attention should be on students and how prepared they are to handle the challenges of the world when they graduate. I happen to think that teaching them how to think creatively and outside the box is one of the most effective ways to do this.

Bethany Kelly is currently completing her final semester of her bachelor's degree in art education. Her passion for art and learning is something she hopes to instill in her future classroom using some of the methods explored in this paper. After graduation, she hopes to continue her studies by pursuing a master's degree in drawing and installation art.

REFERENCES

Amabile, T. M. (1997). Entrepreneurial Creativity through Motivational Synergy. *Journal Of Creative Behavior, 31(1)*, 18-26.

Bain, K. (2012). What the best college students do. Cambridge, MA: Belknap Press.

Bain, K. (2004). What the best college teachers do. Cambridge, MA: Belknap Press.

Benzer, F. (2013, September 17). [Videoconference interview by B. Kelly].

Bettencourt, L., & West, G. (2010). A unified theory of urban living. *Nature: International Weekly Journal of Science, 467(7318)*, 912-913. http://dx.doi.org/10.1038/467912a.

Carlton, J. (2013, September 13). [Personal interview by B. Kelly].

Delacruz, E. (2011). The teacher as public enemy #1- a response. *Art Education, 5-9.*

50 famously successful people who failed at first [Fact sheet]. (2010, February 16). Retrieved October 16, 2013, from http://www.onlinecollege.org/2010/02/16/50-famously-successful-people-who-failed-at-first/.

Harris, M. (2010). Interdisciplinary strategy and collaboration: a case study of American research universities. *Journal Of Research Administration, 41(1),* 22-34.

HTH design principles. (2012, December 18). Retrieved December 1, 2013, from http://www.hightechhigh.org/about/design-principles.php

Kohn, A. (1999, March). From degrading to de-grading. High school magazine, Retrieved from http://www.alfiekohn.org/teaching/fdtd-g.htm

Lehrer, J. (2012). Imagine: how creativity works. Boston, MA: Brilliance Audio

McClellan, N. (2002). MFAA: An Interdisciplinary Prototype. *General Music Today, 15(2)*, 14-18.

New IB research examines the impact of the creativity, action, service (CAS) component of the diploma programme in developing civic-mindedness. (2013, November 5). Retrieved December 1, 2013, from International Baccalaureate Organization website: http://www.ibo.org/announcements/2013/impactcas.cfm

NOCCAtube. (2009, April 15). About NOCCA [Video file]. Retrieved from http://www.nocca.com/about-nocca/

Pearlman, B. (2002). Designing, and making, the new american high school. *Tehnos, 11(1)*, 12-19.

RSA, T. (2010, April 1). RSA Animate - drive: The surprising truth about what motivates us [Video file]. Retrieved from http://www.youtube.com/watch?v=u6XAPnuFjJc

TED Talks. (2006, June). Ken Robinson: How schools kill creativity [Video file]. Retrieved from http://www.ted.com/talks/ken_robinson_says_schools_kill_creativity.html

TED Talks. (2009, February). Elizabeth Gilbert: Your elusive creative genius [Video file]. Retrieved from http://www.ted.com/talks/elizabeth_gilbert_on_genius.html

TED Talks. (2010, December). Ken Robinson: Changing educational paradigms [Video file]. Retrieved from http://www.ted.com/talks/ken_robinson_changing_education_paradigms.html

What we believe. (2013). Retrieved October 16, 2013, from http://www.innocentive.com/

Peter Jones

A Vaccination Theory of Catharsis

Abstract

This brief paper attempts to put Aristotle's idea of catharsis as stated in his Poetics in context with his overall ethical theory as stated in the Nicomachean Ethics, and with that to improve understanding of how Aristotle's catharsis actually works. I posit that, given Aristotle's views on *eudemonia* and the development and habituation of practical decision-making, catharsis works as a "vaccination" against the vicissitudes of life due to experiencing weakened versions of real events in tragic drama.

In aesthetics, no defense of art (if specifically drama) is better known than Aristotle's theory of catharsis, and yet it is still debated how the purging precisely takes place. Chapter Six of the *Poetics*, where the defense is stated, devotes most of its time to describing precisely what makes a good drama rather than specifically defending drama as catharsis. Nonetheless, the defense can be aided by knowledge of Aristotle's ethics, which deals with virtue and choice for the end of *eudemonia* as an "activity of the soul [that accords with] rational principle" (Aristotle, *Nicomachean Ethics*, Book I, Chapter VII). This paper will show how putting the theory of catharsis in context with Aristotle's ethical theory demands a new interpretation of how the purging of fear and pity takes place, and how it solves problems raised by other theories. In all, this new theory may not coincide with a "literal" reading of catharsis, insofar nothing is "purged" so much as it is *prevented* or *blunted*, but the medical imagery and its effects for people are still maintained in the form of a *vaccination*. In this, catharsis aids people in learning how to live ethically through the experience of the drama.

Before going into depth with Aristotle's ethics, it is helpful to examine two of the leading interpretations of the theory of catharsis, each with its own shortcomings and problems. One theory suggests that catharsis is wholly internal to the drama itself[1]. This proposes that once an otherwise morally good character is led to his or her downfall through making bad choices, the character is purged and the pity and fear that have been aroused is ended. However, this interpretation seems to take lightly Aristotle's contention that art has learning value to people (as contrasted to Plato who derided art as

"third removed" from the eternal forms and thus is unreliable as knowledge into what it describes (Plato, *Republic*, Book X)). The catharsis acts for its own sake; there may not be any applicable connection to those watching it, the reaction is merely emotional, there is no cognitive engagement that takes place. To counter this, another theory is often proposed, which treats artists as therapists for the public.[2] The public thus learns, as it notes the downfall brought about by choices, that fate, which breeds anxiety and fear, is not out of one's control and thus the negation of the belief in fate purges the anxiety and fear. This approach, while it creates a stronger connection between art and its viewers in the form of a consequential effect outside of the art itself, presumes that people are *a priori* guilty of having certain false beliefs or negative emotions but that cannot necessarily be supported as a universal theory. In addition, this interpretation narrows both the causes of fear and anxiety and the role of artists, the latter to a point of denying an artist's own intentions for the work. One can easily say that artists arouse pity and fear for the emotional reaction itself without some ideological agenda, which would be supported by the former theory.

What does Aristotle's ethical theory, which emphasizes the personal development of virtuous character, have to do with his theory of catharsis or his overall defense of drama for that matter? Quite a lot, actually—the role of choice as descrybed in the *Nicomachean Ethics* is one aspect that connects his two ideas. In Book III, he describes choice as something very much connected with virtue, with deliberation being its prerequisite. Man is determined to be the source of his or her actions and is thus responsible for them, and must deliberate in choosing the means in order to attain those ends. Thus virtue is intrinsically connected to a deliberated choice; and that virtue is an action that one continuously engages in, as opposed to being a static attribute (Aristotle, *Nicomachean Ethics*, Book III, Chaps. 3, 5). As a means to justify drama, this element of his ethics explains his view that drama is best served by depicting, for the sake of arousing fear and pity, the downfall of an otherwise morally good man who has made a bad choice, even if poorly deliberated. Moreover, it should be noted that it is the *actions* of the character that arouse fear and pity, and not the character himself or herself (*Poetics*, Part XIII). The fear and pity engages one with the character's decision-making process to see how the actions of the character play out in their consequences, helping to stimulate a process in the viewer's own mind.

Focusing on choice alone would merely support the "internal" interpretation of catharsis. As stated before, this interpretation does little to connect the actions in the drama with the things that people are supposed to garner

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[1] One significant proponent of this view is Gerald Else in his *Aristotle's Poetics: The Argument*.

[2] Sir William David Ross, in his *Aristotle*, is a proponent of this view.

from watching the drama, other than an emotional reaction to only those events in the drama. To make a case for support of practical wisdom, that is, aid the development of character, one must ask what the drama does for the audience watching it. This is, of course, supported by the "artist as therapist" interpretation. In this case, the practical purpose of the dramatist is to instill an idea, namely the belief that fate is not all-powerful, supposedly to purge the audience of the fear that comes with the opposite belief (that fate is all-power-ful). But getting rid of false beliefs seems to not only be pre-suppositional on the artist's part, it also appears to suppose a narrower view of *eudemonia* than what can reasonably be garnered from Aristotle's ethics.

A review of the meaning of *eudemonia* is also informative. Although often translated as "living well," this must also be augmented by "living virtuously." By contrast, pleasure, which is only a state of mind, cannot be an end goal in itself; what matters are virtuous actions (*Nicomachean Ethics*, Book VII, Chap. XII). Certainly virtue, as practiced, is supposed to be pleasurable and, although it cannot guarantee pleasure, it at least serves as a guard against mis-ery and pain, especially from the chance elements of life. It is notable that in making this case Aristotle seeks to merge the rational and irrational elements of the mind into practical decision-making on ethical issues, rather than des-ignating the rational as the source of virtue and the irrational as a roadblock to virtue as Plato supposed: "For in speaking about a man's character we do not say that he is wise or understanding but that he is good-tempered or tem-perate…" (Book I, Chap. XIII) After all, as practical wisdom, virtue must be readily applicable into the immediate vagaries of the day-to-day world (Book II, Chaps. 1–3). In fact, Aristotle's discussion of the weakness of will is offered as support for the merging of rational and irrational elements in decision mak-ing, as having weakness of will is a flaw in balancing the rational and irrational elements: in cases where one knows what the right thing to do is but fails to do so because it goes against one's predispositions means that one has failed to make a proper account of what is good. Eudemonia is thus best thought of as belief training and not a set of beliefs in itself, as what would be found in a model where certain beliefs are to be purged. At best beliefs are to be tempered, especially in actual decision-making situations.

It should be noted though that this model of ethical decision-making mentioned above does not appear to take into account the fact that Aristotle himself said that some things have no virtuous counterpart, such as cruelty and betrayal (see, for example, *Nicomachean Ethics*, Book VII, Chap. 5). Thus, it cannot be necessarily said that every aspect of life is subject to the balancing of rational and irrational elements that have described earlier. However, this absolute prohibition is also equally something that can be discovered through the moral training, even if it is not practiced as a matter of "balancing."

Although all this seems to imply that virtue is most effective when practiced, it does not prohibit simple observation of others in decision-making, and this is part of how it can be taught and learned.[3] Thus observing actions in a play, especially those that arouse fear and pity, contributes to virtue as practiced, even as subconsciously recollected. As stated before, the actions in the play that arouse fear and pity stimulate decision-making in one's own mind with-out actually making decisions but rather seeing them out through others.

This analysis of Aristotle's ethical philosophy reveals several things. For one, a review of *eudemonia* shows that there are no specific "wrong thoughts" that need to be taken out or even "wrong actions" that need to cease in order to achieve it (or perhaps more precisely partake in it, as it is an action rather than a state of being). The merging of the irrational and rational elements in decision making further demonstrates that emotions are not independent of practical reason, but can be habituated without reference to actual fact, allow-ing a sort of theoretical practice outside of actually doing it oneself, thus not directly connecting any emotion to a pre-existing thought or belief as would be implied by an artist as therapist approach. The need for practical wisdom, as stated many times already, necessitates that art go beyond the temporary emotion directly invoked by the actions in the play.

In fact, a new theory of catharsis must necessarily merge what remains of the two previous theories, namely the "internal catharsis's" emphasis on arousing fear and pity in itself without assumptions on the viewer and the "external catharsis's" emphasis on the socio-psychological role of drama with more far-reaching consequential effects. It must also acknowledge the role of irrational in influencing virtuous decisions. Thus, it may be more helpful to understand *catharsis* as a *vaccination* rather than a simple purging as a more literal translation would suggest. Although the medical concept of vaccina-tion did not exist (or at least was not well-known) in Aristotle's time, the idea of having a weakened version of "the real thing" in order to aid immunity to something seems to very much agree with Aristotle's view of *eudemonia* as a guard against the miseries and pain of life. This can be seen in three ways: one is that merely seeing the actions in the play arousing fear and pity will actually encourage the person to make better decisions in life, having seen the poor choices made and thus will avoid the consequences. Secondly, in cases where

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3 Plato, by contrast, seemed to find that virtue was divinely dispensed, although this depends on a recollection theory of learning that depends on a Theory of Forms that Aristotle rejected, especially as premised for Plato's criti-cism of art as being "third removed."

the person himself or herself is unsure whether his poor lot in life was due to his choices, the emotional reaction itself, having already been experienced, will help the person better weather their lot, contributing to *eudemonia*. Thirdly, it helps them minimize pain and misery due to persons close to them, also due to having seen and experienced the emotions in the play.

This vaccination theory of catharsis helps to clarify the relationship between emotion (the irrational element) and *eudemonia*, and allows for people to develop it without reference to any previous beliefs, and acknowledges the role of drama as a contributor to practical wisdom. Curiously enough, it can provide another defense of art against Plato's attack on it: Even if we grant that fear and pity in drama is "third removed" from the fear and pity in real life, they are similar enough in that one can help alleviate the other.

