

INTIMATIONS



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A Journal of Exploratory Research and Analysis

The research articles published here reflect Capstone Research efforts sponsored by the University Honors Program in 2012-13. The projects discussed here were conceived from personal academic interests and mentored by faculty who are familiar with the research and scholarship driving these efforts of discovery.

While the stirrings of personal interest are a crucial element in the cultivation of sound research practices, they should not be confused with intimations of sound research. Intimations of sound research emerge only from a special growth in perspective, and the goal of good mentoring is to awaken these intimations and override the restrictive limits of personal interests and their attendant beliefs. We thank our faculty mentors, well over a hundred thus far, who have worked with our Capstone students over the past twelve years to frame and conduct compelling research projects.

In the process of acquiring new perspective in life, we often need to cultivate new attunements, attitudes and convictions. But we also need to see how these orientations sensitize or desensitize us to the blind spots in our understanding. Are there not issues, concerns, opportunities and challenges relevant to our lives that we can only appreciate *from somewhere else*? As we grow more experienced in life, we are fortunate to

discover new points of entry for exploring our surrounding world, but often only by closing off, eclipsing or transforming *other* points of entry to which we have grown accustomed.

To see the world in a new light, to enrich our access to the world, requires attentive listening to intimations of the unexpected. Our capacity to engage issues and concerns otherwise masked from view often demands a special openness and attention to experiences we find strange and challenging. We seldom see the world in a new light without first having the curiosity and willingness to explore surprising, unexpected, easily marginalized phenomena -- nor without learning to discern otherwise hidden facets of our filtered social and personal constructions.

We trust this collection of articles will stir your interest in some timely topics. The goal of these writings is to increase awareness of what is actually at stake, integrate this into the formation of compelling research questions, present findings based on analysis of criticism and exploratory questions, and suggest how these findings might influence more positive developments. These articles reflect efforts to raise *curiosity* to the level of *sound research* with respect to topics and issues we hope will spark interest in the minds of our readers.



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* * * * *

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* * * * *

Seniors in the Honors Program are encouraged to tackle complex problems using methods, insights and knowledge drawn from relevant disciplines. Honors Program faculty and capstone research mentors offer critical feedback and guidance along the way. The main objective is for students to explore, gather, and analyze information effectively, and to share their reflections on the implications of what they have discovered. Group discussions help to promote thoughtful questioning and critical analysis. The primary goal is to communicate knowledge, judgments, and original perspective cultivated on the basis of careful inquiry, exploration and analysis.

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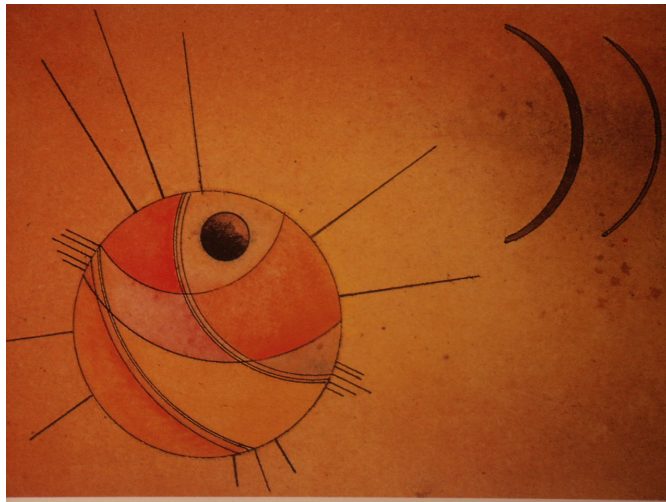
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HONORS PROGRAM COMMUNITY STATEMENT

The Honors Program at CSU Stanislaus is a community of scholars bound together by vital principles of academic openness, integrity, and respect. Through focused study and practice involving exploration and discovery across a variety of disciplines, the Honors Program upholds these principles of scholarly engagement and provides students with the necessary foundations for further research and inquiry.



Our interdisciplinary curriculum is integral to this work, and is intended to facilitate creative understanding of the irreducible complexities of contemporary life and knowledge. Personal and intellectual honesty and curiosity are essential to this process. So, too, is critical openness to difficult topics and respect for different perspectives, values and disciplines. The Honors Program aims to uphold these virtues in practice, in principle, and in community with one another.

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The Birth of a Revolutionary: The Rise of Ché Guevara

Derrick M. Saenz-Payne

Global relationships have become deeply embedded in the advancement of the human species. International relations have helped spread technology into areas far beyond the lands in which they were developed. In the process, societies developed new complexities and these new connections nourished an environment promoting outward expansion. Trade increased wealth and growing ideologies united various people under shared beliefs. As these global relationships created the conditions needed for advancement, they have also paved the way for imperial conquests. Although time has progressed, the globalized world of today still carries the traits of the past. As the world becomes more intertwined and the global market expands, the question that must be asked is: How will society approach the international relationships of the future?

This study reveals how international relations surrounding the Cold War transformed a young physician named Ernesto Guevara de la Serna into a global revolutionary. Guevara was born into a middle-class Argentine family but abandoned his comfortable lifestyle to fight oppression.



Many studies that have been done on Guevara have concentrated on his life as a devout communist, guerrilla soldier, or revolutionary leader. This study offers a unique perspective by focusing on what drove Guevara as a young adult to abandon his life in Argentina to become a revolutionary. The transformation Guevara experienced was driven by what he witnessed during his journey across Latin America. At age twenty-three, Guevara left Buenos Aires, Argentina, as a medical student determined to help society through medicine; but within three years, at age twenty-six, Ché Guevara emerged after witnessing Cold War imperialism crush the progress that Latin America yearned for.



What Guevara witnessed while exploring Latin America came as a result of decades of United States imperialist policies, toppled with the start of a new era in U.S. foreign policy enacted at the start of the Cold War. While conducting research on Guevara's journey, it became clear that there was a pattern of U.S. involvement in Latin America which played a direct role in not only Guevara's transformation, but also in shaping Latin American society as a whole. The link between U.S. foreign policy in Latin America

and the societal conditions Guevara witnessed during his explorations required this study to be structured in two connected components. In the first component, there is an examination of U.S. foreign policy in Latin America leading up to Guevara's journey, illustrating the U.S. role in creating the conditions Guevara encountered during his exploration. In the second component, there is an analysis of Guevara's journey as he personally encountered the outcome of U.S. foreign policy in Latin America. Both of these linked components combined resulted in the rise of Ché Guevara.

Four of the most influential events in defining Latin American political and economic development during the first-half of the twentieth century occurred in the U.S. The U.S. developed several foreign policies directed towards Latin America. Three critical U.S. policies towards Latin America were: the Roosevelt Corollary, developed by President Theodore Roosevelt in conjunction with his famous Big Stick Diplomacy; Dollar Diplomacy, declared by President William Taft; and the Good Neighbor Policy, announced by President Franklin D. Roosevelt. The fourth event that helped shape Latin American development was the National Security Act of 1947. It was under this act that the Central Intelligence Agency was established. In the five decades leading up to the Cold War and Guevara's journey, Latin America was deeply influenced by U.S. foreign policy.

The Roosevelt Corollary to the Monroe Doctrine was announced in 1904. The Roosevelt Corollary positioned the U.S. to become the leading nation within the Western Hemisphere while providing the framework for U.S. foreign policy in Latin America. This declaration occurred at a time when the U.S. political agenda favored imperialist expansion. In 1900, Senator Albert Beveridge addressed Congress praising imperialist expansion while also re-igniting the notion of

Manifest Destiny and Anglo-Saxon racial superiority. Senator Beveridge exclaimed, "We will not renounce our part in the mission of our race, trustee, under God. We will move forward to our work, not howling out regrets like slaves."¹ Four years later, the Roosevelt Corollary set an influential precedent by considering U.S. intervention in Latin America an obligation. President Roosevelt announced, "Chronic wrong-doing... ultimately requires intervention by some civilized nation, and in the Western Hemisphere the adherence of the United States to the Monroe Doctrine may force the United States to the exercise of an international police power."² The concept of the U.S. being the international police power within the Western Hemisphere strongly influenced U.S. and Latin American relations on the decades that followed.

President William Taft developed a new U.S. foreign policy towards Latin America known as Dollar Diplomacy. This approach moved away from conventional military interventions and redirected its efforts to gain economic control in Latin America through economic imperialism. The U.S. purchased Latin American debt owed to Europe, and in the process gained control of the Latin American economy. The purchased debt was used as leverage to control of Latin American exports, including seizing customs houses. Francis Mairs Huntington Wilson was Assistant Secretary of State under President Taft and designed Dollar Diplomacy. Wilson claimed this policy would "substitute dollars for bullets."³ When describing Dollar

¹ Peter H. Smith, *Talons of the Eagle: Latin America*, York: Oxford University Press, 2008), 88.

² Theodore Roosevelt, "The Roosevelt Corollary to the Monroe Doctrine (1904)," *Major Problems in the Gilded Age and the Progressive Era: Documents and Essays*, Edited by: Leon Fink, (Boston, MA: Houghton Mifflin, 2001), 272-273.

³ F.M. Huntington Wilson, "The Relation of Government to Foreign Investment (1916)," *Latin America and the United States: A Documentary*

Diplomacy in regards to Latin American development, Wilson argued, “Neighboring countries comprise an environment. The strongest will dominate that environment.”⁴ Although Latin America provided the vital resources needed to fuel U.S. economic growth, with Dollar Diplomacy, the progress of those developing countries was of no importance.

In 1933, President Franklin D. Roosevelt took office and announced his Good Neighbor Policy. President Roosevelt denounced the international police power concept and attempted to reengineer Latin American relations to promote mutual development. President Roosevelt declared, “Never before has the significance of the words ‘good neighbor’ been so manifest in international relations. Never have the need and benefit of neighborly cooperation in every form of human activity been so evident as they are today.”⁵ With President Roosevelt’s call for “neighborly cooperation in every form of human activity,” foreign policy towards Latin America seemed to be progressing. Unfortunately, while the Good Neighbor Policy called for more cooperation, U.S. dependency on vital resources from Latin America allowed oppressive dictators to gain power as long as they cooperated with U.S. interests.⁶

History, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 111-113.

⁴ F.M. Huntington Wilson, “The Relation of Government to Foreign Investment (1916),” *Latin America and the United States: A Documentary History*, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 111-113.

⁵ Franklin D. Roosevelt, “The Good Neighbor Policy declaration in Washington D.C. (1933),” *Latin America and the United States: A Documentary History*, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 133-134.

⁶ Carleton Beals, “A Skeptic Views the Good Neighbor Policy (1938),” *Latin America and the United States: A Documentary History*, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 147-149.