No interpretation is perfect, and this theory is no exception. One can say that it diminishes the role of choice that Aristotle gives to his ethics and therefore their role in his theory of drama, as the emotional reaction here is not necessarily connected to any actions of the character that arouse fear and pity. However, it is only clear that the emotion itself is purged, not any beliefs that contributed to it. Therefore choice, as an element of the drama, is not necessarily the target of the purging, although we can acknowledge that it makes the emotion and purging stronger. And as stated before, emotion, as an irrational element, by itself plays a role in *eudemonia*, and is not necessarily counter to thoughts or beliefs from the rational side of the soul—it can help develop beliefs without replacing other beliefs.

So in short, the vaccination theory of catharsis that I propose acknowledges drama's role in public life and for the development of *eudemonia* via the experience of strong negative emotions invoked by drama so that they will not be as strong as experienced in real life. It removes any presumption of preexisting beliefs of the audience, and can work in several different ways based on influence on choice and also the weathering of bad experiences both within and beyond one's control.

Bibliography

Aristotle, *Poetics* (Chap. 6) and *Nicomachean Ethics* (Books 1, 2, 3, 6, 7, and 10) in Forrest E. Baird ed., Philosophic Classics: Ancient Philosophy, 6th edition (Upper Saddle River, New Jersey, 1997), 378-408, 412-450 (*Nicomachean Ethics*), 461-462 (*Poetics*).

Else, Gerald, *Aristotle's Poetics: The Argument*, E. J. Brill, 1957.

Plato, *Phaedo* and *Meno* in Forrest E. Baird, ed., Philosophic Classics: Ancient Philosophy, 6th edition (Upper Saddle River, New Jersey, 2011), 108-77.

Plato, *Republic (Book 10)*. Downloaded 12/2/2013.

Ross, (Sir William) David, *Aristotle, 6th edition* (Routledge, London, 1995), 294-302.

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Jeff Bess

Kevin Durant is Not Nice: Understanding Cognitive Dissonance in the Marketing of a Superstar

Abstract

This paper discusses the implications of cognitive dissonance theory for the study of image construction in Nike's "KD is Not Nice" advertising campaign. A brief review of cognitive dissonance theory precedes a thorough evaluation of the causes and consequences of cognitive dissonance in Nike's persuasive campaign. It is concluded that cognitive dissonance is present throughout, even in Durant's own psyche.

Introduction

The career opportunities afforded to professional athletes extend far beyond the court, field, or rink. Star players in each of the four major North American professional sports leagues have myriad opportunities to supplement their income with endorsement deals and paid appearances, making the cultivation of a personal "brand" nearly as financially vital as competitive success. This makes the careful construction and maintenance of a positive public image essential. Projecting the most financially advantageous persona is not always as straightforward as staying out of trouble and focusing on the sport, however. Rather, constructing such an image is fundamentally a matter of persuasion that requires an active combination of forward-looking public relations strategies and savvy marketing. This is particularly the case for athletes at the top of their profession, who are both granted the greatest opportunity to capitalize on their celebrity and are often expected to embody values such as toughness, endurance, aggression, and masculinity. In the case of NBA superstar Kevin Durant, Nike has crafted a marketing campaign centered on the bold declaration that "KD is Not Nice." to capitalize on this common archetype. This campaign seeks to characterize Durant as the archetypal gladiatorial champion athlete. Doing such has required a strategy that accounts for Durant's widespread reputation among fans as a well-meaning, kind person. This has forced Nike to both navigate and utilize cognitive dissonance to shape fans' impression of Durant.

Theory

Humanity is as defined by its capacity for reason as it is by its inability to achieve the ideal of perfect rationality. Even ostensibly "rational" decisions or beliefs grounded in seemingly sound justifications often leave much data out of the equation and rely on at best incomplete logic. As a result, human reason does not and cannot derive from a perfectly unified theory of understanding the world. Instead, the complexity of the world and humans' inability to cognitively process all of it makes reliance on contextual knowledge and imperfect application of principle to practice a necessity. The same cognitive sophistication that is responsible for this ability to "rationalize" using mere pieces of reason can lead to contradictory and even directly oppositional thoughts in an individual. When these thoughts or beliefs come into conflict with one another a state of "cognitive dissonance" can be observed. First theorized by Leon Festinger, cognitive dissonance is defined as the simultaneous presence of contradictory cognitions in an individual (Festinger, 1957). Cognitive dissonance theory can be applied to a multitude of fields that study human behavior and thought processes. Its importance to persuasion theory, however, is plain; the art of persuasion demands navigating understanding and often changing people's thoughts on a subject. This requires confronting, avoiding, and remedying cognitive dissonance.

A fundamental premise of Festinger's theory is that individuals seek internal consistency (Wicklund & Brehm, 1976). Given the choice, he argues, people will tend to take actions consistent with their thoughts and derive conclusions consistent with their other beliefs. This desired state of cognitive congruence demonstrates the fundamental thesis of cognitive dissonance. Cognitions that fit into pre-existing beliefs are defined as "consonant," or generally consistent. In contrast to consonant cognitions, Festinger defines thoughts that conflict with our established opinions and beliefs about the world as "dissonant" (Wicklund & Brehm, 1976). Examples of behavior driven by preconceived notions are everywhere. For instance, if an individual has decided that he or she does not like vegetables he or she is unlikely to eat peas and carrots when there is a steak available. If such an individual were to try eggplant for the first time and find its taste repulsive, he or she would likely be satisfied on some level to have their opinion about vegetables confirmed by experience. These cognitions would be said to be consonant since they are not in conflict with each other and in this case are even self-reinforcing. On the other hand, a state of cognitive dissonance would likely result if the same individual were to eat zucchini for the first time and unexpectedly think find it is deliciousthen a state of cognitive dissonance would likely result. In this case, a generally held view about the world ("vegetables are gross") is being contradicted by a particular new experience ("zucchini is delectable"). These are fundamentally dissonant positions; vegetables are gross and zucchini is a vegetable, therefore zucchini should be gross. This can result in mental discomfort as the individual attempts to reconcile the conflicting opinions. After all, it is human nature, as defined by Festinger, to desire and strive for consistency in one's cognitions.

Dissonance can occur in a number of ways. First, as in the vegetable example, an individual can discover new information or observations that conflict with previously held beliefs on a subject. Alternatively, an individual can organically draw a conclusion based on previously-obtained knowledge that conflicts with their own opinions (Festinger, 1957). Whether the dissonance is introduced externally or is the product of internal, contradicting lines of reasoning the impact on the individual is generally the same. As Festinger originally argued, there is mental discomfort that comes along with cognitive dissonance. The degree of this discomfort is linked to the importance of the originally held belief and the degree to which it is contradicted by other cognitions. (Wicklund & Brehm, 1976). Reaction to the discovery of dissonant thoughts vary by the individual but the origin of the dissonant thoughts and the importance of the conflicting values to any given individual will shape their experience of dissonance.

Communication and social psychological theory has advanced considerably since Festinger's original theorization of cognitive dissonance in the 1950s. Anthony Greenwald and David Ronis wrote in 1978 on the evolution of cognitive dissonance theory in the preceding twenty-plus years (Greenwald & Ronis, 1978). Greenwald and Ronis argue that while Festinger's cognitive dissonance theory has been instrumental in furthering the study of cognitive psychology it is no longer a complete nor entirely accurate articulation of the phenomenon. The core criticism forwarded by Greenwald and Ronis is that Festinger underestimated the importance of social responsibility for dissonant views. They argue that cognitive dissonance is primarily triggered by an expectation that the individual harboring dissonant views will be held accountable for each position and have to reconcile their contradictions in a social setting (Greenwald & Ronis, 1978) This expands the self-concept assumed by Festinger to include social context. Greenwald and Ronis contrast this view to Festinger's original assertion that the drive for internal consistency is sufficient to cause uncomfortable cognitive dissonance even without the fear of social repercussions. This clarifies the cause of dissonance may not necessarily be the personal desire to achieve internally consistent views but more the desire to be understood as such (Greenwald & Ronis, 1978). The implication is that Festinger's work, while theoretically very important, is incomplete insofar as it does not take into account broader social psychological phenomena that can impact cognitive dissonance. Therefore, the developments in the literature identified by Greenwald and Ronis are not a wholesale rejection of Festinger's work but rather recognition of the limitations of its ability to ascribe motives to dissonant actions. Thus, while understanding cognitive dissonance requires

a broader theoretical basis than first offered by Festinger, his work retains significant importance and usefulness.

Cognitive dissonance theory can be used in many different fields. Perhaps most intuitively, it has been applied to the field of education. Cognitive dissonance can help to explain and induce motivations for learning. For instance, introducing dissonant cognitions in students may cause an eagerness to understand the truth behind a mistaken understanding of the world. A corollary to this is the idea that remedying cognitive dissonance can be pleasurable for students, increasing incentives for learning (Aronson, 2003). Another application of cognitive dissonance theory has been in public campaigns to raise awareness of and combat environmental ills, such as littering. The dissonance in this case is clear: every lazy person that throws a McDonald's bag out of their car window knows on some level that they are harming the environment. These same people would probably rather protect the environment than actively destroy it if directly given the choice but allow cognitive dissonance to obscure the contradictions between their actions and beliefs. It follows, then, that confronting individuals with this dissonant cognition may have the effect of inducing planet-friendly behaviors, such as recycling (Fried & Aronson, 1995). Though these examples are not an exhaustive list of cognitive dissonance theory's possible applications they illustrate the brood relevance of the theory to any attempt to understand human behavior and motivations.

The above examples also demonstrate the potential for using cognitive dissonance as a persuasive tool. Every persuasive act is an attempt to change someone's cognitive relationship to some concept, person, or other thing. The value of a persuasive appeal is measured primarily by the effectiveness of its outcomes. This requires understanding human motivation since persuasion is by definition not coercive and therefore requires willing acceptance on the part of the audience. This is where Festinger's original theory, as well as the developments discussed by Greenwald and Ronis, becomes vital. If individuals, for either internal or social reasons, seek congruency between their thoughts and actions then exposing cognitive dissonance can be a strong motivator for behavioral change (Wicklund & Brehm, 1976). The application of cognitive dissonance theory to public environmental policy is particularly illustrative of this fact. If people are generally in favor of protecting the environment then they are likely to take actions consistent with this belief if confronted with cognitive dissonance. Unless confronted with the contradiction, however, individuals may not become aware of the linkages between their dissonant opinions and/or actions. Making this connection in a persuasive appeal can be a powerful way to induce this realization, thereby stimulating behavior change.

This principle can be applied to any number of persuasive campaigns, such as those that promote healthy eating, fitness, etc.

Though cognitive dissonance is a theory that expands well beyond the scope of communication studies, it is a vital tool to understand how an individual's cognitive processes interact and can be influenced through persuasion. The evolution of the theory since Festinger's original publication has served to further enhance its predictive and explanatory power on both individual and social levels of analysis. In the persuasive context, cognitive dissonance theory is key to understanding how beliefs are formed and adapted with the introduction of new information. By avoiding its negative impacts through consistent message construction and actively using it as a tool to help shape opinions cognitive dissonance has much to offer both scholars and practitioners in the persuasion discipline.

Kevin Durant: Nice or Not?

Kevin Durant is among the premier players in the National Basketball Association (NBA) with four All-Star appearances and three NBA scoring titles to his name already at the age of 25 (National Basketball Association, 2013). He is also, by all accounts, a very nice guy. While kindness and humility are certainly virtuous character traits for a human being to possess it is not what is usually expected from professional athletes. Athletes, especially extremely successful ones such as Durant, are more often portrayed as gladiatorial figures that exemplify dominance and masculinity (Holt & Thompson, 2004). While it is not the only means of branding superstar athletes, this idea of the warrior-like champion athlete is often deployed in the marketing of products that star players have endorsed as a means of suggesting to consumers the competitive superiority of a certain brand of sporting equipment, apparel, supplements, etc. In some instances the inability to identify an athlete with this masculine archetype can even be a liability to the athlete's commercial viability (Holt & Thompson, 2004). When the athlete in question is Kevin Durant, however, effective use of this archetype requires some persuasion to overcome preconceived cognitions about him. To this end, Nike, which manufactures Durant's signature KD shoe line and an accompanying collection of athletic clothing, has constructed an advertising campaign centered on the idea that "KD is Not Nice" (Golliver, 2013). This campaign has used a variety of means to persuade consumers that Durant has the cold-blooded edge and intensity the public expects from its star athletes.