In the decades leading up to the Cold War, international relations between the U.S. and Latin America evolved in stages based on presidential preference. The Roosevelt Corollary positioned the U.S. to be the international police power, gaining the political power to interfere in Latin American affairs. As economic ties with Latin America became more influential in determining U.S. economic growth, Dollar Diplomacy promoted U.S. interests at the expense of Latin American development. The Good Neighbor Policy attempted to create international relations based on cooperation, but further prevented Latin American development by collaborating with oppressive totalitarian regimes. Ultimately, each of these policies played a key role in the societal development of Latin America. As the Second World War came to an end, the Cold War was about to begin a new chapter in international relations between the U.S. and Latin America.

Once the Cold War began, the U.S. reclaimed its international police power in order to control the Western Hemisphere. The National Security Act of 1947 created new ways for the U.S. to intervene in Latin American affairs. Within the National Security Act, the Central Intelligence Agency (CIA) was created. Under Sec.102 (d)(5) of the National Security Act, the newly created CIA was granted the power to engage in covert actions abroad in the name of protecting U.S. interests. Sec.102(d)(5) states that the National Security Council can order CIA operations “to perform such other functions and duties related to intelligence affecting the national security as the National Security Council may from time to time direct.”⁷ As the Cold War began to dominate global discourse, the founding of the CIA marked the beginning of a new era in U.S.

⁷ “National Security Act of 1947,” *Latin America and the United States: A Documentary History*, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 178.

foreign policy. It was under the guidance and authority of the CIA that paramilitary operations abroad came to directly influence Guevara's transformation.

The U.S. role as lead nation within the Western Hemisphere strengthened the U.S. sphere of influence. After decades of influential international relations between the U.S. and Latin America, Guevara entered the world in a position to witness the outcomes of long-lived imperialist policies. Guevara was born on June 14, 1928. While Guevara's parents were from the generation living under the U.S. international police power gained with the Roosevelt Corollary, followed by Dollar Diplomacy's move towards economic imperialism, Guevara himself experienced the slight taste of progress under the Good Neighbor Policy leading up to the Second World War. Unfortunately, Guevara also experienced the reversal back towards imperial interventions at the start of the Cold War as covert CIA operations began in Latin America.



Although many people lived in poverty throughout Latin America, Guevara grew up fairly comfortable in a middle-class Argentine family. His father, Ernesto Guevara Lynch, was a businessman who held a variety of professions. His mother, Celia de la Serna, was a free-thinking woman who challenged the social norms surrounding the Argentine middle-class.⁸ Guevara grew up watching his mother open their kitchen to children living in the neighborhood. Celia would portion the

⁸ Jon Lee Anderson, *Che Guevara: A Revolutionary Life*, (New York: Grove Press, 1997), 20.

food distributed amongst her family to make sure that the children from the neighborhood could also eat.⁹ As an adult Guevara carried many of his mother's personal characteristics, including her rebellious nature and compassion for others. As Guevara became a teenager his father introduced him to world affairs. During the Spanish Civil War (1936-1939), Guevara followed the conflict closely with his father. Young Guevara even created his own military map where he placed flags illustrating frontline positions. When the Second World War began in 1939, Guevara and his father joined a local organization, supporting the Allies, which monitored the German immigrant population for Nazi subversion.¹⁰



When Guevara approached adulthood, he began to advance as a student and read heavily. He made plans to go to college and study engineering, but later changed his focus to medicine after witnessing the death of his grandmother.¹¹ When asked why he chose medicine Guevara said, "I dreamed of becoming a famous investigator... to find something that could be definitively placed at the disposition of humanity."¹² At a young

⁹ Ibid, 39.

¹⁰ Ibid, 23-24.

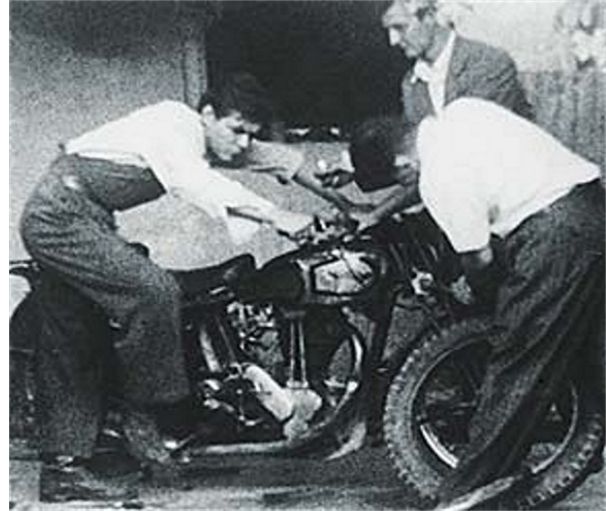
¹¹ Ibid, 41.

¹² Jon Lee Anderson, *Che Guevara: A Revolutionary Life*, (New York: Grove Press, 1997), 42.

age, Guevara wanted to use medicine as a vehicle to help humanity. During his years in college, Guevara was not political and did not subscribe to any ideology. He began to read social philosophers, including Karl Marx, but admitted that he did not understand the complexity of Marxism during this time.¹³ At one point in college Guevara attended a Federación Juvenil Comunista (Communist Youth) meeting, but once the meeting began, Guevara walked out.¹⁴

Guevara's passion was in medicine not politics, but he also began to feel a strong passion to explore. Guevara and his friend Alberto Granado developed a plan to travel across Latin America. As Granado and Guevara discussed the details of their journey, Latin American leaders called for a new economic system that would promote Latin American development. In 1950, the United Nations Economic Commission for Latin America (ECLA) put forth the case that U.S. policies in Latin America over the last five decades created an unbalanced relationship benefiting only the U.S. Leading the debate was Raúl Prebisch, the Executive Secretary of the ECLA. Prebisch argued that Latin America produced "the raw materials for the international economy" but were marginalized into the "peripheries" of the global trade system.¹⁵ While the system should have provided the developing countries that produce raw materials with technological and industrial imports, Latin America was not receiving the imports it needed to develop. Prebisch declared, "This disequilibrium destroys the very premise underlying the very nature of the International Division of Labour Agreement."¹⁶ While Latin American leaders attempted to expose

the unbalanced system shaping Latin America, Granado and Guevara were preparing to witness these conditions for themselves.



In January 1952, at the age of twenty-three, Granado and Guevara left Buenos Aires, Argentina, to explore Latin America. The journey that lay ahead was nothing short of epic. Their mode of transportation was Granado's Norton 500 motorcycle, and their travel plan was based on one key principal: improvisation.¹⁷ It was not long into their journey that Guevara realized that he was embarking on a journey across two different worlds. As Granado and Guevara approached Chile on their way out of Argentina, they began to witness societal conditions deteriorate. When they reached Junin de los Andes, near the Chilean border, they encountered a town Guevara described as "unable to break the monotony of its stagnant life."¹⁸ Despite attempts to invigorate the town, the lack of local employment made increasing the standard of living impossible.

¹³ Ibid, 37.

¹⁴ Ibid, 50-51.

¹⁵ Raúl Prebisch, "A New Economic Model for Latin America (1950)," *Latin America and the United States: A Documentary History*, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 189-191.

¹⁶ Ibid, 189-191.

¹⁷ Ernesto Guevara, Journal entry dated: "October 17, 1951," *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 33.

¹⁸ Ernesto Guevara, Journal entry titled: "Circular Exploration," *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 47-48.



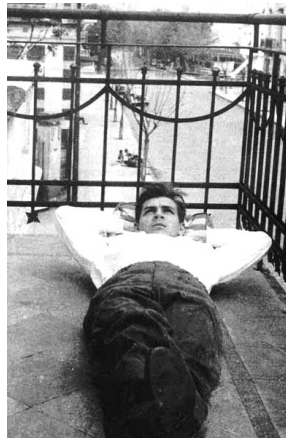
At this time, Guevara did not display any contempt or hostility towards foreign companies in the region. On the contrary, he defended the foreign-owned operations in Junin de los Andes. Guevara wrote in his journal, “The day it was ‘discovered’ as a tourist haven the town’s climate and transport difficulties were solved and its subsistence secured.”¹⁹ Although Guevara does sarcastically label the area “discovered,” in a way that insinuates one cannot discover a place already inhabited, he does credit foreign investments for supplying better transit routes and sustenance for the local population.

When Granado and Guevara entered Valparaiso, Chile, on March 7, 1952, Guevara had an encounter that had a profound impact on his conscience. While exploring the city, Guevara was approached by a local man who asked Guevara to visit the man’s sick mother. Once Guevara made it to the woman’s bedside, he was moved by what he witnessed. The room was filled with “the acrid smell of concentrated sweat and dirty feet mixed with dust.”²⁰ Such conditions only amplified her

¹⁹ Ernesto Guevara, Journal entry titled: “San Martin de los Andes,” *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 45.

²⁰ Ernesto Guevara, Journal entry titled: “La Gioconda’s Smile,” *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 70.

severe asthma and worsening heart condition. After conducting a medical examination, Guevara advised her on a healthier diet and gave her the remaining Dramamine tablets that he used for his asthma.²¹ This encounter marked a significant point in Guevara’s journey. For the first time, Guevara wrote extensively in his journal about the societal impact resulting from the impoverished condition surrounding his travels. Guevara wrote, “It is at times like this, when a doctor is conscious of his complete powerlessness, that he longs for change.” He further wrote, “Individuals from poor families who can’t pay their way become surrounded by an atmosphere of barely disguised acrimony; they stop being father, mother, sister or brother and become a purely negative factor in the struggle for life.” In concluding his entry, Guevara noted how the poor are subsequently viewed by the community as a “personal insult to those who have to support them.”²² It was becoming clear to him that the harsh conditions he was encountering in Latin America permeated every underlying layer within society.



²¹ Ibid, 70.

²² Ibid, 70.



Following his encounter in Valparaiso, Granado and Guevara set out to visit one of the world's largest copper mines in Chuquicamata, Chile. The mine was owned by the Anaconda Mining Company, an international mining company owned by U.S. investors. While Granado and Guevara waited for permission from the company to visit the mine, they met a young Chilean couple looking for work in the mines. While sitting around a candle in the cold Chilean desert, the couple began discussing their lives as Chilean miners. During the conversation the couple mentioned that they could only seek employment in the most dangerous mines: the sulfur mines. When Guevara asked why they could only work in the sulfur mines, the couple replied that it was because they were communists.²³

In Guevara's mind, that couple, poor and socially exiled for their political beliefs, represented the oppressed around the world. After his encounter with the Chilean mining couple, Guevara wrote, "The couple, numb with cold, huddling against each other in the desert night, were a living representation of the proletariat in any part of the world."²⁴ As

²³ The Law for the Defense of Democracy was passed in Chile in 1948. This made it illegal to be a communist in Chile.