Understanding the persuasion and image construction happening in the "KD is Not Nice" campaign requires some context regarding Durant's place in the contemporary NBA landscape. Durant is generally considered to be the second-best player in the NBA behind LeBron James, who has won back-to-back NBA championships and four of the last five NBA MVP Awards (National Basketball Association, 2013). During this same time Durant has also been very successful but has also been seen as something of an also-ran (Golliver, 2013). This presents a challenge for advertisers looking to showcase his image to sell a product, especially when combined with his reputation as perhaps the NBA's most low-key superstar. In response to this challenge, Nike decided that, in order to effectively persuade consumers to buy their products based on Kevin Durant's endorsement, they must first advertise Durant himself. This is a prime example of persuasion in advertising as advertisers are actively working to get the public to accept the carefully-developed persona that underlies the campaign.

When analyzing a persuasive strategy it is essential to know exactly what the persuader's intended outcomes are. In this instance, it is important to keep in mind that while this campaign is in many ways advertising Kevin Durant himself the end goal of the advertisement is to sell products. The broader persuasive strategy is often bigger than any particular persuasive appeal and this is perfectly illustrative of this fact. The "KD is Not Nice" campaign is one half of a two-part persuasive strategy. The message constructed is intended to persuade fans that Kevin Durant is not "nice" but rather a God-like athlete in order to set up a second, larger strategy to sell products. This component of the persuasive strategy is particularly important and instructive to analyze, however, because it is not persuading the audience to make a decision (to purchase something) but rather trying to bend the attitudes of the public. This makes the "KD is Not Nice" component of Nike's general business strategy a perhaps more nuanced example of a persuasive appeal than many ad campaigns.

Nike has used a variety of persuasive strategies in the "KD is Not Nice" campaign. One strategy involves image selection. A print advertisement that is part of this campaign shows Kevin Durant with a snarling face and clenched fist on a black background with plain white text surrounding it. The expression in this image has been chosen to convey aggression and toughness. The presentation of the image is also part of the persuasive strategy. The visual style is raw and bold, relying on a black-and-white color scheme and uppercase type. There is no winning shot, powerful dunk, or even a basketball, in the ad. Instead, there is just Durant alone in his moment of triumph. In contrast, a more typical Nike advertisement may focus on a particular game-winning shot or the training and preparation that an athlete endures. This is not the case in these advertisements because the message is not that of typical athlete-endorsed advertisements. Instead of trying to sell the audience on the idea that Durant is a trusted and excellent athlete, the campaign is simply trying to lay

the groundwork for product-centered advertisements by persuading consumers that Durant fits the image being sold.

The language used in the campaign is also significant. Text in an advertisement is usually kept to a minimum so each component of it must be analyzed closely. The main tagline for the campaign is simple and declarative: "KD is Not Nice." This is a succinct message that can be repeated many times and drilled into a reader's consciousness. This is an instance where an overly complicated or needlessly clever tagline could even be counterproductive to the persuasive goals; the message is as in-your-face as the slogan. The text of the advertisement is also entirely in capital letters. This has a major effect on the tone of the message and is itself a persuasive tactic to reinforce the legitimacy of the message being communicated. Overuse of capital letters is itself "not nice" in most settings and is a good example of the medium being the message. All text used as part of a persuasive strategy must be carefully chosen and both the content and form of the text used in this instance conforms to that principle.

The outcomes of Nike's persuasive appeal are hard to directly identify. To the extent that the advertisement is only an advertisement for a product the outcomes can be at least indirectly measured in the profits Nike gains from Kevin Durant-endorsed products. Even that quantification is imprecise, however, because other factors such as overall sales trends can impact whether a persuasive advertisement results in a purchase. It is even more difficult, however, to measure the outcomes of the advertisement's persuasive appeal about Kevin Durant's nature as a person. One complicating factor is particular to this persuasive context: there are no opinion polls or other direct quantitative measures of the public's feelings about Kevin Durant. This Public opinion about an athlete can be indirectly measured in terms of jersey sales, Twitter followers, and so on, but those are imperfect metrics at best. To some extent, though, this is a problem that complicates any analysis of the effects of persuasive strategies. Outcomes are hard to identify and even more difficult to directly link to particular causes. This is particularly true for persuasive appeals that require a change in attitude instead of a change in behavior. Jersey sales, for instance, may indicate that a certain number of people are fans of Kevin Durant but that number does not say much that is relevant to this paper because people may choose to buy Kevin Durant without considering if he is nice or not. If identification of a player like Durant with the typical athlete archetype can potentially hinder Nike's success in leveraging his brand for a profit, however, they are likely to wager that the reliable potential of such a campaign justifies it despite the difficulty of measuring its direct impact. It is safe to say, at least, that the "KD is Not

Nice" campaign has had the outcome of changing the public conversation surrounding Durant to some degree. And, again, insofar as the advertisement campaign is part of a broader persuasive sales strategy that might be the only outcome that matters. What is clear is that Nike and Kevin Durant made the conscious decision to create the idea in the public that Kevin Durant can fit the gladiatorial archetype of the star athlete and they have crafted a smart strategy to do so.

Application

Applying cognitive dissonance theory to the "KD is Not Nice" advertising campaign yields several insights. First, in the most straightforward sense, the campaign introduces a dissonant representation of Durant in the context of his overall public image. This is due to the very nature of the message Nike is trying to construct, which is intended to market an image of Durant that is in stark contrast to his current public persona. Unlike more "organic" media representations of a celebrity like Durant that might cause the public to question his kindness (a leaked mug shot, video of him instigating an on-court brawl, etc.) the "KD is Not Nice" campaign does not carry any moral weight or really even presentse of a reason *why* Durant is suddenly so menacing. Instead, the campaign must exist as but one instance of representation in a mass of media portraying Durant as both a person and brand. This makes the campaign's claim more plainly dissonant because it does not correspond to a real-life event that would help the audience to accommodate this new characterization of Durant's personality.

That the campaign simply introduces dissonant cognitions about Kevin Durant's hardly groundbreaking, however. After all, every persuasive message that seeks to change an audience's mind on an issue about which its members have already developed an opinion has to at some level overcome what has led each individual to their initial impression. This requires acceptance of dissonant claims that conflict with the audience's pre-existing cognitions. What is more interesting is how the campaign navigates the challenges presented by the resulting state of cognitive disequilibrium.

As noted earlier, the "KD is Not Nice" campaign does not come in response to some revelatory information that has suddenly cast Durant as a villain in the public consciousness. This places a heavier burden on every supporting element of the campaign that helps to shape the persuasive message. An example of this is the visual style of the advertisement, both graphically and textually. The "KD is Not Nice" campaign could not rely upon simple serif text against a stock photo of Durant playing basketball to get its message across. Such an advertisement would introduce the dissonant claim that Durant is not nice

in the weakest possible way and decrease its persuasive appeal. Given that there is no real-world referent for the campaign's claim about Durant, the advertisement must somehow communicate the claim in a way that illustrates to the audience the image it is trying to construct. In order to achieve this the advertisement uses visual cues that communicate aggression, masculinity, and edginess. Images of Durant and bold stylistic elements are chosen that portray him in this light. Aside from providing aesthetic appeal and general visual context for the advertisement, these elements help to ease the audience's sense of cognitive dissonance. Though the audience's existing impression of Durant may be counter to that presented by the campaign the internal consistency of the campaign's representations provides some friendly consonance to help integrate the campaign's generally dissonant message into the audience's cognitions.

The challenge of introducing dissonant representations of Kevin Durant in the "KD is Not Nice" campaign extends beyond the difficulty of effective message construction. The decision to attempt a persuasive appeal of this nature is itself a challenge. Foundational to cognitive dissonance theory is the premise that people do not like to hold contradictory opinions and will seek to achieve internal consistency by ridding themselves of dissonant cognitions. This means there is significant risk involved whenever attempting to persuade by introducing dissonant information since the very theory that validates the strategy's potential effectiveness also argues that the disequilibrium caused by such an appeal can be significantly alienating to the receiver. The public images of figures such as Kevin Durant are carefully crafted and any message that could cause the public's impression of such a figure to be defined by negative or incongruent cognitions is a potentially treacherous public relations strategy. A failure of the persuasive appeal may not simply leave the public's impression of Durant unchanged but could actually damage it. This illustrates the power of cognitive dissonance to shape opinions, whether or not it is part of an intentional persuasive strategy. As such, cognitive dissonance must be respected as a potential hazard and not recklessly wielded as a cure-all persuasive tool. To do so requires accounting for both the causes and effects of cognitive dissonance in any persuasive situation.

A second broad application of cognitive dissonance theory to the "KD is Not Nice" campaign concerns the persuasive environment in which the campaign exists. As noted in earlier sections, Kevin Durant's public persona does not conform to the traditional "star athlete" archetype. Durant has more often been cast as an easy-going, basketball-loving kid than as a gladiatorial exemplar of aggression and masculinity. This reveals Durant's current public image itself be a potential source of cognitive dissonance for sports fans and members of the public that are used to dominant professional athletes that embody that same competitive grit and toughness personally. In this way the "KD is Not Nice" campaign seeks to resolve dissonant cognitions in addition to introducing them. Put another way, to the extent that the campaign's advertisements are incongruent with the public's image of Durant, they can also be said to be consonant with the archetype of the "not nice" superstar athlete. Again, the visual elements of the campaign are critical. The images and style used may be unlike what one may expect from a Kevin Durant advertisement but they are exactly what one would expect from an athlete of his stature and competitive success. This helps the overall persuasive appeal to present Durant in a manner consistent with the cultural referent it invokes. In addition to helping establish internal stylistic and substantive consistency within the campaign, this strategy attempts to persuade that Durant is himself consonant with the audience's existing cognitions about people occupying his position in society.

The campaign further engages the concept of cognitive dissonance by helping reconcile the values of competitiveness and kindness. Durant is unique as a public figure not just because he is a star athlete that does not fit the typical hyper-aggressive mold but also because he is both truly a fierce competitor and a genuinely nice person. Though the "KD is Not Nice" campaign introduces a measure of cognitive dissonance by suggesting Durant is not entirely the friendly young man he has been portrayed as in the media, it would be a mistake to take the campaign's tagline at face value either. The lack of "niceness" attributed to Durant in the campaign's appeal is not an accusation of "meanness" but more a redefinition of what it means to be "nice" in a competitive setting like the highest levels of professional sports. In other words, the point of the persuasive appeal is not necessarily to make Durant look like an actually bad person but rather to remove the perceived barrier his reputation as a particularly kind person presents to Nike as they market him as a star athlete. By using language that boldly declares "KD is Not Nice" the campaign implies consonance between the "nice" Durant fans are familiar with off the basketball court and the "not nice" Durant that destroys his opponents on the court. Challenging the exclusivity of those two characteristics challenges their relationship as constitutive of cognitive dissonance. Thus, the persuasive appeal allows for enough nuance to avoid having to achieve a literal reversal in the audience's perception of Kevin Durant. Instead, the campaign allows for a more sophisticated impression of Durant to emerge that portrays him as "not nice" in the competitive sense without necessarily suggesting that he is a genuinely bad person of impure character.

A third, albeit far more speculative, application of cognitive dissonance theory to the "KD is Not Nice" campaign relates to Durant's own psyche. As discussed earlier, Durant is in an interesting position as the clear second-best

player in the NBA and perennial second-place finisher to the slightly, but significantly, superior LeBron James . (National Basketball Association, 2013). Durant has explained in interviews that he is unsatisfied with this state of affairs and is sick of continuously finishing second. He has also made it clear that he views James to be his direct rival and the sole person whom he must leapfrog to achieve his goal of being the best player in the NBA (Golliver, 2013) When placed in the context of James and Durant's substantially different public images it becomes easy to see how through the "KD is Not Nice" campaign Durant may himself be exorcising cognitive dissonance about his identity as a basketball player. Though LeBron James is surely a nice enough person, his branding and public image has always been driven by his unparalleled athletic dominance; it was, after all, a Nike campaign that first dubbed him "King James." If Durant views James as the standard of excellence which he must surpass then it is not too much of a leap to wonder if he might also aspire to James's public position as the de facto "kingKing" of the NBA. If this is the case, the "KD is Not Nice" campaign may be a reaction to what Durant views as a shortcoming of his personality, his public image, or both. Though a driven athlete such as Kevin Durant is surely not lacking in confidence in his abilities, it seems intuitive that dissonance may arise when his own demeanor and reputation differ so significantly from what everyone, himself included, seems to expect from the athletic force he aspires to be. In that way the "KD is Not Nice" campaign could be interpreted as Durant publicly embracing an identity consonant with his notion of what his stature demands.

These applications of cognitive dissonance theory to the "KD is Not Nice" campaign illustrate the ways in which complex webs of cognitions can interrelate in ways both useful and potentially detrimental to a persuasive appeal. Public relations and marketing campaigns must be cognizant of all the ways in which they may inadvertently trigger cognitive biases in audiences that could negatively impact their persuasive message. This is particularly the case in campaigns such as this one where the message is focused on conjuring a facially contradictory cognition in the audience as opposed to just influencing, for instance, a customer to buy a product.