²⁴ Ernesto Guevara, Journal entry titled: "This Time, Disaster," *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 78.

a result of this encounter, Guevara began to challenge his view of humanity. In his journal Guevara wrote, "It was one of the coldest times in my life, but also one which made me feel a little more brotherly towards this strange, for me at least, human species."²⁵ While Guevara contemplated the legal persecution and repression of the mining couple, he wrote, "It's a great pity they repress people like this," who they label "communist vermin" because they are viewed as the threat to "decent life." Guevara continues by writing that they were people who adhered to "a theory they do not understand." They related to the "strange doctrine" of communism when they read "bread for the poor." In concluding his journal entry, Guevara wrote that all they yearned for was a "natural longing for something better."²⁶

The couple had such a profound impact on Guevara that he gave them the only money he had. Early in the trip, Guevara stopped to visit his girlfriend Chichina before leaving Argentina. Before Guevara departed she gave him fifteen American dollars to buy her a bathing suit if they made it to Florida. Although Chichina broke off their relationship soon after giving Guevara the money, removing the responsibility for him to save it, Guevara gave the money to the couple instead of spending it on himself. The fact that Guevara gave the couple all the money he had, while he and Granado struggled to eat, shows how powerful that encounter was. The acts of compassion Guevara witnessed from his mother as a child were now being relived in Guevara himself as he encountered the impoverished Latin American commoners.

Guevara could not understand how an industry as large as the copper industry could be surrounded by such impoverished conditions. Guevara explained in his journal that "Chile produces 20 percent of the world's

²⁵ Ibid, 78.

²⁶ Ibid, 79.

copper,” and because it was a time of “potential conflict,” the need for copper increased dramatically in order to produce “weapons of destruction.”²⁷ Guevara continued his analysis of the copper industry by describing the political conflict emerging between those who want to nationalize the mines and those who want them to stay in foreign hands. Even after the experience Guevara had with the Chilean mining couple, he still did not choose a side in the political conflict. Instead, Guevara further shows his view as a growing humanitarian. Guevara wrote, “Whatever the outcome of the battle, one would do well not to forget the lesson taught by the graveyards of the mines, containing only a small share of the immense number of people devoured.”²⁸

During his journey, Guevara began to feel compassion for the people he encountered. In his journal Guevara wrote, “These people who watched us walk through the streets... are a defeated race. Their stares are tame, almost fearful, and completely indifferent to the outside world.”²⁹ He began to feel a sense of unity amongst people who shared a common ancestral history, but lived as if they were a “defeated” race. On his twenty-fourth birthday, Guevara was volunteering at the San Pablo leprosy colony in Peru. The hospital staff hosted a birthday celebration and Guevara was asked to give a celebratory speech. In his journal Guevara wrote a narration of his emotional speech:

Although our insignificance means we can't be spokespeople for such a noble cause, we believe, and after this journey more firmly than ever, that the division of [Latin

²⁷ Ernesto Guevara, Journal entry titled: “Chuquicamata,” *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 80.

²⁸ Ibid, 81.

²⁹ Ernesto Guevara, Journal entry titled: “Tarata, The New World,” *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 93.

America into unstable and illusory nations is completely fictional. We constitute a single mestizo race, which from Mexico to the Magellan Straits bears notable ethnographical similarities.³⁰

After leaving Peru, Granado and Guevara spent a short time in Colombia and Venezuela. In Venezuela, Granado and Guevara separated ways. Guevara flew into Florida, only to catch another flight back to Argentina where he planned on finishing his medical degree and continue back on his journey.

The anguish surrounding the “unstable” nations throughout Latin America that Guevara described in his birthday speech was overtly present during his journey. In order to illustrate the societal conditions in Latin America while Guevara explored the area, it is useful to provide additional evidence beyond the personal testimony of Guevara. The United Nations Statistical Yearbook provides additional statistical evidence to further validate the conditions surrounding Latin America during Guevara’s journey. In 1952, the U.S. infant mortality rate (per 1,000) was 28.5. Every country reported in South America had over triple the U.S. infant mortality rate. Chile reported a rate of 133.6, four and half times that of the U.S., while Colombia and Venezuela reported 110.7 and 79.4 respectively.³¹ The unbalanced system that Raúl Prebisch attempted to expose in 1950 was continuing to stall Latin American development.

Guevara returned to Argentina to finish his medical degree with a new perspective on life. After returning to Argentina in August 1952, Guevara finished his graduate exams and wrote his doctoral thesis in remarkable time. Within six months, Guevara passed

³⁰ Ernesto Guevara, Journal entry titled: “Saint Guevara’s Day,” *The Motorcycle Diaries: Notes on a Latin American Journey*, (Melbourne: Ocean Press, 2004), 149.

³¹ United Nations Statistical Yearbook, (New York: 1953), 43-45.

thirteen graduate exams and wrote his doctoral thesis to receive his medical degree.³² After receiving his degree, Guevara packed his luggage to continue his journey. His plans were to travel Bolivia, Peru, Ecuador, and then finally to Venezuela to reunite with Granado. But along the way his plans changed.

Once Guevara left Argentina, he headed to Bolivia to witness the growing agrarian revolution. Several enormous land reforms made Bolivia the second country in Latin America, behind Mexico, to initiate large-scale land reform.³³ After arriving in La Paz, Bolivia, Guevara met a man named Ricardo Rojo. During their time in La Paz, Rojo introduced Guevara to several men from Guatemala also there to witness the revolution. After witnessing the events unfold in Bolivia, Guevara decided to travel to Guatemala instead of continuing towards Venezuela to meet Granado. Guatemala was also in a historic position during this time, and Guevara wanted to be there to witness it.



Guatemalan President Jorge Ubico

³² Ernesto Guevara Lynch, *Young Che: Memories of Che Guevara by His Father*, (New York: Vintage, 2008), 181.

³³ *Ibid*, 183.

After years of oppression under the brutal regime of Guatemalan President Jorge Ubico, the people of Guatemala revolted. In 1944, protests, strikes, and a large dissent movement pushed Ubico out of power and the rebel military granted the Guatemalan people their country's first free election. A university professor named Juan José Arévalo was elected President of Guatemala. In 1947, Arévalo passed labor codes in an attempt to increase revenue. For the first time in Guatemalan history, a governmental system was working within democratic lines in order to improve the economic and societal future of Guatemala. In 1950, Colonel Jacobo Árbenz Guzman was elected president in Guatemala's first democratic transition of power. Unfortunately, the proliferation of the Cold War promoted U.S. imperialist policy, which would soon shatter the small slice of progress the people of Latin America had desired for decades.



President Jacobo Árbenz Guzman

In 1952, Árbenz enacted agrarian land reform, which expropriated unused land from large plantations with the agreement to pay for the land under the prices calculated by the most current tax records. The United Fruit Company, a lucrative U.S. company, owned huge amounts of land in Guatemala. Of that land only fifteen percent was used while eight-five percent went unused. In 1953,

when Guatemala offered United Fruit \$627,572 in compensation based on the tax value claimed the previous year, the U.S. State Department claimed that the property was worth over \$15.5 million.³⁴ United Fruit severely undervalued the value of the land in order to pay Guatemala less taxes. It was this excitement surrounding the huge agrarian land reform that led Guevara to Guatemala.

Guevara arrived in Guatemala in December of 1953. With Guevara in Guatemala City, the CIA, under the authorization of President Dwight D. Eisenhower, initiated the main offensive in Operation PBSUCCESS in June of 1954. Operation PBSUCCESS was an intensive paramilitary and psychological campaign to remove President Árbenz, Guatemala's democratically elected president. According to the U.S. Department of State, the operation had two specific objectives:

1. To remove covertly, and without bloodshed if possible, the menace of the present Communist-controlled government of Guatemala;
2. To install and sustain, covertly, a pro-US government in Guatemala.³⁵

The operation consisted of several stages, including implementation of "aggressive sabotage" followed by "para-military force enters target country, proclaims authority, declares target regime null and void."³⁶ With Cold War tension justifying covert action against the growing "Communist-controlled

government" in Guatemala, the U.S. Government stripped Guatemala's democratic progress in a Latin American region where such progress was extremely rare.

The communist threat in Guatemala was propagated in order to maintain U.S. economic interests. In assessing the actual communist threat in Guatemala, testimony from Guatemalan and U.S. officials created two opposing arguments. Luis Cardoza y Aragón served in several ambassadorial posts under Árbenz. Aragón argued that the Guatemalan Labor Party (PGT), which the U.S. claimed was infiltrated by Soviet-driven communists, in reality, contained no communists.³⁷ In his report, Aragón summarized the events in Guatemala by stating, "The U.S. squashed a little butterfly that wished to fly a little more freely within the capitalist system, and to emerge from a barbaric, inhuman situation to better living conditions for its people, of all classes."³⁸

On the other side of the debate, John C. Dreier argued that the communist threat was very real and becoming a growing concern. Dreier was the U.S. representative to the Organization of American States (OAS), and claimed that the U.S. had proof that there was a Soviet-lead communist conspiracy within the Guatemalan government. When asked for details regarding the evidence used to anchor these claims, Dreier stated that the U.S. would reveal the evidence at "the right time."³⁹ If any such evidence existed at that time, it was not presented.

³⁴ Peter H. Smith, *Talons of the Eagle: Latin America, the United States, and the World*, (New York: Oxford University Press, 2008), 149.

³⁵ U.S. Department of State, "Foreign Relations of the United States (1953)," *Secret History: The CIA's Classified Account of Its Operations in Guatemala, 1952-1954*, (Stanford, CA: Stanford University Press, 2006), 152.

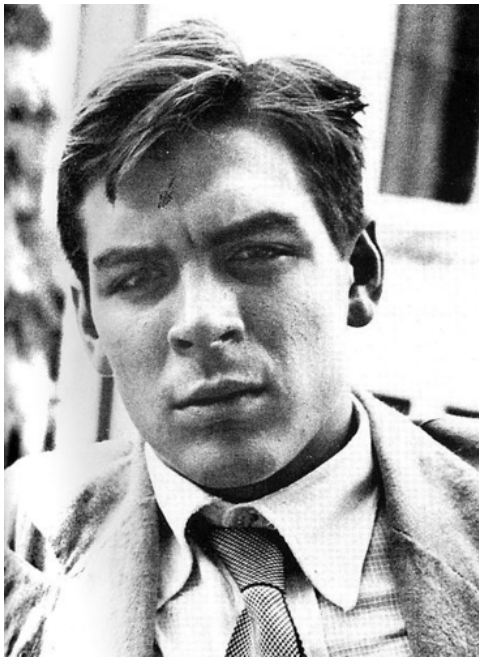
³⁶ U.S. Department of State, "Foreign Relations of the United States (1953)," *Secret History: The CIA's Classified Account of Its Operations in Guatemala, 1952-1954*, (Stanford, CA: Stanford University Press, 2006), 154.