Conclusion

The mere existence of the "KD is Not Nice" campaign as a persuasive appeal demonstrates the ways in which cognitive dissonance always affects what kinds of messages are constructed in a marketing and public relations context. Attempting to sway the opinion of an audience on any issue is always a challenge when the audience already holds an opinion on the issue and that is particularly the case when it comes to the impression the public has of a celeb-

rity. That challenge does not exist in a void, however, and achieving persuasive goals in these fields requires recognition and navigation of an audience's existing cognitions. In the case of the "KD is Not Nice" campaign, Nike has identified a dissonant relationship between public expectations of dominant professional athletes and the persona of Kevin Durant. By manipulating existing cognitions about Durant and avoiding the pitfalls of introducing irreconcilably dissonant messages, Nike has displayed an understanding of the ways cognitive dissonance, persuasion, public relations, and marketing intersect and interact.

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REFERENCES

Aronson, E. (2003). *The Social Animal*. New York: Worth Publishers.

Bass, J. J. (2011). Campaign Signs, Race, and Political Participation in Mississippi, 2008. *Southeastern Geographer , 51* (3), 473-494.

Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford: Stanford University Press.

Fried, C. B., & Aronson, E. (1995). Hypocrisy, Misattribution, and Dissonance Reduction. P*ersonality and Social Psychology Bulletin , 21* (9).

Golliver, B. (2013, April 29). Kevin Durant sick of second, working for first with help of advanced stats. *Sports Illustrated*.

Greenwald, A., & Ronis, D. (1978). Twenty Years of Cognitive Dissonance: Case Study of the Evolution of a Theory. *Psychological Review , 85* (1), 53-57.

National Basketball Association. (n.d.). *Kevin Durant*. Retrieved November 1, 2013, from NBA.com: http://www.nba.com/playerfile/kevin_durant/

National Basketball Association. (n.d.). *Lebron James*. Retrieved November 1, 2013, from NBA.com: http://www.nba.com/playerfile/lebron_james/

Travis, D. (2008). A Response to Senator Barack Obama's Philadelphia Speech on Race and Politics in America. *Journal of the Indiana Academy of the Social Sciences , 12,* 1-8.

Wicklund, R. A., & Brehm, J. W. (1976). P*erspectives on Cognitive Dissonance*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Elizabeth Wood

Literature Review on the Effects of Offshore Wind Turbine Noise on Marine Mammals

Abstract

Increasing environmental issues have caused cleaner forms of energy such as offshore wind power to be exploited. Despite the benefits of offshore wind power, the construction and operation of the turbines have potentially negative effects on marine mammals. Marine mammals rely heavily on their perception of sound. A review of studies about the effects of turbines on marine mammals indicates that marine mammals' hearing can be damaged (temporarily or permanently) by the noise associated with turbines. Other effects of anthropogenic noise on marine mammals include behavioral changes and masking of social signals. However, these potentially harmful effects can be minimized through forms of mitigation that involve discouraging marine mammals from swimming near turbine construction and decreasing the amount of noise created during construction and operation. The effects of turbine noise on marine mammals have not been researched to a full extent since offshore windpower is still a rising form of energy. More research needs to be conducted on the short-term and long-term effects to marine mammals as well as on mitigation to reduce the effects.

Introduction

The issues of energy production and pollution came to the forefront of politics and international interest in 1997 when the Kyoto Protocol was issued. The 191 countries that signed the protocol made a commitment to reduce greenhouse gas emissions by means of carbon offsets (Kikuchi, 2010). The commitment of this protocol has become increasingly important since 1997, as energy demands and pollution have risen. Based on the current increasing energy demands, the International Energy Outlook has predicted the world's demand for energy will significantly increase by 44% from 2006 to 2030 (Saidur, et al., 2011). The increasing demand for energy causes an increase in pollution due to the fossil fuel combustion caused by energy production. The main types of energy production utilized are coal and natural gas (Saidur, et al., 2011). The combustion of fossil fuels releases harmful greenhouse gases such as carbon dioxide into the environment. An assessment from the Intergovernmental Panel on Climate Change showed that recent global warming was caused by human activities mainly related to burning fossil fuels (Saidur, et al., 2011).

This environmental crisis, paired with the commitment to increase use of carbon offsets, has led to a rise in wind energy. Wind energy does not release any pollutants or greenhouse gases, and is considered to be the most environmentally friendly source of renewable energy (Saidur, et al., 2011). Because of the obvious advantages of wind energy, it has become the fastest growing source of clean energy. At the end of 2010, wind power accounted for 2% of global energy, but the Global Wind Energy Council has predicted that the use of wind power will significantly increase by 160% by 2017 (Sun, Huang and Wu, 2012). Due to this rapid increase of wind power, wind farm developers have stopped focusing on onshore wind farms and have started exploring the possibilities of offshore wind farms (Madsen, et al., 2006). Offshore wind farms have more potential than onshore because they offer a greater yield of energy. On average, the wind speed offshore is 20% higher than onshore and each turbine that is offshore generates 50% more energy than an onshore turbine (Kikuchi, 2010). Construction of several offshore wind farms have already been completed, with many more expected in bodies of water such as the Baltic Sea and several other European shelf seas (Krone, et al., 2013). These seas are going to be heavily utilized in the future, with plans already made for hundreds of wind turbines to be built (Andersson, et al., 2007).

Despite the benefits of offshore wind power, there are concerns about the consequences of wind turbines to wildlife. Any wildlife that has offshore environments as part of a habitat can potentially be effected by offshore wind power. Studies of offshore wind power have shown that marine and terrestrial wildlife, such as migratory birds, are affected by ecosystem disruptions and turbine collisions (Kunz, et al., 2007; Larson and Clausen, 2002). Marine mammals are especially affected by offshore wind power due to their sensitivity to noise and disruptions. Marine mammals, such as pinnipeds (seals) and cetaceans (dolphins, porpoises, and whales) can be harmed by construction and operation of offshore wind turbines (Thomsen, et al., 2006). This added noise in the environment can affect marine mammals' behavior, their ability to communicate, and their ability to hear. In order to properly assess this topic, several terms must be defined. "Noise" is defined as any sound that has the ability to damage a marine mammal's ability to receive signals or that causes changes in the mammal's behavior (Madsen, et al., 2006). Any noise created by the turbines or during construction is defined as being anthropogenic since the turbines are man-made (Bailey, et al., 2010). All of the current offshore wind farms have been built in shallow waters. Deep water wind turbines have been built, but not to the extent of existing wind farms. The definition of "shallow water" varies depending on the literature, but is typically defined as

being between 10 and 200 meters deep, whereas, depths exceeding 200 meters are always considered "deep water" (Bailey, et al., 2010; Madsen, et al., 2006; Southall, et al., 2007). Water depth influences the marine mammals that normally populate the area.

Functions of Sound for Marine Mammals

For marine mammals, the ability to hear and perceive sounds correctly is vital. In deep waters, the visibility of marine mammals is limited due to a lack of light. This lack of visibility results in marine mammals relying on sound instead of sight for navigation and orientation (Kikuchi, 2010; Madsen, 2006). Other functions of hearing and sound for marine mammals include communication, foraging, and detection of predators (Sun, Huang and Wu, 2012). In areas of coastal Europe, where offshore wind farms are emerging, the harbour porpoise is the most frequently occurring species of cetacean. The harbour porpoise is very acoustically delicate and uses sound to forage for food and to orient itself. The harbour seal, also common in coastal Europe, uses sound primarily for communicating with other seals (Thomsen, et al., 2006).Marine mammals' heavy reliance on hearing and sound put them at risk when anthropogenic noise from offshore wind farms is imparted into their environment (Parsons, et al., 2008). When the noise from the wind turbines is added into a marine environment, it can hinder the marine mammals' social communication and ability to detect sounds from prey and predators (Madsen, et al., 2006).

Potential Impacts from Wind Turbines

An offshore wind farm's life can be divided into four stages that all together last approximately 30 years. The first stage is the pre-construction stage, which lasts 1 to 5 years. The construction stage is next and usually lasts 1 year. Then the operational stage begins, and lasts between 20 and 25 years. Finally, the decommissioning stage takes approximately 1 year (Nedwell and Howell, 2004). The two stages that will potentially affect marine mammals are the construction stage and the operational stage.

During the construction stage of an offshore wind farm, activities such as shipping, pile-driving, and dredging take place (Nedwell and Howell, 2004). All of these activities generate underwater noise that could possibly disturb marine mammals; however, pile-driving is the main concern in the construction phase of an offshore wind turbine (Bailey, et al., 2010). Effects of wind turbine construction on marine mammals include threshold shifts, changes in behavior, and masking of sounds. The effects of pile-driving noise on marine

mammals have been defined in 4 concentric zones around wind farm construction areas (Madsen, et al., 2006). Zone 1 is where the mammal can hardly hear the sounds. Zone 2 is where the mammal can hear the sounds loud enough that it responds to the stimuli, resulting in a change in behavior. Zone 3 is where the mammal's signals of interest are matched with the frequency from the added noise and masking occurs. Zone 4 involves sound volumes great enough to cause injury to marine mammals. These injuries are usually in the form of either a permanent threshold shift (PTS) or a temporary threshold shift (TTS) (Madsen, et al., 2006). Threshold shifts occur when noise exposure decreases an animal's ability to hear sounds under a certain decibel (dB) and the shifts can be permanent (PTS) or temporary (TTS). The noise levels required to onset PTS and TTS have been estimated for cetaceans to be 230 dB re 1 1Pa (peak broadband level) and 224 dB re 1 1Pa for TTS, respectively. Corresponding results for pinnipeds were a noise level of 218 dB re 1 1Pa to cause PTS and a level of 212 dB re 1 1Pa for TTS (Southall, et al., 2007). The risk of PTS and TTS is lessened by the fact that the average noise emitted from pile-driving is 205 dB re 1 1Pa and the onset of PTS and TTS is not estimated to begin until sound has reached 212 dB re 1 1Pa (Sun, Huang and Wu, 2012; Southall, et al., 2007). However, the onset of TTS has been recorded at 160 dB re 1 1Pa in a study discussed later (Nachtigall, Pawloski and Au, 2003; Nachtigall, et al., 2004).

The current design of offshore wind turbines is the same as onshore wind turbines except that the offshore turbines are supported in the water by four steel columns. These four columns are driven into the sea floor via a pile-driver and the sound is radiated omnidirectionally. Vibration can also be used to set the columns into place, but this method is rarely used (Madsen, et al., 2006). A study done in the Moray Firth of Northeast Scotland examined the effects of pile-driving sounds on marine mammals while two 5 MW (megawatt) wind turbines were being installed (Bailey, et al., 2010). This study serves as an example of the duration of time and amount of pile-driving done to install a wind turbine. Approximately two hours were allotted for pile-driving each column, so the total time allotted for both turbines was 16 hours. The 16 hours was split up over five days and a mean of 6,223 blows from the pile-driver were used on each column. The blows were administered once per second with a mean of 0.8 blows per second (Bailey, et al., 2010). This level of construction would have to be multiplied in the case of building a wind farm as opposed to only two wind turbines.

Now that the logistics of pile-driving have been assessed, case studies of the effects of the sound from pile-driving need to be examined. Bailey et al., 2010

examined the effects of pile-driving sounds on bottlenose dolphins (*Tursiops truncatus*), common seals (*Phoca vitulina*), grey seals (*Halichoerus grypus*), harbour porpoises (*Phocoena phocoena*) and minke whales (*Balaenoptera acutorostrata*). All of these marine mammals frequent the area, but the mammal of special importance in this study was the bottlenose dolphin because the area of the pile-driving is home to a protected group of this species (Bailey, et al., 2010). In this study, zone 1 ended 70 km from the pile-driving. Beyond 70 km, the sounds of pile-driving could not be distinguished by the marine mammals. Zone 2 was determined to be between 14 and 50 kilometers (km) from the pile-driving. Avoidance and changes in behavior for pinnipeds were observed within 14 km of the construction. This reaction was observed within 50 km of the construction for cetaceans (Bailey, et al., 2010). Zone 3 was only estimated for bottlenose dolphins. The estimation was that the pile-driving sounds could mask strong communication signals from bottlenose dolphins within 15 km and could mask softer signals within 40 km (Bailey, et al., 2010). Zone 4 was determined to be at 40 meters and less from the pile-driving. For cetaceans, a permanent threshold shift would have occurred 5 meters from the operations and a temporary threshold shift would have occurred 10 meters from the operations. For pinnipeds, a permanent threshold shift would have occurred within 20 meters and a temporary threshold shift would have occurred within 40 meters of the operations (Bailey, et al., 2010). A similar study showed that TTS occurred in bottlenose dolphins that were exposed to construction noises of 160 dB re 1 1Pa for 30 minutes (Nachtigall, Pawloski and Au, 2003). This shows the relationship between the level of sound and the duration. The number of symptoms exhibited by marine mammals is directly proportional to the length of exposure time (Nachtigall, et al., 2004).