³⁷ Luis Cardoza y Aragón, "Terminating a Revolution in Guatemala – A View from Guatemala," *Latin America and the United States: A Documentary History*, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 195-196.

³⁸ Ibid, 195-196.

³⁹ John C. Dreier, "Terminating a Revolution in Guatemala – A View from Washington," *Latin America and the United States: A Documentary History*, Edited by: Eric Zolov [eds.], (New York: Oxford University Press, 2011), 192.

While each of these arguments build a case favoring each respected side, more recent research uncovered evidence supporting the Guatemalan claims that there was no communist threat. Historian Nick Cullather was hired by the CIA in 1992 to analyze Operation PBSUCCESS documents in an effort to have them declassified. During the process, new evidence revealed that in 1946 (one year prior to the CIA being created) FBI operatives investigated Guatemalan leaders suspected of conspiring with Soviet-influenced communists, but found “little of interest.” CIA operatives took over the investigation in 1947, but also concluded that “Guatemala remained a low priority.”⁴⁰ Although this information shines new light on justifications used to authorize covert actions against Guatemala, the majority of Operation PBSUCCESS documents remain in classified status nearly sixty years later.



Ernesto Guevara de la Serna

⁴⁰ Nick Cullather, *Secret History: The CIA's Classified Account of Its Operations in Guatemala, 1952-1954*, (Stanford, CA: Stanford University Press, 2006), 14-15.

Witnessing this event from the streets in which the fighting occurred caused all the feelings and emotions built in Guevara over the previous two years to fully transform him into a revolutionary. In January 1954, five months before the CIA invasion began, Guevara wrote a letter addressed to his entire family. In this letter, Guevara praised Guatemala as the most democratic nation in Latin America. Ernesto wrote, “The way I see things, in the whole of America, ‘and I know about these things’, there is no country as democratic as this one (Guatemala).”⁴¹ Guatemala was a place Guevara truly enjoyed. In a letter to his Aunt Beatriz, Guevara wrote that he hoped to find stable employment in Guatemala in order “to stay for two years.”⁴² The fact that Guevara was searching for a way to stay in Guatemala instead of continuing his travels is further proof that Guevara had high hopes for Guatemala.

Once the CIA invasion occurred, Guevara’s hopes for Guatemala and Latin America were shattered. On the last day of the CIA lead invasion, on June 20, 1954, Guevara wrote his mother and expressed the discontent that cause his transformation into a revolutionary. Guevara wrote, “various military installations of the country were bombed... two days ago an aircraft bombed the lower neighborhood... killing a two-year-old girl.” Guevara continued by stating, “The danger is not... the number of troops... nor in the aircraft that do nothing but bomb the houses of civilians and machine-gun some of them; the danger is how the gringos (read here the Americans) manage their puppets at

⁴¹ Ernesto Guevara, “Letter addressed to whole family (dated: January 15, 1954),” *Young Che: Memories of Che Guevara by His Father*, (New York: Vintage, 2008), 229-230.

⁴² Ernesto Guevara, “Letter to his Aunt Beatriz (dated: February 12, 1954),” *Young Che: Memories of Che Guevara by His Father*, (New York: Vintage, 2008), 229-230.

the United Nations.”⁴³ In this letter, Guevara also discusses the reversal in U.S. foreign policy resulting from Cold War political polarization. Guevara wrote that the “Americans have totally dropped the good-guy mask that Roosevelt had given them,” and now “are committing an outrage” by these “shamefaced attacks.”⁴⁴ This statement proves that Guevara was fully conscience of the reverse in U.S. foreign policy towards Latin America as the Cold War began dominating global discourse. In closing his letter to his mother, Guevara informed her that he “registered with the urgent medical-assistance service” and “joined the youth brigades to receive military instruction.”⁴⁵

After Operation PBSUCCESS overthrew Guatemala’s democratically elected president, Ché Guevara rededicated his life to changing the world through revolution. The twenty-three year old medical student who hoped to help society through medicine no longer existed. Instead, the man who emerged took up arms and set out to fight for those who had no voice. Although Ché Guevara went on to participate in controversial conflicts at a time in history when the Cold War polarized world affairs, the events leading to his transformation provide valuable lessons for future international relations.

The Roosevelt Corollary gave the U.S. enormous power within the Western Hemisphere, and during the Cold War that power was increased after the National Security Act of 1947 added the ability to engage in covert actions without national or international accountability. Dollar Diplomacy linked U.S. economic interests, both private and public, to national security. The Good Neighbor Policy attempted to turn the U.S. away from engaging in military

interventions in Latin America, but the policy continued to promote economic relationships that favored U.S. financial interests at the expense of human suffering. The U.S. foreign policy exercised during the first-half of the twentieth century still influence the globalized world long after the death of Ché Guevara.



After Ché Guevara was killed in 1967, international relationships continued to create new dilemmas. The Vietnam War flared into the 1970s, while relations in the Middle-East intensified following the overthrow of the Shah of Iran. In the 1980s, the U.S. intervention in Nicaragua led to increased turmoil in Central America. The Persian Gulf War in the early 1990s marked another U.S. intervention abroad. The U.S. war in Afghanistan and the U.S. war in Iraq, starting in 2001 and 2003 respectively, carried the U.S. into war well past the first decade of the twenty-first century.



⁴³ Ernesto Guevara, “Letter to his mother (dated: June 20, 1954),” *Young Che: Memories of Che Guevara by His Father*, (New York: Vintage, 2008), 229-230.

⁴⁴ *Ibid*, 229-230.

⁴⁵ *Ibid*, 229-230.

The most recent full-scale U.S. conflict, the U.S. invasion of Iraq in 2003, contains the most striking characteristics resembling Cold War imperialism. In the early 1950s, the U.S. allowed Cold War fears to justify the CIA invasion of Guatemala under unproven assumptions that the Guatemalan government had been infiltrated by Soviet-influenced communists. As a result of the CIA invasion, Ché Guevara redirected his life to become a revolutionary. Ché Guevara went on to fight in many several bloody battles, but he also went on to address the United Nations (UN), showing civility as a guerrilla leader.



Ché Guevara Addressing the UN

Nearly fifty years later, in 2003, the U.S. allowed the threat of terrorism to justify the invasion of Iraq under false information claiming Iraqi dictator Saddam Hussein had weapons of mass destruction. The results of the 2003 invasion of Iraq are still unraveling today, but one can already see that the nature of these outcomes incorporate brutal reactions. The days of a revolutionary leader like Ché Guevara addressing the UN are over. That civility has now been replaced with improvised explosive devices (IEDs) and suicide bombers.

Although the Cold War ended decades ago, the fear that fueled Cold War policies has shifted from the fear of communism to the fear of terrorism. It is true that acts of terror pose a real threat in today's world, but it is important that the lessons of the past do not go overlooked. Critical evaluations of history

improve our prospects for making wiser decisions by examining the outcomes of past actions. International relations continue to evolve, and every relationship carries its own consequences. Many of these reactions often go unseen to most of society. Unless one travels abroad, well out of their daily life, the poverty and despair surrounding much of the world gets overlooked. As Raúl Prebisch stated, it is these countries that become socially marginalized in the "peripheries" of world affairs. Guevara set out to explore Latin America, and in the process was able to witness the harsh reality of unbalanced international relations. After witnessing such conditions, Guevara began to yearn for social justice. Unfortunately, as Guevara began to witness progress, he also witnessed the power of imperialism shatter the hopes of millions in Latin America. The result, Ché Guevara emerged and set out to spread revolution across the world to fight imperial oppression.

It is important for everyone to take responsibility and to be held accountable for their actions as individuals. But when international relationships create the world in which these individuals live, those parties who determine the societal conditions are also responsible. The actions taken by the revolutionary rebels during the American Revolution were ultimately the responsibility of those men and women as individuals reacting to the conditions pressed upon them by Great Britain. If the actions of Great Britain were ignored while evaluating that historic event, the results would not correctly illustrate who or what lead to such a daring reaction. The same principal holds true when analyzing the actions surrounding the rise of Ché Guevara. Ché Guevara was only one man, illustrating only one example of how the complexities involved in international relations can create an eventual collision between the people involved. It is important for the safety and prosperity of all humans to consider the outcomes of ones actions.

A Man's Best Friend Or A Soldier's Best Medicine? How Rehabilitation Dogs Can Be Utilized To Treat Veterans With Post-Traumatic Stress Disorder

Camila Sweaney

The screams echo in your head as you sprint to your rendezvous point. A Humvee flies into the air, having come into contact with a roadside bomb, and erupts into a ball of fire. The gunshots are deafening and the ringing in your ears aggravates you to the point of insanity. You are running as fast as you can, when suddenly an enemy soldier accosts you from behind...

You wake with a start, realizing this nightmare is the same you've had every night since returning from Iraq. The anxiety you feel is debilitating, so much so that sometimes you are afraid to leave the house. You are alone and scared, that is, until you are given a rehabilitation dog to help combat the crippling symptoms of posttraumatic stress disorder. When you wake with a start in the middle of the night, you reach for the warm fur of your companion who now sleeps at your feet. The nightmares subside, along with the feeling of having to always be on alert. Over time, you're no longer afraid to leave the house and your best friend and canine companion marches unwaveringly at your side.

This is a hypothetical point of entry, but all over the United States combat veterans with post-traumatic stress disorder (PTSD) struggle with similar circumstances. Sometimes PTSD manifests itself in extreme irritability, guilt, and uneasiness about falling asleep for fear of reliving the trauma through nightmares. Traditional methods of treating this disorder include medication and therapy, however, when the veterans return home they are often alone and isolated.

Rehabilitation dogs can help solve this problem. Canines, as a species, have been nicknamed "man's best friend" for a reason. Since primeval times, dogs have provided a source of companionship and have also been useful in hunting and searching. How might dogs be useful now? They have been called upon to serve those with physical disabilities like deafness, blindness, and limb deficiencies, but what purpose might dogs serve in treating those ailments that we cannot see—illnesses of the mind? Recent studies have shown that dogs are useful in treating those with psychological problems, and in my study I seek to discover the effectiveness of rehabilitation dogs in treating a specific subset of individuals—our servicemen and

women who have returned from combat with crippling symptoms associated with PTSD.

BACKGROUND

According to Schwartz (1984), posttraumatic stress disorder is an anxiety disorder that often results from experiencing a traumatic event. Symptoms of the disorder are nightmares, severe anxiety, and often irrational fears. Very little research has been done regarding PTSD in veterans and how service dogs can be used to rehabilitate them.