Several studies on marine mammals were conducted during the construction of the Nysted wind farm (also called Rødsand I) in Denmark. One of these examined the behavior of seals from the Rødsand Seal Sanctuary. During the construction period of the wind farm, the average number of seals recorded on land at the Rødsand Seal Sanctuary increased 12.5% from 2.79 seals to 3.14 seals (Edrén, et al., 2004). Despite this increase, the data were found to be insignificant and the conclusion was that the construction had little effect, if any at all, on the seals' behavior (Edrén, et al., 2004). Avoidance mechanisms such as going on land have been observed in marine mammals other than seals. North Atlantic right whales (*Eubalaena glacialis*) have been observed avoiding pile-driving noise that ranged between 134 and 148 dB re 1 μPa (Nowacek, Johnson and Tyack, 2004). Changes in the amount of communication between marine mammals have also been recorded. During pile-driving at the Nysted offshore wind farm the median response time for harbour porpoises to respond to each other's clicks rose to 1-8 days, from a response time of 6-23 hours measured prior to construction activity (Tougaard, et al., 2005). This reaction occurred within 10 km of the pile-driving. Several days after pile-driving stopped, normal levels of communication between the porpoises resumed. It is unknown whether the porpoises left the area completely or simply quit communicating during pile-driving. Regardless, the lack of communication during construction indicates that the porpoises were affected and were in zone 2 (Tougaard, et al., 2005). The swimming behavior of harbor porpoises during pile-driving was mainly directional swimming, which is thought to be related with travel, and then changed to non-directional swimming, which is thought to be related with foraging for food, when pile-driving ceased (Tougaard, et al., 2003). This change in behavior took place within 15 km of the pile-driving and shows that the porpoises were in zone 2 (Tougaard, et al., 2003).

Although the sounds from pile-driving pose the greatest threat to marine mammals, there are also risks associated with the operational noises of offshore wind turbines. Pile-driving and construction are loud and disruptive to marine mammals, but that stage of a wind turbine's lifecycle only lasts for one year. Operational noise is not as disruptive, but it can last for more than 20 years (Nedwell and Howell, 2004). The amount of noise made from an operational turbine varies depending on the how the turbine was made (Madsen, et al., 2006). The noise created by offshore wind turbines can be put into two groups: mechanical noise and aerodynamic noise. The mechanical noise is caused by the parts of the wind turbine that move and aerodynamic noise is caused by air passing over and through the turbine's blades (Saidur, et al., 2011). The risks associated with operational noise are masking and behavioral changes; however, masking is not a problem for all marine mammals. Bearded seals (Erignathus barbatus) have the ability to shift the frequency at which they communicate whenever a tonal noise such as the operation of a wind turbine threatens to mask communication. It has not yet been studied, but it is believed that other seals also have this ability (Terhune, 1999). The principles behind the risks of noise from construction and operation are the same; however, the risk is far less during operation because the noise is quieter (Madsen, et al., 2006). One study used simulated noise from a 2 MW wind turbine in an area populated by harbour porpoises. The porpoises displayed behavioral changes, but upon review of the study it was concluded that the best way to study the effects of wind turbine noise is to use actual turbines (Koschinski, et at., 2003).

FUTURE OF RESEARCH ON WIND FARMS AND MARINE MAMMALS

All of the literature reviewed is in agreement that additional research of wind turbine effects on the behavior and hearing thresholds of marine mammals is needed. Changes in behavior have been difficult for scientists to measure since different species and individuals will react differently (Southall, et al., 2007). The main focus of current literature has been marine mammals such as dolphins, seals, and porpoises. Almost no studies have been conducted on the effects of offshore wind turbines on whales. This will become increasingly important in the future when wind farms are being built in deep water (Madsen, et al., 2006). With offshore wind power being relatively new, studies on the long-term effects of the sound of wind turbines on marine mammals will also have to be conducted (Bailey, et al., 2010).

Other than continuing research on the mammals themselves, more research needs to be done on the propagation of sound in underwater environments. Sound transmission has been studied more in deep water than shallow water. Shallow water presents obstacles such as varying sediment, depth, and temperature that make studying it complicated (Bailey, et al., 2010). In order to properly assess an area for a wind farm to be built, measurements and models need to be made specifically for that area. Every potential underwater site will have varying properties and different species that frequent it. These aspects must be taken into consideration before building (Madsen, et al., 2006).

FORMS OF MITIGATION

Although the risks of noise from construction and operation of offshore wind turbines are obvious, how to minimize these risks is still in question. Several forms of mitigation have been investigated to some extent. The forms discussed in literature are soft-start pile-driving, bubble curtains, marine mammal observers (MMOs), and wind turbine design. Soft start pile-driving is a form of mitigation in which pile-driving activity is increased gradually, starting with 5 blows at low power that are separated by several minutes and increasing in power over time. The goal of the soft start technique is to warn the marine mammals that are in hearing range and give them a chance to swim away. Studies have used this technique, but its efficacy is unknown (Bailey, et al., 2010). Bubble curtains are a form of mitigation in which a thick layer of bubbles are made in a circle around the construction. Bubble curtains have the possibility of being able to decrease the size of the impact zones from pile-driving by masking some of the noise (Rodkin and Reyff, 2004). Marine mammal observers are trained divers that prevent the mammals from swimming into zone 4 during pile-driving (Bailey, et al., 2010). The design of future offshore wind

turbines is the last form of mitigation. Changes in the design of the turbine blades paired with the addition of added insulation can reduce the mechanical and aerodynamic noise (Saidur, et al., 2011). The geometry of the turbines in a wind farm can also affect the amount of noise that is radiated (Madsen, et al., 2006). Further research into these and other forms of mitigation will identify the most successful methods of reducing the risks to marine mammals.

DISCUSSION

Since research on the effects of offshore wind turbine noise on marine mammals is still sparse, no absolute conclusions on the effects can be made (Madsen, et al., 2006). Currently, pile-driving seems to be the only legitimate risk associated with noise from wind turbines. Paired with mitigation, the risks of pile-driving to marine mammals' hearing can be minimized. Operational noise does not seem to pose a major threat to marine mammals, but the risks associated with this noise are expected to increase in the future. Offshore wind turbines are expected to get bigger and noisier. More wind farms will be established and a greater number of wind turbines will be built in concentrated areas (Madsen, et al., 2006). Although this will increase the risks, mitigation devices, such as better turbine design and wind farm geometry, can help reduce the risks. The only conclusion that can be made about the relationship between wind turbine noise and marine mammals is that more research needs to be conducted. Research needs to be done on behavioral patterns and hearing thresholds of marine mammals, on the long-term effects of noise on marine mammals, and on the future designs of offshore wind turbines.

After graduating with her bachelor's degree in biology, Elizabeth Wood hopes to work in environmental sustainability and conservation. She is interested in in sustainable energy and wildlife conservation.

REFERENCES

Andersson, M.H., Gullström, M., Asplund, M.E. and Öhman, M.C. (2007). Importance of Using Multiple Sampling Methodologies for Estimating of Fish Community Composition in Offshore Wind Power Construction Areas of the Baltic Sea. *Ambio*. 36: 634-636.

Bailey, H., Senior, B., Simmons, D., Rusin, J., Picken, G. and Thompson, P.M. (2010). Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals. *Marine Pollution Bulletin*. 60: 888-897.

Edrén, S.M.E., Teilmann, J., Dietz, R. and Carstensen, J. (2004). *Effect from the construction of Nysted offshore wind farm on seals in Rødsand seal sanctuary based on remote video monitoring*. Technical report, Energy E2 A/S, National Environmental Research Institute, Roskilde.

Kikuchi, R. (2010). Risk formulation for the sonic effects of offshore wind farms on fish in the EU region. *Marine Pollution Bulletin*. 60: 172-177.

Koschinski, S., Culik, B.M., Henriksen, O.D., Tregenza, N., Ellis, G., Jansen, C. and Kathe, C. (2003). Behavioral reactions of free-ranging porpoises and seals to the noise of a simulated 2 MW windpower generator. *Marine Ecology Progress Series*. 265: 263-273.

Krone, R., Gutowa, L., Joschko, T.J. and Schröder, A. (2013). Epifauna dynamics at an offshore foundation: Implications of future wind power farming in the North Sea. *Marine Environmental Research*. 85: 1-12.

Kunz, T.H., Arnett, E.B., Cooper, B.M., Erickson, W.P., Larkin, R.P., Mabee, T., Morrison, M.L., Strickland, M.D. and Szewczak, J.M. (2007). Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. *The Journal of Wildlife Management*. 71: 2449-2486.

Larsen, J.K. and Clausen P. (2002). Potential Wind Park Impacts on Whooper Swans in Winter: The Risk of Collision. *Waterbirds: The International Journal of Waterbird Biology, Special Publication 1: Proceedings of the Fourth International Swan Symposium 2001*. 25: 327-330.

Madsen, P.T., Wahlberg, M., Tougaard, J., Lucke, K. and Tyack, P. (2006). Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. *Marine Ecology Progress Series*. 309: 279-295.

Nedwell, J. and Howell, D. (2004). A review of offshore windfarm related underwater noise sources. *Cowrie Rep 544 R*. 308: 1-57.

Nachtigall, P.E., Pawloski, J.L. and Au, W.W.L. (2003). Temporary threshold shifts and recovery following noise exposure in the Atlantic bottlenosed dolphin (Tursiops truncatus). *Journal of the Acoustical Society of America*. 113: 3425-3429.

Nachtigall, P.E., Supin, A.Y., Pawloski, J. and Au, W.W.L. (2004). Temporary threshold shifts after noise exposure in the bottlenose dolphin (*Tursiops truncatus*) measured using evoked auditory potentials. *Marine Mammal Science*. 20: 673-687.

Nowacek, D., Johnson, M. and Tyack, P. (2004). North Atlantic right whales (Eubalaena glacialis) ignore ships but respond to alerting stimuli. *Proceedings of the Royal Society: Biological Sciences*. 271: 227-231.

Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A. and Burns, W.C.G. (2008). Navy sonar and cetaceans: Just how much does the gun need to smoke before we act? *Marine Pollution Bulletin*. 56: 1248-1257.

Rodkin, R.B. and Reyff, J.A. (2004). Underwater sound pressures from marine pile-driving. *Journal of the Acoustical Society of America*. 116: 2648.

Saidur, R., Rahim, N.A., Islam, M.R. and Solangi, K.H. (2011). Environmental impact of wind energy. *Renewable and Sustainable Energy Reviews*. 15: 2423-2430.

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr., C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and Tyack, P.L. (2007). Marine mammal noise exposure criteria: initial scientific recommendation. *Aquatic Mammals*. 33: 411-521.

Sun, X., Huang, D. and Wu, G. (2012). The current state of offshore wind energy technology development. *Energy*. 41: 298-312.

Terhune, J.M. (1999). Pitch separation as a possible jamming-avoidance mechanism in underwater calls of bearded seals (*Erignathus barbatus*). *Canadian Journal of Zoology*. **77**: 1025-1034.

Thomsen, F., Lüdemann, K., Kafemann, R. and Piper, W. (2006). Effects of offshore wind farm noise on marine mammals and fish, biola, Hamburg, Germany on behalf of COWRIE Ltd.

Tougaard, J., Carstensen, J., Henriksen, O.D., Skov, H. and Teilmann J. (2003). Short-term effects of the construction of wind turbines on harbour porpoises at Horns Reef. Technical report HME/362-02662, Techwise A/S, Hedeselskabet, Roskilde.

Tougaard, J., Carstensen, J., Teilmann, J. and Bech, N.I. (2005). Effects on the Nysted Offshore wind farm on harbour porpoises. Technical Report, Energi E2 A/S, NERI, Roskilde.

Rachel Farmer, Abigayle McGrew and Dr. Joshua Smith

Identification and Cloning of *THD13* in *Tetrahymena thermophila*, a Holong of the Histone Deacetylase *SIRT2*

Abstract

The human *SIRT2* gene, a member of the Sirtuin family, has various roles in biological processes including, regulation of chromatin structure, transcriptional silencing, DNA repair, and control of cellular life span. The Sirtuin family is said to be linked with disorders such as diabetes, cancer, neurodegenerative diseases, and cardiovascular defects. *SIRT2* also deacetylates histones and is thought to be an inhibitor of cell proliferation. This leads to many implications concerning future medical treatments. The expression of *SIRT2* increases in response to caloric restriction and oxidative stress, as well and could provide further insight into these conditions. In order to further study the functions of *SIRT2*, the gene *THD13*, a homolog of *SIRT2* from *T. thermophila* was isolated, copied, inserted into a plasmid vector, and then finally cryopreserved for later experimentation. Since T. thermophila is a frequently reproducing ciliate, it serves as a useful model organism for studying genes. The goal was to isolate and amplify the gene *THD13* from T. thermophila for further study. Little is known about *THD13*. There is no information published on the gene, nor do we know its importance or function. The project was conducted in our introductory level biomedical science course, and we, as freshman undergraduate students, were given the opportunity to contribute to the field of science and genomics through this experience. First, the genomic DNA (gDNA) of T. thermophila cells was isolated. Then, the gene *THD13* was amplified from both gDNA and coding DNA (cDNA) through polymerase chain reaction (PCR). The PCR results were analyzed by agarose gel electrophoresis. The amplified *THD13* gene was then inserted into an E. coli plasmid vector and cryopreserved to allow for further study of the gene *THD13* in relation to its homolog *SIRT2* in H. sapiens.