For veterans, having PTSD doesn't just affect mental health—it affects physical health and day-to-day functioning as well. A study conducted in 1998 by Beckham et. al. that surveyed and tested 276 combat veterans (225 with PTSD and 51 without PTSD) found that "when age, socioeconomic status, minority status, combat exposure, and cigarette pack-year history were controlled, combat veterans with PTSD reported and were rated as having a greater number of health problems than combat veterans without PTSD" (p. 1568). Although this sample size is relatively small, other studies with larger sample sizes have shown similar results. For example, in a study conducted by Schnurr et.

al. (2006), a group of 325 male veterans with PTSD was surveyed. The researchers concluded that “Higher PTSD severity was associated with poorer psychosocial and physical health-related quality of life” (p. 711). In an even larger study conducted by Vasterling et. al. (2008), 800 veterans were assessed and the results indicated that:

“PTSD symptoms seem to adversely impact physical health functioning via their negative effect on health symptoms, which in turn negatively influence day-to-day functioning. While it seems intuitive that the impact of health on day-to-day functioning has much to do with the number and frequency of somatic symptoms, particularly for military veterans and other trauma victims seeking treatment for PTSD, such health symptoms appear to be set in motion by PTSD” (p. 354).

Posttraumatic stress disorder has even been correlated with later medical morbidity in veterans. In a large study conducted by Boscarino (2006), 15,288 male U.S. Army veterans (some with and some without PTSD) were surveyed 30 years after their military service (all served in the Vietnam War). The data was examined 16 years after the survey was conducted and the study findings indicated that “adjusted postwar mortality for all-cause, cardiovascular, cancer, and external causes of death (including motor vehicle accidents, accidental poisonings, suicides, homicides, injuries of undetermined intent) was associated with PTSD among Vietnam Theater veterans” (p. 248).

This data emphasizes the gap that exists in current treatment plans for veterans with posttraumatic stress disorder. Much of their treatment has to do with treating the emotional issues that stem from the disorder (like anxiety, nightmares, uncontrollable anger, etc) through prescription medication and therapy rather than finding a way to help veterans accomplish even those simple day-to-day tasks that become complicated when

battling PTSD (like going to the grocery store or seeing a movie with friends) which seem to be overlooked by more traditional rehabilitation methods. The studies highlighted above emphasize the need for well-rounded treatment plans that can positively impact veterans’ capability to go about their daily lives with confidence—this is where rehabilitation dogs can become useful.

Rehabilitation animals (including dogs, horses, etc) have been used for centuries to help those with physical and mental impairments. Researchers Rintala, Matamoros, and Seitz (2008) discuss the usefulness of service dogs in their study. They state, “Service dogs help persons with mobility impairments achieve an optimal level of functional independence in activities of daily living and enhance participation in society” (p. 489). These researchers surveyed and observed 40 individuals given a service dog and found that “all but one participant with a service dog indicated that the dog made a positive difference in the lives of family members, friends, and/or attendants” (p. 496). Additionally, the dogs were found to have a positive impact on emotional well-being. The researchers discovered that “provision of emotional support and companionship by the dogs was mentioned by 44 percent of the participants as having a major impact” (p. 496).

Dogs have also been shown to lessen stressor response symptoms. In a small group study, with ten individuals observed and tested, researchers Barker et. al. (2010) looked into the physiological stress response of the individuals studied before and after being introduced to a therapy dog. The researchers discovered that “positive attitudes toward pets in the total sample of dog owners were associated with decreased levels of self-reported stress” and “results support a buffering effect on the stress response

associated with owners interacting with their dogs” (p. 89).

Other therapy animals have had a positive impact on the emotional well being of individuals. This impact is emphasized by Burgon’s (2011) research involving “at risk” adolescents and equine therapy. She discovered that the youth involved in the program, after working with the horses, experienced an increase in “self-esteem, self-efficacy and a sense of mastery, empathy, and the opening of positive opportunities” (p. 179). It can be argued that many therapy animals, including dogs, might have a similar impact.

Military groups in multiple nations have been utilizing dogs for centuries, and Ostermeir (2010) in his account of the history of guide dog usage traced the practice of using dogs to assist veterans back to World War I. He principally highlights the use of dogs to assist veterans who were blinded in battle. Ostermeir states in his conclusion, “Today there are approximately 10,000 active guide dog teams in the United States, with more than a dozen schools providing guide dog services to blind civilians and veterans” (p. 592). Because the practice of providing guide dogs to blind and physically impaired veterans is so common, it would be such a small step to begin using dogs to rehabilitate veterans with PTSD and other mental/emotional impairments resulting from their military service. Beck et. al. also mention in their research that, “Historically, the US military has promoted the therapeutic use of animals with wounded soldiers. In the years that followed World War I, dogs were used with psychiatric patients at St. Elizabeth’s Hospital in Washington, DC.” (39)

As recently as 2011 moves have been made within the U.S. government to begin helping veterans with PTSD acquire rehabilitation dogs. The Veterans Dog Training Therapy Act was passed in 2011 and, according to the measure, a pilot

program will be established in VA centers helping veterans with mental health conditions to address the symptoms of PTSD through the use of therapy dogs. Because the suicide rates are so high and the numbers of servicemen and women combating the symptoms of PTSD has increased significantly, the bill emphasizes the need for additional, possibly unconventional treatment methods—like rehabilitation dogs.

RATIONALE

Many men in my family have served in the military and several of them have returned to the United States with crippling psychological ailments. I’ve devoted my life to being an advocate for veterans either through government organizations or nonprofit organizations. I would love to discover, through this project, alternate, non-invasive methods for treating posttraumatic stress disorder and other psychological ailments that plague returning combat veterans. I have read multiple pieces that seem to provide evidence for the effectiveness of using therapy dogs to treat veterans with PTSD and I'd like to do more research into this potentially useful technique. Along with traditional treatment methods, the use of a rehabilitation dog to address the symptoms of a veteran with PTSD could potentially help create a more well-rounded treatment process. If the usage of a rehabilitation dog were successful and more widely implemented, we would likely see a decrease in the number of suicides in our servicemen and women. The use of service dogs may also decrease medical costs associated with providing medical and psychological care for veterans, thereby improving the quality of healthcare for veterans overall.

METHODS

I plan to perform a literature review on topics associated with PTSD and how veterans with the ailment could benefit from service dogs. I will examine articles in relation to cost

associated with owning a dog, qualifications that may be necessary to own such a dog, current and past legislature within the government pertaining to the topic, etc.

SIGNIFICANCE

The research found in my literature review could open up interest in continued research about a whole new avenue of care for veterans that does not rely upon drugs with unpredictable side effects, but rather dramatically improves the morale of a veteran with PTSD through the companionship of a canine. On a broader scale, if the government were to endorse and accept the use of rehabilitation dogs as effective treatment for veterans with PTSD the cost of healthcare associated with providing medication and psychological assistance could be lessened and the long-term usefulness of a rehabilitation dog would likely be more cost effective.

Based on the information that I have read thus far through my research, I expect that using a rehabilitation dog to help treat combat veterans with posttraumatic stress disorder in conjunction with other traditional treatment methods like seeing a psychologist and being prescribed certain medications will have a positive correlation with an individual's recovery.

I expect that through my investigation of the literature that exists on the topic at this time, I will come to the conclusion that rehabilitation dogs are a useful and non-invasive method for rehabilitating combat veterans with PTSD.

LITERATURE REVIEW

Currently, more and more research is being conducted pertaining to the possibility of using service dogs in treating veterans with PTSD with promising results. For example, the organization NEADS (National Education for Assistant Dog Services) has been conducting such research and outline their progress in an article. Kathy Foreman and

Cynthia Crossman (2012) state "In July 2009, NEADS undertook a 2-year study to more definitively evaluate whether specially selected and trained service dogs could lessen the symptoms of PTS in Veterans" (62). In their study, they began by placing trained service dogs with 15 combat veterans diagnosed with PTS. "To date," they add, "we feel that this study has been quite successful. The results are being tabulated and we will publish our results in the near future" (62). The group NEADS emphasizes that it is extraordinarily important to match dogs and their personalities to the humans they will interact with, stating, "A particular strength of the NEADS program is that we take great care in matching dogs with their human partners. Applicants complete a detailed application and participate in several in-depth interviews, the purpose of which is to get to know the applicant and find the right dog match to meet his or her needs" (62).

A group of researchers, Beck et. al. (2012), desired to research the effects that animal assisted therapy (or AAT) had on wounded veterans who also experienced symptoms of PTSD. The researchers found that, "It is possible that AAT primarily brings about reminiscence and comfort due to the immediate socialization that one experiences when interacting with pets. Recollection of memories related to past personal experiences with pets may provide a transient state of emotional well-being" (43).

An article by Yount, Olmert, and Lee (2012) discussed the cost effectiveness of a certain service dog training program called the Warrior Canine Connection (or WCC) and how future research of the program would likely result in a more advanced understanding of how service dogs can assist veterans with PTSD. They state,

"The WCC program breeds its own high-quality, purpose-bred service dogs...This circumvents the logistical difficulties of owning and keeping service dogs on

military...property. It also affords active duty service members and veterans who cannot or do not own dogs the opportunity to experience the high quality connection with a dog that can provide powerful relief of PTSD symptoms. The program is also highly cost effective, providing dog-assisted therapeutic relief to the largest number of PTSD patients with a limited number of service dogs. The Warrior-trainers experience relief from their PTSD symptoms while creating highly valuable service dogs that can be provided free of charge to Veterans with disabilities” (64).

The researchers also assert that more research is needed to understand how service dogs can benefit veterans with PTSD saying, “Studies designed to investigate the causes and effects of the WCC program may provided valuable evidence that has been lacking in the study of animal assisted therapy” (67).

Currently, Walter Reed Army Medical Center is one of the only military medical centers in the country that encourages and provides service dogs as a means for holistic therapy to its patients. Researchers Yeager and Irwin (2012) state that “The tremendous and far-reaching impact animal assisted therapy has had on current and prior Wounded Warriors is difficult to measure and therefore hard to quantify. Indeed, it is especially difficult for those who have not experienced close interaction with animals, particularly dogs, to truly appreciate the

therapeutic power of that interaction” (60). The authors also indicate that without further funding and participation in animal assisted therapy for veterans with PTSD, it is difficult to fully grasp the potential for the program. They state, “The willingness of those first at Walter Reed...to explore nontraditional approaches and try animal therapy has impacted injured Warriors in positive ways that are still largely unmeasured. Unfortunately, these successes may remain largely unrecognized unless and until more such programs are instituted throughout the military medical system” (60).