Introduction

Age-related diseases, cancer, and metabolic dysfunction are all affected by the over-expression or under-expression of genes key to cellular processes. The *SIRT2* gene encodes for a deacetylase protein which plays a role in gene expression by altering the transcription of DNA. During the G2/M phase, the *SIRT2* protein migrates to the nucleus to deacetylated histones. One effect of this deacetylation may be decreased cell proliferation or increased apoptosis. *SIRT2* is thought to be an inhibitor of cell proliferation due to its low level of expression in tumors of the brain or spine, which have rapidly reproducing cells (Wang et. al 2007). This regulation of gene expression caused by *SIRT2*'s deacetylase function has significant implications for the study of human diseases such as diabetes, cancer, neurodegenerative diseases, and cardiovascular defects (Machado et. al 2012). Although there is not extensive research on the *SIRT2* gene, it is known to be closely related to the SIR2 gene in yeast. The SIR2 gene family is involved in regulation of chromatin structure, transcriptional silencing, DNA repair, and control of cellular life span. Therefore, the human *SIRT2* gene is also thought to be involved in these processes. Additional functions of *SIRT2* are thought to be rather diverse. The *SIRT2* protein is an NAD-dependent deacetylase (NDAC) found mainly in the cytoplasm, and increases dramatically during mitosis (Dryden et. al 2003).

The expression of *SIRT2* also increases in response to caloric restriction and oxidative stress. The *SIRT2* protein responds to oxidative stress by deacetylating the transcription factor FOXO3a which plays a role in both reducing cellular reactive oxygen species (ROS) and increasing cell death. In the event of caloric restriction, the expression of *SIRT2* is elevated in adipose tissue, which has a role in secreting hormones and cytokines used in cellular homeostasis and immune response (Wang et. al 2007). Other scientists suggest that *SIRT2* may induce autophagy in the context of cancer. It is hypothesized that the same may be true for cells involved in neurodegeneration (Donmez et. al 2013). *SIRT2* may also have a role in the regulation of adipose tissue functionality because it alters adipocyte differentiation by deacetylating FOXO1. This suggests that *SIRT2* could effectively improve metabolic dysfunctions in those with increased fat mass by altering the functionality of adipose tissue. This could aid in the prevention of obesity and weight related conditions. There is further study indicating that *SIRT2* could also regulate blood glucose levels (aiding in the battle against diabetes or pre-diabetes conditions involving irregular blood sugar levels) by deacetylating an imperative enzyme in gluconeogenesis (Machado et. al 2012).

With all of these promising applications, it is clear why research involving *SIRT2* is important. Through research and lab work in a BMS 110 Honors course, several steps were taken in order to clone and preserve a homolog of this gene, found in T. thermophila. The first step was to identify a T. thermophila homolog of *SIRT2* using bioinformatics tools. The gene identified as a homolog in this lab was *THD13*. The next step was using polymerase chain reaction (PCR) to duplicate *THD13* to give us more of the targeted gene. Next, the results of PCR were analyzed through agarose gel electrophoresis to confirm that a resulting product from the polymerase chain reaction was in fact obtained. The DNA was then purified, inserted into an E. coli plasmid vector, and cryopreserved, enabling it to be used for further research in relation to the *SIRT2* gene.

Methods/Procedures: (Reference "Smith 2013" for full protocols)

1. Isolation and Quantification of T. thermophila Genomic DNA
The genomic DNA of T. thermophila cells was isolated by a process of several steps. 1.4 mL of T. thermophila cells were centrifuged for 1 minute at 10,000 rpms in order to collect the cells at the bottom of a microcentrifuge tube. The supernatant was immediately removed after centrifuging, and 700 μL of urea lysis buffer was added to break open the T. thermophila cells and release the DNA. The tube was inverted repeatedly (for no longer than 5 minutes) until the mixture became somewhat viscous. Then, 600 μL phenol:chloroform:iso-amyl alcohol was added for the process of phenol-extraction. The tube was centrifuged for 5 minutes at maximum speed in order to separate the lysate from the rest of the mixture. After centrifuging the mixture into two distinct layers, the lysate was extracted and the addition of phenol:chloroform:isoamyl, centrifuging, and extraction of lysate was repeated. Then, 150 μL of 5M NaCl was added to the extracted lysate in order to remove carbohydrates from the mixture and approximately 700 μL of isopropyl alcohol was added to precipitate the DNA. This mixture incubated at room temperature for 10 minutes and was then centrifuged for 10 minutes at maximum speed. The supernatant was decanted from the mixture after centrifuging, and 500 μL of 70% ethanol was added to get rid of residual phenol and salts. The mixture was centrifuged for three minutes at maximum speed, and the supernatant and ethanol were removed, allowing the resulting pellet of precipitate to dry. Once the pellet was dry, 50 μL of Tris-EDTA buffer was added and the pellet was resuspended. Then 1 μL of RNase A (10 mg/ml stock) was added, and the sample was incubated for 15 minutes at 37°C. The purity and concentration of the sample were calculated using a NanoDrop 2000. The machine was blanked with 2 μL of the TE buffer used to make the dilutions. Then, 2 μL of the gDNA sample were measured by gathering readings at wavelengths of 260nm and 280nm. The ratio of absorbance (A260/A280) provided an estimated purity of the DNA and the concentration was given also. The quantified samples were then stored on ice.

2. Bioinformatics
Next, bioinformatics procedures were used to find a gene in the T. thermophila genome that was a homolog of the *SIRT2* gene in H. sapiens. The amino acid sequence for *SIRT2* was determined using the NCBI database, http://www.ncbi.nlm.nih.gov/. The sequence was then entered into the BLAST tool on the Tetrahymena Genome Database, http://www.ciliate.org/, in order to find the top homologs for *SIRT2*. Out of the top 5 homologs with the best e-values, the first gene was already named, and the second gene was not really a gene. Therefore, the match with the third highest E-value was the most valid option, which was TTHERM #00672190 (This gene will now be referred to as *THD13*). The Tetrahymena Genome Database was also used to find the functional motifs and domains, RNA-seq data, amino acid sequence, expression profile, genomic sequence, and coding sequence of *THD13*. Next, *THD13* and *SIRT2* were compared by entering the protein sequences for both genes in the BLAST tool on the NCBI database. Both protein sequences were also entered into ExPASy:prosite, http://prosite.expasy.org/, to compare the functional motifs and domains of the two genes. With this information about the gene *THD13*, specific primers designed for our purposes were ordered through Integrated DNA Technologies Company for use in PCR.

3. Polymerase Chain Reaction
The process of PCR (Polymerase Chain Reaction) was used to amplify *THD13* through the act of replication. First, the lyophilized primers from the Integrated DNA Technologies Company were centrifuged in order to collect the plasmid vectors at the bottom of the tube. Then, the primers were rehydrated by adding sterile ddH2O up to 200 μL in both the *THD13*-TF (forward primer: CACCCTCGAGGAAGAAGTGAATTTGAGTTACAAA) and*THD13*-TR (reverseprimer: AGAGCCTAGGTCACACATCCAAATCTTCGAATT) tubes and centrifuging them briefly. A working stock of 20 pmol/μL for each primer was made by adding 180 μL of water to each already diluted mixture. The PCR master mix was then created using 30 μL of Betaine (5M), 30 μL of GC Buffer (5X), 3.0 μg of gDNA (1.0 μg/μL), 3.0 mM dNTP's (10mM), 1.5 μL of both TF and TR primers (20 μM), 1.5 μL of Phusion Polymerase(2 U/μL), and 79.5 μL of sterile distilled water. This mix was pipetted into three different tubes. The same PCR mix was made again, only this time 3.0 μg of Wild Type cDNA (1.0 μg/μL) was substituted in place of the 3.0 μg of gDNA. This mix was also separated into 3 spearate tubes. All six tubes (3 gDNA, 3 cDNA) were then placed in a thermocycler at different temperatures. Three optimum temperatures for the PCR reactions were determined based on calculations of the base pairs of DNA within the primers. Two tubes (1 gDNA tube and 1 cDNA tube) were placed at each temperature- 52° C, 54.3° C, and 58° C- in the thermocycler. During the cycle, the tubes were first heated to 98° C for 1 minute in order to denature the DNA and split the strands apart. They were repeatedly heated to the calculated annealing temperatures for 25 seconds and then heated at 72° C for 90 seconds to allow for elongation. This cycle was repeated 34 times. The temperature then remained at 72° C for 10 minutes and dropped to 4°C to store the samples.

4. Agarose Gel Electrophoresis

The results of PCR were visualized using agarose gel electrophoresis. A 1% agarose gel was created through several steps. First, 0.75 g of agarose was microwaved with 75 mL of TAE (1X) until the agarose dissolved. Once the mixture cooled slightly, 0.75 μL of ethidium bromide (10 mg/mL) was added to bind to the double stranded DNA and allow visualization under UV light. A comb was placed in the casting tray that would create 14 wells that were each 1.5 mm. The gel mixture was poured into the tray and left to set for about 30 minutes in order to solidify. Then the gel was turned, putting the wells on the negatively charged side of the tray so that the PCR samples could run towards the positively charged side. Next, the chamber was filled with TAE (1X) until it just covered the gel and the comb was removed. Each PCR sample was prepared by mixing 1 μL of 10X sample dye (containing bromophenol blue and xylene cyanol) with 10 μL of PCR sample on parafilm. Each of the 6 samples mixed with dye were then pipetted into the wells on the agarose gel (See **Figure 1** for specific lane pattern). 20 μL of the 1 kB ladder was added to lane 7, and 20 μL of the BP ladder was added to lane 8 in order to have a marker for how many base pairs each sample showed on the gel run. The power supply on the electrophoresis chamber was set on 120 volts (constant) for 42 minutes and was then turned up to 150 volts (constant) for an additional 7 minutes. The first picture was taken under the UV light at this time. The samples were then run for another 30 minutes, and a second picture was taken under the UV light. This was performed a second time, repeating the entire PCR and gel electrophoresis steps, this time using a combination of several types of cDNA while keeping the gDNA mixture the same. This process allowed us to analyze the results of the PCR reactions, and after viewing the results, the cDNA sample indicated in **Figure 1 B** was chosen to continue with.
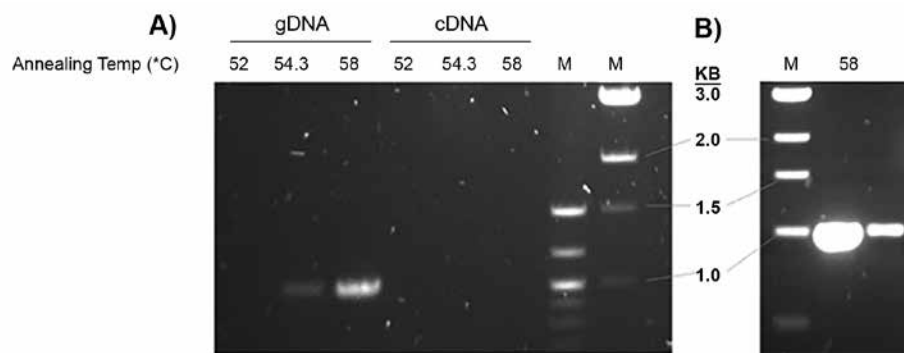

Figure 1: Agarose Gel Electrophoresis

5. TOPO Cloning PCR Product and E. Coli Transformation

The cDNA sample from the second run of PCR was used for the next step, TOPO cloning and E. coli transformation. Cloning reactions were made using the following components: 1.5 μL of PCR product (cDNA mentioned above), 1 μL of salt solution, and 2.5 μL of sterile H2O. The cloning reaction components were mixed together, then left to incubate at room temperature (22-23°C) for 30 minutes. Next, 2 μL of the TOPO cloning reaction were added to a vial of chemically competent E. coli that had been manipulated for plasmid injection. The mixture of TOPO and E. coli was left to incubate on ice for 25 minutes. The mixture was then heat shocked for 30 seconds at 42°C in a water bath and immediately put back on ice for 1-2 minutes. 250 μL of room temperature SOC medium was then added to the mixture. The tube of TOPO cloning reaction, E. coli, and SOC medium was placed horizontally in a shaking incubator at 200 rpm and 37°C for 40 minutes, allowing the cells to undergo 2 rounds of replication (once every 20 minutes). After the last incubation, the mixture was spread onto two pre-warmed LB plates containing 50 μg/mL of kanamycin. In order to verify that the only cells that reproduced were the ones with *THD13*, the plasmids used contained a gene for kanamycin resistance. Therefore, only the cells with this kanamycin resistance gene would survive if they were surrounded by kanamycin. One plate received 200 μL of the E. coli mixture, and the other plate received the remaining portion of the E. coli mixture which was about 50 μL. The mixture was spread onto the plates using sterile glass beads, and the plates were then allowed to incubate overnight at 37°C. The next morning there were 8 colonies on the plate treated with 50 μL of kanamycin and 28 colonies on the plate treated with 200 μL of kanamycin (see **Figure 2)**.

Amount of E.Coli Solution Added to Plate	Number of Colonies Formed (CFUs)
50 μL	8
200 μL	28

Figure 2 Results from TOPO cloning and E.coli Transformation of *THD13*

6. Construction of Plasmid Map and Restriction Enzyme Digest Design

The next step was to create a map of our plasmid so that restriction enzyme digests could be designed and the cloning of *THD13* into the plasmid vector could be verified. In order to construct a specific plasmid map for the created product, the Gene Construction Kit 3.0 was used. The gene sequence of the PCR product, including the beginning primer sequence, was inserted into the program. Assuming the *THD13* gene was correctly inserted into the E. coli, the

image produced by the program accurately displayed the created plasmid with certain regions of interest. Next, the sites of restriction enzymes were added in order to design a restriction enzyme digest that would allow us to determine whether or not the target gene was inserted and that it was inserted with the correct orientation. This plasmid map with restriction enzyme markers can be seen in **Figure 3**. A mock gel of the restriction enzyme digests Xho/AvrII and EcoRI/EcoRV was also created and the predicted band sizes can be seen in **Figure 4**.

Figure 3: Plasmid Map of E.coli with inserted _THD13_ Gene

This figure shows regions of interest on the plasmid including:
1) The origin of replication (upper left)
2) Kanamycin resistance gene (lower left)
3) Inserted _THD13_ gene (lower right)
4) Restriction enzyme sites found throughout the plasmid

Digest: Band Range	Band Size (bp)
Xhol-Avrll (XA)	2590, 1014
EcoRV-EcoRI (EE)	2561, 912 (131)*

Figure 4: Band Size Predictions for Gel Run of Xhol/Avrll and EcoRi/EcoRV Restriction Enzyme Digests
*Band sizes lower than 500 bp cannot be seen on gel images in figure 7.

7. Plasmid Purification and Restriction Enzyme Digest

After designing the restriction enzyme digest, the plasmids needed to be purified in order to actually run the digest. The plasmids were isolated by inoculating six 2mL cultures of LB liquid media (in tubes with 50 μg/μL of Kanamycin) with six of the transformant colonies obtained from the TOPO cloning process in step 5. A 1 LB-Kanamycin plate was also swabbed with the 6 colonies used to inoculate the cultures of LB liquid with Kanamycin. This was done by picking up each individual colony on a sterilized 6- inch wooden stick, swabbing the colony onto the LB-Kanamycin plate, and then swishing the rest of the colony into the liquid LB media. The LB tubes with plasmid colonies were then taken to a shaking incubator set at 37°C. The LB-Kanamycin plate was taken for storage until a later date. The next day, 1.5 mL of each of the liquid plasmid cultures was transferred by pouring the liquid into individual microcentrifuge tubes. These tubes were centrifuged for 2 minutes on maximum speed, and the supernatant was then discarded. Next, 350 μL of sucrose lysis buffer was added and the pellet left at the bottom of the microcentrifuge tube was thoroughly resuspended. Then, 25 μL of lysozyme solution (10 mg/mL in TE) was added in order to break down the cell walls and allow the sucrose to go in and bring water in to burst the cells and release their DNA. The tubes were incubated for 5 minutes at room temperature in order to allow time for the DNA to be exposed. The tubes were then heated at 99°C for exactly one minute in a boiling water bath in order to kill the lysozyme and separate the proteins/gDNA into single strands. The tubes were moved to the centrifuge again and centrifuged for 15 minutes at maximum speed so as to gather the denatured proteins, cell wall and gDNA into a pellet that was removed in order to isolate the plasmids. Left with just supernatant, the DNA was precipitated by adding 40 μL of 3M NaOAc and 220 μL of isopropanol which brought the DNA out of solution by making it less soluble. The tubes were incubated at room temperature for another 5 minutes and centrifuged for 10 minutes at maximum speed. The supernatant was removed from the tubes, and the pellets were loosened from the sides of the tubes by a process of washing with 1000 μL of 70% ethanol. The tubes were centrifuged at maximum speed for 2 minutes, and the supernatant was discarded. The pellets were resuspended in 50 μL of Tris-EDTA (TE) buffer and allowed to sit at room temperature for 3 minutes before being mixed with a pipet. Using the now purified plasmids, restriction enzyme digests were prepared that would allow us to verify the accuracy of the cloned plasmids. Two digest cocktails were made, and each was divided into three different tubes to create three different cultures for both of the restriction enzyme digest combinations determined in step 6 (6 digests total- one for each of the 6 purified plasmid cultures). In the first digest cocktail, 14 μL of 10X Buffer 4, 3.5 μL of XhoI, 3.5 μL of AvrII, 1.4 μL of 100X BSA, and 96.6 μL of water were all mixed together. This cocktail was divided into three tubes, placing 17 μL of the cocktail and 3 μL of purified plasmid culture into each tube. The next cocktail was made using 14 μL of 10X Buffer 4, 3.5 μL of EcoRV-HF, 3.5 μL of EcoRI, and 98 μL of water. This cocktail was also split into 3 different tubes using 17 μL of cocktail in each along with 3 μL of a different purified plasmid culture. These 6 tubes of restriction enzyme digest solution were incubated at 37°C for at least 1 hour, and a gel was later run to visualize the results. (See step 4 for complete procedure on gel electrophoresis)

8. Cryopreservation of E. coli Plasmid containing Plasmid with THD13

Finally, the plasmids were stored for later research through the process of cryopreservation. First, the cells of cultures that had positive results on the gel electrophoresis in step 7 were grown in LB liquid media. This was done by inoculating a 2 mL culture of liquid LB media (in tubes with 50 µg/µL of Kanamycin) with the positive culture (sample #6) using a 6 inch wooden stick to pick up the cultures off of the plate that was swabbed in step 7 and swirling the culture into the tube of liquid media. After inoculation, the tubes were incubated at 37°C in a shaking incubator. The next day, the culture was checked to see if it had grown enough to make the tube cloudy, and proceeded to obtain a 2 mL cryopreservation tube containing 700 µL of 50% Glycerol. 700 µL of bacterial cells were added to the cryopreservation tube containing glycerol, tightened the cap and mixed by inversion so as to prepare the cells for freezing by replacing some of their water content with glycerol which will prevent ice crystals from puncturing the cell walls when they freeze. Finally, the tube was labeled and placed in powdered dry ice or liquid nitrogen until frozen solid. The tubes were transferred to the -80°C freezer for storage for up to 10-15 years.

RESULTS

The first step in this lab was to isolate the gDNA of T. thermophila. The quantified results of two tubes of DNA were obtained using a NanoDrop 2000 (**Figure 5**). It was determined that tube A was the only tube that had a concentration of 1.7 or higher (the minimum concentration value suggested

Nano Drop Results for Isolate DNA Tube A	
A260	40.214
A280	13.148
A260/A280 (purity)	2.22
Measured Concentration	2.0107 µg/µL

Nano Drop Results for Isolate DNA Tube B	
A260	9.796
A280	4.345
A260/A280 (purity)	2.25
Measured Concentration	0.4898 µg/µL

Figure 5

for this experiment). Next, a homolog for the gene *SIRT2* was found using bioinformatics. This is where the study of *THD13* comes in. After ruling out the first two matches for T. thermophila homologs, further research was begun on *THD13* because of its e-value. Though *THD13* was predicted as a large gene to begin with, (around 5943 bp) the RNA-sequence data suggested that only a small portion of this sequence was expressed well. The first portion of the RNA sequence was deciphered to be the only portion expressed well enough to be its own gene, making the gene prediction only 1011 bp (**Figure 6**, see page 90). This also altered the amino acid sequence of the gene, so the new amino acid sequence of *THD13* is provided in **Figure 7**.

After this, *SIRT2* and *THD13* were compared using several different computational tools. The functional motifs and domains were compared using ExPASy prosite graphics, and the two genes were both found to have deacetylase domains and proton accepting active sites (**Figure 8**). Knowing that *THD13* was the best match as a homolog for *SIRT2*, both forward and reverse primers were designed based on the predicted gene sequence seen in **Figure 9**. These primers were used to initiate annealing of base pairs on the duplicated DNA strands during the process of PCR. The results of this process were visualized through agarose gel electrophoresis (**Figure 1**). For the first round of PCR, only two bands showed up on the gel- the gDNA at 54.3°C and 58°C. The 58° band seemed to be expressed most clearly, indicating that this was the optimum annealing temperature. A second run of PCR was performed on both gDNA and cDNA at 58°C. The sample of cDNA from this round of PCR was used in the next step-TOPO cloning and E. coli transformation.

After incubating two kanamycin treated plates overnight with the E. coli plasmid solution, the data shown in **Figure 2** was collected, showing that 8 colonies grew on the plate with 50 µL of E. coli solution, and 28 colonies grew on the plate with 200 µL. Next, a new LB-Kanamycin plate was swabbed with 6 colonies from the 200 µL plate and the same 6 colonies were also inoculated in liquid LB media. After designing a plasmid map (**Figure 3**) to show areas of interest and restriction enzyme sites, 2 restriction enzyme digests were designed to determine whether or not the *THD13* gene was inserted and oriented in the correct direction. A mock gel was also created alongside the plasmid map, showing predicted band sizes for each of the digests (**Figure 4**). A gel electrophoresis was run on the 6 colonies after restriction enzymes XhoI/AvrII (XA) and EcoRI and EcoRV-HF (EE) were individually added to samples of each colony. The gels were examined for patterns that matched the predicted band sizes determined on the Gene Construction Kit 3.0 (**Figure 4**). All lanes showed bands within the 2500 range, and lane EE6 and XA6 each showed bands around 1000 as well (**Figure 10**). Sample #6 was then preserved through cryopreservation.
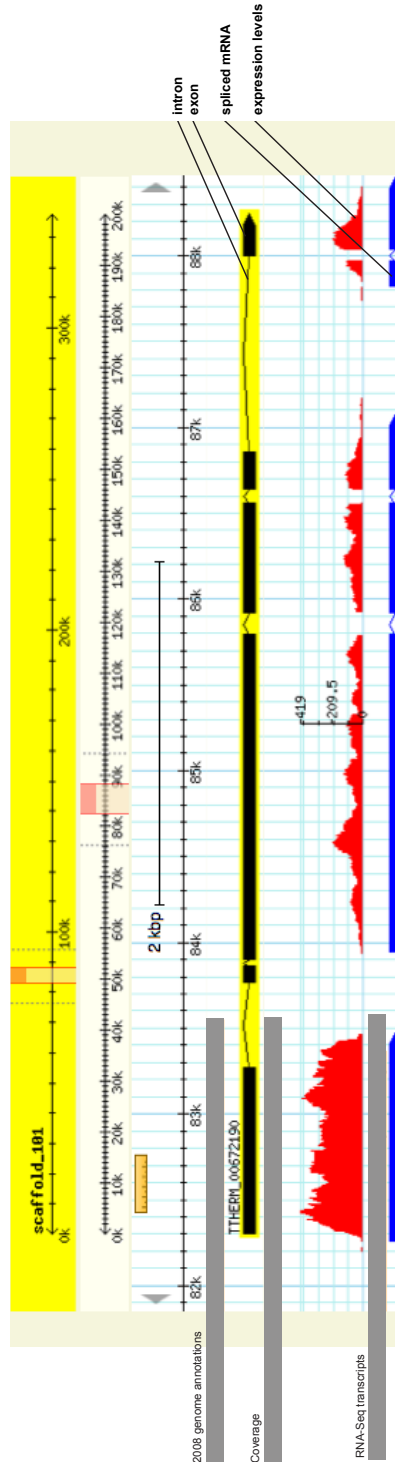
Figure 6: RNA sequence data:

The BLAST tool on the Tetrahymena Genome Database, (tfgdp.ihib.ac.cn) was used together with this data. **A)** shows the *THD13* gene running 3'–5'. The exons and introns of the *THD13* gene are displayed by the **2008 genome annotations.** The **RNA-Seq transcripts** represent the spliced mRNA from exons. The Coverage section shows the expression levels of these exons. **B)** displays the isolated portion of the RNA sequence that will be used for the gene *THD13*.
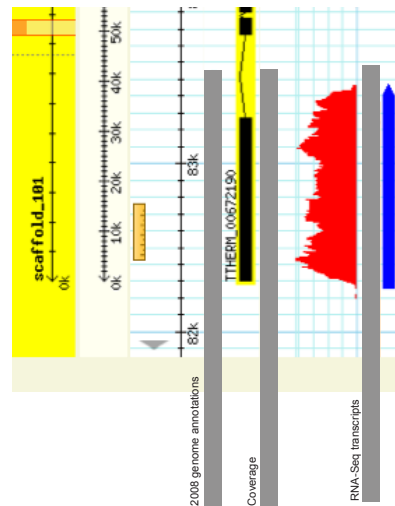
MEEVNLSYKEVVEKIKNKQINNILFLTGAGISTSSGIPDFRSPNG
LYSKVQKYKLEYPEQIFEIKYFTKNQMPFYEMDKEFFSNKPHFT
SAHYFMAEVNRREQLLFVFSQNVDGLELEAGLPPEKLCQVHG
NYRGARCQKCGFKHDINKYKEFVQKQVIYKCENCKRGPVRPN
VVFFGESLDKGFTKNTYKIAAADCVFIMGTSMQVAPFNLTVEK
ISKNVPVIVINRDMVYLPYKKYIHLKNDIDDNIEKLMTDLGWD
FPKIERNYPSNWFTDPQKQEETKIEETEHENFSYSSGYYNNNIT
HLQDNQEDKEATEKNEDQEELNNLEKKFEDLDV*

Figure 7: New Amino Acid Sequence
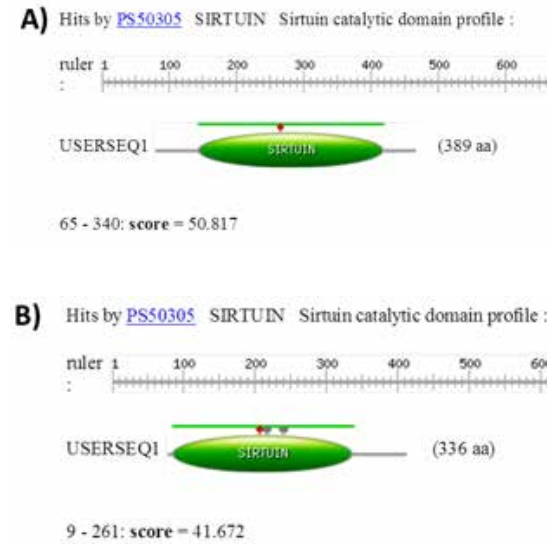
Figure 8: Prosite Illustrations of Functional Motifs/Domains of SIRT2 and THD13

These two images were obtained through ExPASY: Prosite (http//prosite.expasy.org/) to compare the functions and domains of *THD13* and *SIRT2*. **A)** predicted features for *SIRT2*: it has a deacetylase domain and has an active site at 187 for accepting protons. **B)** *THD13* has a deacetylase domain and has a proton accepting site at 130, along with binding sites for zinc at 138, 141, 162, and 165.

Figure 9: Genomic DNA Sequence of *THD13*

THD13 is a 1011 bp sequence containing one exon and no introns. Lowercase sequence is not in RNA-seq data and is exclusive to the intron sequence (misprediction). The cDNA size for *THD13* is 1011 bp. The first hilighted region (*THD13*-TF) refers to the forward primer and the lower highlighted region (*THD13*-TR) refers to the reverse primer.
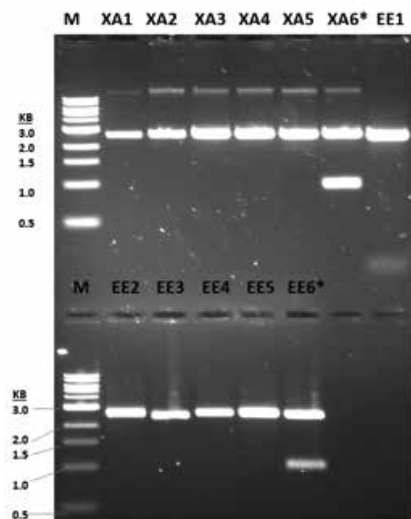
Figure 10: 1% Agarose Gel Electrophoresis of Restriction Enzyme Digests Xhol/Avrll and EcoRI/EcoRV-HF

This image shows the results of a gel run for two different restriction enzyme digests on six different cell cutures containing the plasmids illustrated in **Figure 6**. The "XA" stands for the Xhol/AvrII restriction enzymes used to determine whether the *THD13* gene was inserted in the correct direction. The numbers represent the culture number used in each digest (1–6). The "**M**" stands for the KB ladder used to mark the number of base pairs on the gel. All lanes show bands at around the 2500bp mark, and **XA6** also shows a band slightly above 1000 bp. **EE6** shows an additional band around 1000 as well. The "**XA6***" and "**EE6***" indicate digest samples used later in the lab.

Discussion/Conclusions

The process of DNA isolation went fairly well. Although there was a pipetting error and too much Tris-EDTA Buffer was added, the concentration and purity of at least one of the tubes was acceptable for the next step in the experiment because the concentration of the DNA had to be diluted to 1 μg/μL.

The bioinformatics section of this lab is very useful information to refer to, as it provides many facts and characteristics about *THD13* and its relation to the homolog *SIRT2*. Through this research, the functions and domains of *THD13* and *SIRT2* were matched up through PROSITEcomparisons, and the e-value of *THD13* was determined to be low enough to call it a homolog. The predicted gene sequence and RNA-seq data were also determined, which helped in finding the real expression of *THD13* gene and designing the primers used in PCR.

After PCR, the process of agarose gel electrophoresis was used to visualize the results of PCR and see the size of *THD13* in terms of base pairs. Though the first PCR run did not give clear of results, it still provided fairly accurate results with no primer dimers, which indicatedthat only the targeted gene was amplified. The cDNA sample from the second PCR was ultimately chosen because it was closest to the predicted number of bp for *THD13* (1011 bp) and had the clearest and most accurate expression in relation to the predicted gene sequence obtained through bioinformatics. This may have been due to the fact that the different types of cDNA were mixed for this round of PCR, whereas only used Wild type cDNA was used for the first PCR mix.

After mixing this sample of cDNA into a TOPO cloning reaction and introducing it to chemically competent E. coli, positive feedback was obtained from the growth on gel plates treated with kanamycin. Although a couple of the incubation times were changed from the original protocol, the results still turned out well and allowed us to proceed to the next step of the experiment. With 8 colonies formed on the 50 μL plate of E. coli and 28 colonies formed on the 200 μL plate of E. coli, there was reason to believe that the genes were cloned successfully. The ratio of solution to number of colonies formed indicates fairly consistent results. These results were confirmed when the cultures were run through restriction enzyme digests. Though not all of the 6 culture samples tested were positive, there was one sample with the appropriate band size in the gel visualization. This indicates that some of the plasmids in the TOPO cloning kit may not have been constructed properly, or there may have been a mistake in another aspect of the cloning process. There were some issues with getting all of the 1 μL of salt solution into TOPO cloning reaction, so this may have affected the efficiency of the reaction. There also may have been deficiencies in the TOPO plasmid kits that were used in the experiment. However, this did not prevent positive results overall. Fortunately, one of the positive cloned colonies on the original plate was chosen to be inoculated and purified. By looking at the gel run of the two restriction enzyme digests, one can see that the bands in the XhoI/AvrII digest are right around 2500 and 1000 bp, which is what was predicted for the band size. This shows that the plasmid was inserted with the correct orientation. The second digest-EcoRI/EcoRV also verifies the gene's proper insertion with band sizes right around 2500 and slightly below 1000. Though the third band that was predicted in the mock gel for the EcoRI/EcoRV digest cannot be seen, it can still be assumed that this sample of cells had a properly inserted gene and successfully cloned plasmids. After all, the third band was very small and may have simply run off the gel or can't be seen because of the picture resolution. After purifying the sample, the project was finished by adding the cell culture to glycerol in order to preserve it from being damaged by ice crystals and froze the culture in dry ice. The frozen E .coli plasmids with the *THD13* gene inserted are now in a -80°C freezer where they can remain for up to 10-15 years before metabolic processes break them down to the point of no longer being useable for scientific research.

If another scientist wished to extend this research by studying the *THD13* gene and its relation to the *SIRT2* gene in humans, it would be simple to continue this project. The preserved *THD13* genes can be used to further study the effects of deacetylases on metabolism, chromatin structure, transcriptional silencing, DNA repair, and control of cellular life span. All of these characteristics could be used to make improvements on knowledge about disorders such as diabetes, cancer, neurodegenerative diseases, and cardiovascular defects. Clearly, the study of this gene is very promising in providing new information on various prevalent diseases and disorders.

Though there were a few mishaps throughout the lab, none of them were significant enough to inhibit the ultimate goal of cloning and preserving the *THD13* gene for further research. When we first began the introduction level BMS 110 Honors course, we did not have much experience, but we learned a lot about different processes commonly used in labs such as PCR and agarose gel electrophoresis. We also learned how to use bioinformatics tools which can provide such a vast amount of information about genes, proteins, and other molecules studied in biology. The techniques used in this project were not unique, but the originality lies in the gene being studied. *THD13* is not a gene that has been studied or written about in the literature, but this project prepares for the future studying of *THD13*, leading to advanced learning of *SIRT2* in H. sapiens. We learned the importance of *THD13* as a homolog of the *SIRT2* gene in humans. Experiments with *THD13* can help scientists to study cardiovascular disease, adipose tissue, cancer tissues, deacetylase functions, metabolism, oxidative stress and other processes related to the *SIRT2* gene. As Dietetics and Cell and Molecular Biology majors, we also found it interesting to be able to study a gene whose expression is affected by caloric restriction and has involvement with possible adipose tissue reduction. Learning all of these applications for our gene really made it worthwhile to study.

We would especially like to acknowledge Dr. Joshua Smith and graduate assistant Lynn Andreas for all of their time and guidance. This project truly would not have been possible without the contribution of their knowledge and assistance in lab set up, execution, and data analysis. We could not have done it without them. As freshman, we had limited background knowledge in a lab setting, but a lot was learned throughout the course of this project. Overall, we are very grateful to have been exposed to so many new topics and procedures during this research, and have grown a lot in the ability to comprehend DNA and some of the processes used to study it.

Abigayle McGrew is a cell and molecular biology major and chemistry minor planning to pursue a master's degree in physician assistant studies. She loves Missouri State, the opportunities it supplies in the field of science, and especially her favorite organization, Dance Marathon. Abigayle thoroughly enjoyed the lab work done in Dr. Smith's lab and is grateful for the opportunity to share it with others.

Rachel Farmer is a nursing major and is looking forward to the many opportunities Missouri State offers in healthcare experience through the nursing program. Her dream job is to work at Children's Mercy Hospital in Overland Park. She feels as though BMS 110 was a challenging, yet worthwhile, milestone in developing her career goals and is grateful to Dr. Smith for all of his help on this project.

Joshua Smith, Ph.D., is currently an Associate Professor at Missouri State, where he teaches Principles of Pharmacology, Recombinant DNA Techniques, and Introduction to the Biomedical Sciences. He received his B.S. in agriculture, majoring in biotechnology, biology, and animal sciences from the University of Wisconsin-River Falls. He then went on to obtain his Ph.D. in pharmacology from the University of Minnesota. Dr. Smith's research focuses on the mechanisms that cells use to efficiently repair their DNA after damage to prevent mutations and carcinogenesis.

References

1. Donmez, Gizem, and Tiago F. Outeiro. "SIRT1 and *SIRT2*: Emerging Targets in Neurodegeneration." EMBO Molecular Medicine (2013), 5(3): 344-352. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3598076/

2. Dryden, Sylvia C., Fatimah A. Nahhas, James E. Nowak, Anton-Scott Goustin, and Michael A. Tansky. "Role for Human *SIRT2* NAD-Dependent Deacetylase Activity in Control of Mitotic Exit in the Cell Cycle." Molecular and Cellular Biology (2003) 23:3173-3185. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC153197/#!po=1.21951

3. Machado De Oliveira, Rita, Jana Sarkander, Aleksey G. Kazantsev, and Tiago F. Outeiro. " *SIRT2* as a Therapeutic Target for Age-Related Disorders." Frontiers in Pharmacology (2012), 3:82. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3342661/

4. Smith, JJ. (2013). BMS 110 Section 999, Introduction to the Biomedical Sciences: Missouri State University, Springfield MO. Laboratory Procedures

5. Wang, Fei, Margaret Nguyen, F. Xiao-Feng Qin, and Qiang Tong. "*SIRT2* Deacetylates FOXO3a in Response to Oxidative Stress and Caloric Restriction." Aging Cell (2007), 6(4): 505-514. http://onlinelibrary.wiley.com/doi/10.1111/j.1474-9726.2007.00304.x/full