CONCLUSION

The United States has always had and will always have veterans. Especially now, when troops are returning home from tours in the Middle East, effective means of treating inevitable psychological disorders are needed. Veterans like Luis Carlos Montalvan, author of *Until Tuesday: A Wounded Warrior and the Golden Retriever Who Saved Him*, know first-hand the tremendously positive impact that rehabilitation dogs can have on the management of symptoms associated with PTSD. While medication and psychological counseling have always been the standard treatment, if rehabilitation dogs are proven to be an effective means of treating veterans it could mean a dramatic improvement in care and recovery for those who serve our country so selflessly.

REFERENCES

- Barker, S. B., Knisely, J. S., McCain, N. L., Schubert, C. M., & Pandurangi, A. K. (2010). Exploratory study of stress-buffering response patterns from interaction with a therapy dog. *Anthrozoös*, 23(1), 79-91. Retrieved from Google Scholar.
- Beck C.E., Gonzales F., Sells C.H., Jones C., Reer T., Zhu, Y. (2012). The effects of animal-assisted therapy on wounded warriors in an Occupational Therapy Life Skills program. *U.S. Army Medical Department Journal*, 38-45.

- Beckham, J., Moore, S., Feldman, M., Hertzberg, M., Kirby, A., & Fairbank, J. (1998). Health status, somatization, and severity of posttraumatic stress disorder in Vietnam combat veterans with posttraumatic stress disorder. *The American Journal of Psychiatry*, 155(11), 1565-1569.
- Boscarino, J. (2006). Posttraumatic stress disorder and mortality among U.S. Army veterans 30 years after military service. *Annals of Epidemiology*, 16(4), 248-256.
- Burgon, H. (2011). 'Queen of the world': experiences of 'at-risk' young people participating in equine-assisted learning/therapy. *Journal Of Social Work Practice*, 25(2), 165-183.
- Foreman K., Crosson, C. (2012). *Canines for combat veterans: the National Education for Assistance Dog Services*. U.S. Army Medical Department Journal, 61-62.
- H.R. Rep. No. 111-490 at 1-7 (2010).
- Montalván, Luis Carlos. *Until Tuesday: A wounded warrior and the golden retriever who saved him*. New York: Hyperion, 2011. Print.
- Ostermeier, M. (2010). History of guide dog use by veterans. *Military Medicine*, 175(8), 587-593. Retrieved from Google Scholar.
- Paws for Purple Hearts. (2006). *Paws for Purple Hearts*. Retrieved March 27, 2012, from <http://www.pawsforpurplehearts.org/>
- Reason, P., & Bradbury, H. (Eds.). (2001). *Handbook of action research: Participative inquiry and practice*. London: Sage Publications.
- Rintala, D. H., Matamoros, R., & Seitz, L. L. (2008). Effects of assistance dogs on persons with mobility or hearing impairments: A pilot study. *Journal Of Rehabilitation Research & Development*, 45(4), 489-503.
- Schnurr, P., Hayes, A., Lunney, C., McFall, M., & Uddo, M. (2006). Longitudinal analysis of the relationship between symptoms and quality of life in veterans treated for posttraumatic stress disorder. *Journal Of Consulting and Clinical Psychology*, 74(4), 707-713.
- Schwartz, H. J. *Psychotherapy of the combat veteran*. New York: SP Medical and Scientific Books, 1984. Print.
- Vasterling, J. J., Schumm, J., Proctor, S. P., Gentry, E., King, D. W., & King, L. A. (2008). Posttraumatic stress disorder and health functioning in a non-treatment-seeking sample of Iraq war veterans: A prospective analysis. *Journal Of Rehabilitation Research and Development*, 45(3), 347-358. Retrieved from EBSCOhost.
- Yeager A.F., Irwin, J. (2012). Rehabilitative canine interactions at the Walter Reed National Military Medical Center. *U.S. Army Medical Department Journal*, 57-60.
- Yount R.A., Olmert M.D., Lee, M. (2012). Service dog training program for treatment of posttraumatic stress in service members. *U.S. Army Medical Department Journal*, 63-69.

Queer Theory and Nineteenth Century Homoerotic Photography

Jamianessa Davis

This article introduces my ongoing research on early queer photography's role in the language of the Other and how it serves both to produce and pervert standards of gender, beauty, performativity and homosexuality. My desire for understanding comes from a need to subvert the languages of hegemony, globalization, and colonialism. These subjects as well as their photographs are quite nuanced and incredibly complex. In fact, the subject of art history is extremely convoluted and, in my opinion, requires decentering from the Eurocentric baggage which has oppressed many of the non-normative voices of its own past. For these reasons, I will focus on just a few examples of early queer photography in this article.

Queer Theory as a structured field of study is relatively new. It has only been around since the early 1990s. But the questions, issues, and constructs fueling Queer Theory have been omnipresent for centuries. Something deeply fundamental has compelled the oppressed factions within our culture to ask questions about gender, performativity, and sexuality. Society has a long entrenched history of forcing the oppressed to sit just outside the confines of collective acceptance, refusing to embrace anything that questions the normative limits. For this reason, many artists of the nineteenth and twentieth centuries that would have fallen within that "queer" category remained somewhat in the shadows. So today we use the term "queer" to describe that segment of the population that has been oppressed. The term is a line of demarcation between the other and the normative. By definition, "queer" is whatever is at odds with the normal, so on its own it holds no particular reference or identity¹. With this definition in

mind, my primary focus will be utilizing Queer Theory in the field of nineteenth century nude photography. I believe this application will offer a vital new interpretation of Victorian era photographers of France and the United States, as well as insight into the dichotomous nature of nude photographs of that period. In this paper I will argue that nude male photographs of the nineteenth century were intended for the male gaze, to be used as homoerotica, not as a means of studying the male physique or depicting boyish comradery; which has been the standard photographic paradigm since their inception into the discipline of art history.

Each photograph and its translation is very much a function of the artist's inspiration. It is also the viewer's expectation that functions as a factor in the interpretation of the photograph. The image itself belongs to more than one discursive space and therefore inhabits multiple discourses within photographic history². Nude photography inhabits a liminal vastness in which it can be something different for each viewer. This space of liminality becomes a way to both conceal and reveal the homoerotic desires the artist places on the subject and later, on the artwork. The photograph is the material manifestation of the homoerotic gaze captured within the context of the image's given period. Therefore the meaning of the photograph is significantly influenced by the moment of its production. But it is also subject to changes as the photograph enters into new situations with new surroundings and different people. The photographic space occupied by the image can function as both performative and erotic. The struggle comes when attempting to codify this queer space in

¹ (Jagose)

² (Krauss)

terms understood through our own historical moment, because sexuality of the nineteenth and early twentieth centuries was more interchangeable than the gender and sex roles used today. Therefore what current society considers queer or heterocentric has little likelihood of offering the proper tools for reading the genders and eroticisms demonstrated within these images.

It has become evident that I need to find some way of further distancing myself from the work I intend to critique, and, in so doing, to present scholarly evidence that illustrates this idea of homoeroticism in fine art. Especially when reading images over a hundred years after they were made. A new set of interpretations is highly likely given the distance in time periods between the analyses and the photographs³. My critical analysis is guided by contemporary frameworks. This affords me the option to choose between more conservative or more innovative readings of these works. I find that art history typically chooses to view pictures from the past in a rather conventional manner. Understandably, there is a disconnect between the field of Queer Theory and art history as it applies to nude male photography, even when considering painted portrayals of the nude male form. There are inherent inequities that occur when discussing any queer imagery and the constructs within which they have been created. These biases have been formed through the pedagogy of a heteronormative gaze which has more recently, become mediated through the dogmas of globalization. This has quite a bit to do with closeting the true nature of art as it relates to homosexuality and very little to do with revealing the true intentions of an art historical critique.

The propensity is to disrupt any challenging inquiries about sexuality into some alternate area of historical investigation that does not threaten the status-quo

³ (Hannavy)

construction of heterosexuality and its heterocentric nature⁴. A homoerotic sensibility emerged through the manipulation of ideas about male comradeship, embodiment and eroticism, and their subjection to a homosexually inclined gaze. For this reason I will be stepping back a little further in time to Anne-Louis Girodet, whose methods both enforced the codified closeted neoclassical doctrines and broke from tradition to allow subtle statements of homosexuality within his art. Professor James Smalls theorized that through the simultaneous containment and releasing of sexual and erotic excess between men, Girodet created for himself a method of and space for identity construction. Through this space, he was also able to obliquely write himself into history and mythology⁵.



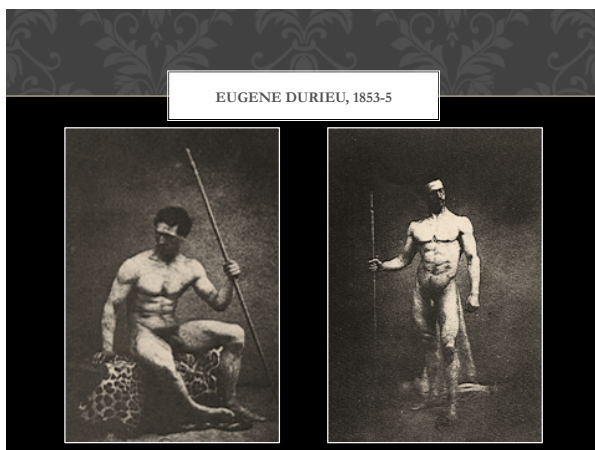
When dealing with art, there has been a tendency to quiet any questions that may challenge the heteronormative majority followed and disseminated by art historians. This problem goes all the way back to the father of art history, J.J. Winckelmann who created a subjective view of the art historical construct but called it objective. Art historians today still use his theories of art as the canon for art history, even though they are faulty in many ways because they mask much of art's real homoeroticism as the fictional narrative of

⁴ (Smalls)

⁵ (Smalls)

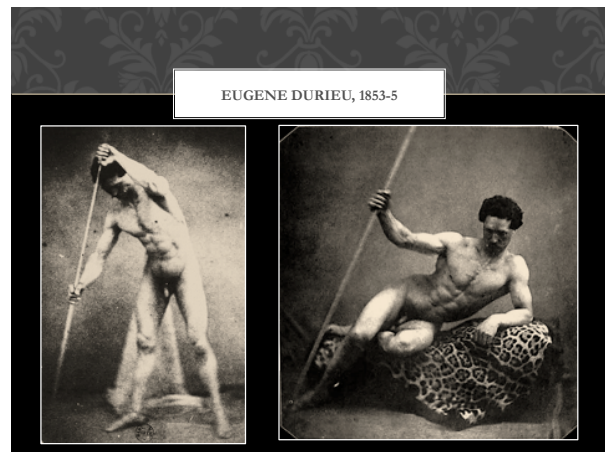
Winckelmann's own deluded fabrications of a closeted homosexuality. Because of his own homoerotic desires, art history now perpetuates the closet of inference as the only viable option for deciphering this period of art when the male nude was depicted as an erotic object on a regular basis. This denial of homosexuality becomes especially significant when we look at Winckelmann's personal life and see that it has in fact been well-documented through his many correspondences that he took part in homosexual activity regularly⁶. This homophobic tension within his contrived art historical corpus is made even more complicated by the scandalous nature of his death; he was in fact murdered by a young male love interest⁷. So it would seem that what was so easily exposed to him, he chose to deny through the constructs of a fabricated heterocentric art historical gaze.

Many of the male nudes made during the nineteenth century had a Greco-Roman emphasis that was considered acceptable to depict, even within the confines of Victorian society. This is what Thomas Waugh termed the "Classical Alibi." This theory used the classical traditions of heroic Greek and Roman male perfection to justify male nudity and homoeroticism in imagery⁸.



EUGENE DURIEU, 1853-5

As evidenced with the works of Eugene Durieu (1800-74), photographs of strong male physiques posed in classic Greco-Roman style had the ability of being read as both erotic and inspiring. When viewed by the public at large, an allegory of heroism was read into these photographs because of the traditions attached to the heroic male nude. Even in the nineteenth century the male body was thought of as good, heroic, and beautiful. These were qualities that could be eroticized depending on the viewer and the context. Most important was the fact that they could be de-eroticized as a means of concealing individual desires deemed inappropriate, even degenerate by many standards⁹.



EUGENE DURIEU, 1853-5

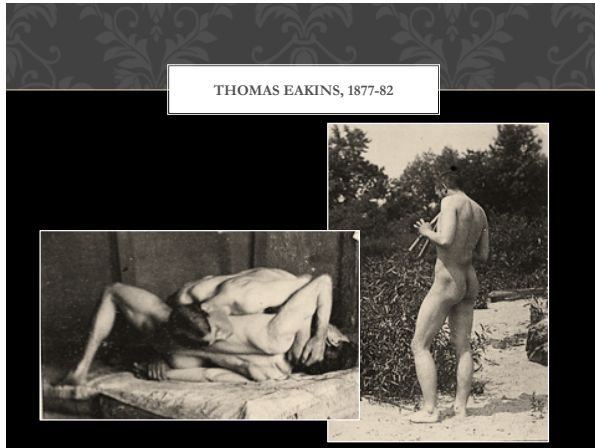
In the case of Thomas Eakins (1844-1916), we can see another Greco-Roman paradigm acted out within his photography. He used the affirmation of male kinship between the older master and his younger pupils, boys wrestling and fighting, male bathers, and pipe players; all of them were nude or scantily clad in togas. No matter what the intent may have actually been, nude photographs and the artists who took them had to hide under some sort of justification to avoid social and legal persecutions of the time.

⁶ (Davis)

⁷ (Smalls)

⁸ (Waugh)

⁹ (Budd)



THOMAS EAKINS, 1877-82

The body of work these early photographers were creating in the European and American era of Victorian propriety needed functional legitimacy; some purpose other than a homoerotic context in order to be viewed as art and not pornography. Many of these nudes were subject to judgment and government censorship, which would have led to fines and even imprisonment for possession and sale of “obscene objects.” Around the mid-1800s photography piqued the interest of artists wanting to document and explore nudity, sexuality, and homosexuality in a new manner. Photography takes on a life like no other art form can because it has the ability to steal the very essence of the subject being photographed. In my opinion, the most interesting aspect of a photograph is really what lies outside the view of the lens. The artist’s psyche has everything to do with the way a photograph is framed; just as the viewer’s subconscious has everything to do with the way a photograph is perceived¹⁰. In the nineteenth century, that collective viewer perception is what judged homoerotic photographs to be immoral and pornographic.

The body of work these early photographers were creating in the European and American era of Victorian propriety needed functional legitimacy; some purpose other than a homoerotic context in order to be viewed as art and not pornography. Many of

¹⁰ (Friedberg)

these nudes were titled “artist’s studies” to avoid conservative homophobic judgment and government censorship, which could have led to fines and even imprisonment for possession and sale of “obscene objects.” Nude photographs such as those of Durieu were called “artist’s studies” to help legitimize them as aesthetic endeavors, when their true purpose was likely fulfillment of the male homoerotic desire.

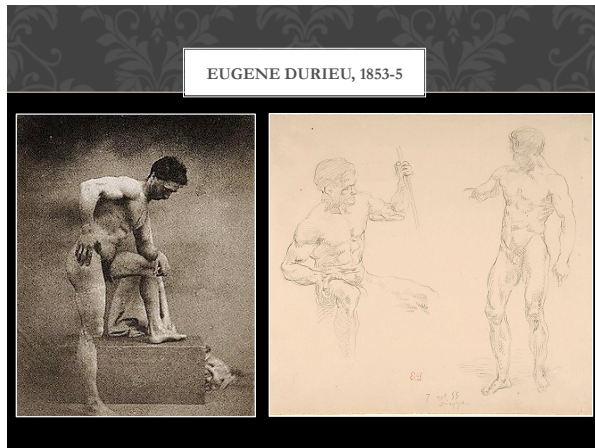
In the early days of photography, before it was considered a valid art form, photographs were increasingly used by painters as cheap substitutes for actual nude models. This practice mostly took place in France where Victorian modesty had less influence on artistic practice. Much of the nude photography by Durieu was commissioned and used by the French painter Eugene Delacroix¹¹. Both men have sexually ambiguous histories and from the research I’ve done, I find no evidence that either man was ever married. Although Delacroix’s journals did offer information on dalliances he had while he was abroad. I do not however, believe that they were romantically involved, only very intimate friends¹². Delacroix supervised each session so he could pose the models in a specific manner of his own choosing, which helps to explain their classical aesthetic.



¹¹ (Hannoosh)

¹² (Ellenzweig)

The extent of his involvement in the nude commissions is documented in his surviving journals. Delacroix's writings suggested that he hand-picked the models based on a certain type of physique. Each of his male specimens had broad, well-defined shoulders, a chiseled chest and torso, and strong defined thighs.



It is likely that Delacroix went searching for his models on the poorer side of town, since men there were manual laborers and would have been more likely to pose nude for money. Delacroix's fantasy was of no ordinary man, but one whose anatomy was reminiscent of classical proportions¹³. Very few of these nudes ever made it to a canvas, but Delacroix sketched them many times in his private journals. When he died, many nude male photographs were found among his belongings¹⁴. In his correspondence he wrote, "With passion and without fatigue those photographs of nude men, that admirable poem, that human body from which I am learning to read."¹⁵

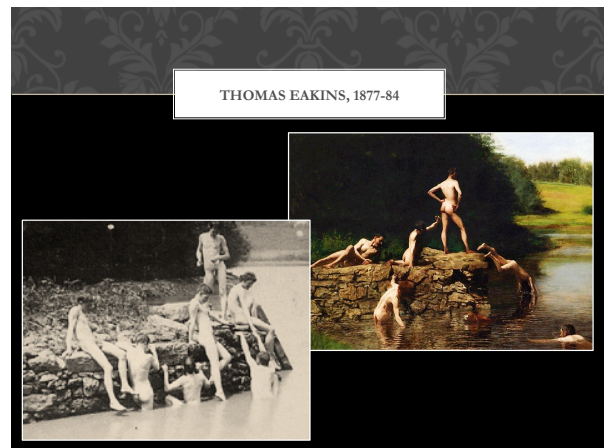
A closer look at the work of Eakins has revealed a number of noticeably homoerotic connotations. Eakins took many photographs of young nude swimmers in preparation for his seminal work *The Swimming Hole* from 1884. Actually he had quite a few shots of his

¹³ (Ellenzweig)

¹⁴ (Delacroix)

¹⁵ (Hannoosh)

male students and friends swimming even before getting this commission, as I found photographic critiques with similar compositions taken a few years prior to these¹⁶. The figures in his painting are aesthetically clothed because of the piece's Greco-Roman theme; however the bathers can legitimately be read as eroticized projections of male yearning as well as subverting signs of sexual ambiguity.



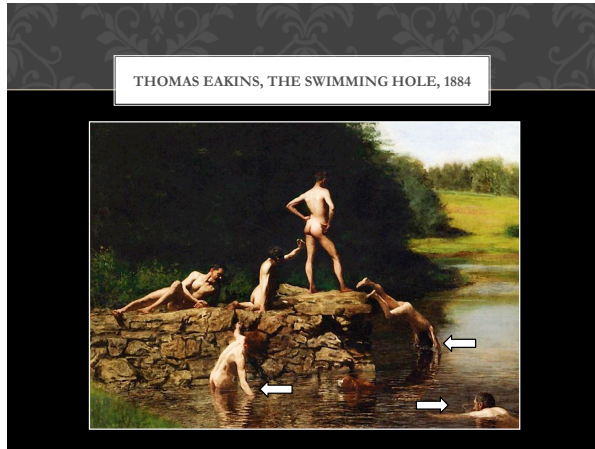
In his paintings, as in his photographs, Eakins was not a detached observer. He painted himself strategically into the position of voyeur, peering out at the young men from the water. Eakins painted himself strategically into the position of voyeur, peering out at the young men from the water¹⁷. There is also a theme of penetration connoted by both the figure diving into the water and the figure caressing the water with his hand. Both of these gestures can be read as a homoerotic content¹⁸. The current painting is actually more sexually ambiguous than the photographs because the commission for this came from Edward Coates, the chairman of the Pennsylvania Academy and he wasn't pleased with amount of overt homosexuality depicted. Eakins had to make multiple revisions to the piece and even after the

¹⁶ (Berger)

¹⁷ (Hatt)

¹⁸ (Brickell)

changes, the commission ended up not being hung in the intended site.¹⁹



Closing Thoughts

Queer theorist Judith Butler has affirmed that all aspects of gender are performative acts based on social and cultural signifiers²⁰. I believe nineteenth century photographers were using nude models to act out or perform homoerotic desires that they were otherwise unable to construct. As a consequence of this convention, the imagined and secretive world

of homoerotic beyond the closed door was now accessible to the voyeur and the closeted homosexual.

This argument also allows the opportunity to recreate the homoerotic performance over and over by means of the photographic vestige left behind. The concept of gender performativity also subverted structured labels that hyper-conservative society began arbitrarily imposing in the 1800s. Victorian era society was secretly interested in anything queer, erotic, and apart from mainstream life. However using photographs to study the body, movement, or for some other higher purpose helped shield photographers and patrons from society's harsh homophobic judgments. With that said, homoerotic imagery has been depicted for thousands of years, whether or not the annals of art history chooses to recognize it exists. In this respect, art historical constructs must begin to atone for its need to "Other" queer artists and their work, especially when looking through a globalized lens.

¹⁹ (Ellenzweig)

²⁰ (Butler)

Works Cited

- Berger, Martin A. "Thomas Eakins and the Construction of Gilded Age Manhood." *Archives of American Art Journal* (2000): 18-22.
- Brickell, Chris. "Visualizing Homoeroticism: Photographs of 1887-92." *Visual Anthropology* 2010: 136-57.
- Budd, Michael Anton. "Every Man a Hero." Bright, Deborah. *The Passionate Camera: Photography and Bodies of Desire*. Routledge, 1998. 41-57.
- Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity*. Routledge, 1990.
- Davis, Whitney. "Winckelmann Divided: Mourning the Death of Art History." Preziosi, Donald. *The Art of Art History: A Critical Anthology*. Oxford University Press, 1998. 40-51.
- Delacroix, Musée National Eugène. <http://www.musee-delacroix.fr/en/>. 2012. 2012.
- Ellenzweig, Allen. *The Homoerotic Photograph: Male Images From Durieu/Delacroix to Mapplethorpe*. Columbia University Press, 1992.
- Friedberg, Anne. *The Virtual Window: From Alberti to Microsoft*. MIT Press, 2006.
- Hannavy, John. *Encyclopedia of Nineteenth-Century Photography*. Routledge, 2007.
- Hannoosh, Michele. *Eugene Delacroix, Journal*. Jose Corti, 2009.
- Hatt, Michael. "The Male Body in Another Frame: Thomas Eakins' "The Swimming Hole" as a Homoerotic Image." Benjamin, Andrew. *The Body: Journal of Philosophy and the Visual Arts*. Academy Editions, Ernst & Sohn, 1993. 9-21.
- Jagose, Annamarie. *Queer Theory: An Introduction*. New York University Press, 1996.
- Krauss, Rosalind. "Photography's Discursive Spaces." Krauss, Rosalind. *The Originality of the Avant-garde and Other Modernist Myths*. MIT Press, 1985. 131-50.
- Smalls, James. "Making Trouble for Art History: The Queer Case of Girodet." *Art Journal* (1996): 20-7.
- Waugh, Thomas. *Hard to Imagine: Gay Male Eroticism in Photography and Film from Their Beginnings to Stonewall*. Columbia University Press, 1996.

The Effect Of Sudemycin Treatment On Alternative Splicing In Primary Murine Hematopoietic Cells Expressing Mutant *U2af1*

Edgar A. Campbell IV

INTRODUCTION

The myelodysplastic syndromes (MDS) are the most common cause of bone marrow failure in adults (Cogle et al. 2011). MDS are a heterogeneous group of hematopoietic stem cell disorders. Hematopoiesis refers to the process that generates all the cells that constitute the blood. Every blood cell originates as a hematopoietic stem cell. These cells reside in the bone marrow, the tissue found in the interior of bones. Hematopoietic stem cells proliferate to form progenitor cells, which differentiate into the different components of blood. The components of blood include erythrocytes (red blood cells), lymphocytes (B cells, T cells, NK cells), and granulocytes (neutrophils, eosinophils, basophils)(Cumano et al. 2001). MDS are characterized by a disruption in hematopoiesis. Cells fail to differentiate because of this disruption. As a result, patients with MDS usually present with anemia or other cytopenias (Tefferi et al. 2009). Up to 30% of individuals with MDS will progress to highly chemotherapy-resistant secondary acute myeloid leukemia (sAML) (Greenberg et al. 1997). Despite the prevalence and deadliness of MDS and sAML, treatments for these diseases have not changed in decades. One reason for this is that the genetic events that initiate the pathogenesis of these diseases were unknown (Ley et al. 2008).

DNA is a molecule that encodes the genetic information used in the development and function of every living organism known to man. The structure of DNA consists of nucleotides and two phosphate sugar strands that wind together to create a double helix. The genetic information is based on a code

made by the order of the four nucleotides that comprise DNA. DNA sequencing is the process that determines the precise order of these nucleotides. Sanger et al. (1977) developed a method to determine the sequence of DNA. His method utilized labeled dideoxynucleotides during *in vitro* DNA replication. These dideoxynucleotides terminate DNA replication when they are incorporated into the newly formed DNA strand. In a DNA replication reaction, these dideoxynucleotides will incorporate randomly in the strand, creating many strands of different lengths. These DNA stands can then be separated based on size and the labels on the dideoxynucleotides can be read in order to give the sequence of DNA. In the ensuing decades, improvements were made in the types of labels on the dideoxynucleotides and in the machinery used to read the labels, but the basis of Sanger sequencing remained unchanged. Sanger sequencing was used to sequence the human genome, a project that lasted 13 years and cost nearly \$2.7 billion (IHGSC 2004). Despite the benefits, the cost of sequencing using the Sanger method severely limited its use in biomedical research.

In 2005, the first major advancement in sequencing technology, since Sanger developed his method in the late 1970s, was made. This new approach in sequencing was dubbed “massively parallel sequencing” and differed significantly from Sanger’s method (Mardis 2011). Although different companies introduced a number of sequencing platforms, all massively parallel sequencers share a basic design. First the DNA being sequenced is fragmented and synthetic DNA adaptors are ligated to the ends. These fragments are then amplified on a solid surface. The solid

surface differs depending on the sequencing platform being used. After amplification, the sequencing machines perform and repeat a number of carefully orchestrated and automated steps that detect the sequence of the DNA. One commonly used massively parallel sequencing platform is the Illumina Hi-Seq 2000. The Illumina sequencers use a glass surface embedded with synthetic DNA primers. The synthetic primers ligated to the DNA fragment attach to the primers embedded on the glass. While attached to the glass plate, the DNA is amplified using PCR. This amplification creates clusters of DNA copies attached to the glass plate. These clusters are each composed of only one sequence. Fluorescently labeled nucleotides are then added, one at a time, on each DNA fragment. The nucleotides contain a chemical blocker that stops the DNA replication. This blocker blocks DNA replication in much the same way that dideoxynucleotides stopped the reaction in Sanger sequencing. Each nucleotide incorporates one at a time because of this blocking group. A single nucleotide on each strand is added, detected by laser, and recorded by camera after each incorporation event. Since DNA cluster contains the same sequence, the cluster gives a single, amplified signal. After the nucleotide is detected, the blocking group is chemically removed and the process is repeated (Mardis 2011). Because each nucleotide added requires many steps, it takes about eight days to read a 100-150 base pair DNA fragment. Despite the long run time and short reading length, the Illumina platform can detect enough DNA fragment island to read the entire human genome three times over in a single eight day run (Mardis 2011). Massively parallel sequencing has enabled genomic sequencing to be done in reasonable timeframe that is many orders of magnitude quicker than previous methods. Since this can all be done on one machine in a week's time, the cost to sequence a genome

has also dropped significantly to about \$30,000, as of early 2011 (Mardis 2011).

With sequencing costs drastically lowered and possible in a reasonable timeframe, whole genome sequencing approaches were used to identify genetic mutations in the cancer genomes of AML (Welch et al. 2011, Mardis et al. 2009, Ley et al. 2008, Link et al. 2011, Ley et al. 2010). Massively parallel whole genome sequencing offered an unbiased approach to discover genetic mutations in cancer genomes. This new approach is contrasted with the initial approach to identifying mutations in cancer that utilized polymerase chain reactions (PCR) to investigate genes that researchers thought might be mutated (Pao et al. 2004, Sjoblom et al. 2006, Wood et al. 2007). The new massively parallel approach has enabled researchers to begin searching for mutations within cancer genomes. The technique to finding cancer mutations begins with sequencing a cancer patient's normal genome. The normal genome is usually obtained from the skin or any other tissue from the patient that is not cancerous. In addition to this genome, the genome obtained from the patient's cancerous tissue is also sequenced. The two genomic sequences are then compared side by side. Differences in the sequence indicate mutations. This was the approach used by Graubert et al. (2012) to detect mutations within the MDS and MDS-derived sAML genomes of patients. A recurrent missense mutation was found within MDS patients. This mutation was located in the coding region of the gene *U2AF1* at amino acid position 34. Graubert et al. (2012) determined the frequency of this mutation within MDS patients by completely sequencing the entire coding region of *U2AF1* in bone marrow and skin samples from 150 MDS patients. Of these patients, 13 individuals (8.7%) were identified with a mutation in position 34 (Fig. 1). Of the thirteen patients identified with a mutation,

eleven harbored a mutation that resulted in an amino acid change from serine to phenylalanine (S34F). The remaining two had a mutation that resulted in an amino acid change of serine to tyrosine (S34Y).

U2AF1 is the highly conserved small (35kDa) subunit of the U2 small nuclear ribonucleoprotein auxiliary factor (U2AF) (Web & Wise 2004). U2AF1 forms a heterodimer with the large subunit (65 kDa) U2AF2 to form U2AF (Wu et al. 1999). U2AF is involved in pre-mRNA processing, a process called splicing. Splicing is a complex process that is ubiquitous in eukaryotic cells. Splicing requires over 150 proteins, an array of small nuclear ribonucleoprotein particles (snRNPs), and a series of small nuclear RNAs (snRNAs) (Will et al. 2009, Wahl et al. 2011). These molecules, referred collectively as the spliceosome, act in concert to achieve crucial post-transcriptional processing of the pre-mRNA. In eukaryotes, DNA, the molecule that encodes all the genetic information needed by living organisms to develop and maintain life, resides in the nucleus of the cell. A molecule called RNA polymerase copies the information encoded in DNA to create a complementary RNA strand referred to as pre-messenger RNA (pre-mRNA). This pre-mRNA contains coding regions called exons and non-coding regions called introns. Introns must be excised out and the exons must be ligated together to form a mature mRNA strand. The major snRNAs that make up the spliceosome are the molecules U1, U2, U4/U6, and U5 (Marz et al. 2008). These snRNAs catalyze the major steps in the splicing process, but they do not act alone. There are a number of regulating and auxiliary proteins that facilitate the splicing reactions. U2AF1 is one of these auxiliary proteins. In order for an intron to be sliced out, the snRNA U2 must attach to the 3' end of the intron. To find the 3' end of the intron, U2 relies on U2AF to find and recognize it. The U2AF1 subunit of U2AF recognizes the

AG splice acceptor dinucleotide present at the 3' end of every intron (Wu et al. 1999). This is a very important function for U2AF1 and partly explains why the sequence and structure has remained conserved throughout eukaryotic evolution (Web & Wise 2004).

The S34F/Y U2AF1 mutation found by Graubert et al. (2012) changes the serine normally found at position 34 into either a phenylalanine or a tyrosine. Both of these resulting amino acids are large and aromatic. Position 34 is located within the first zinc-finger domain of U2AF1. It is not known for sure what the function of the U2AF1's zinc-finger is, but it is known that it is structurally similar to both the mouse and human ZFP36 family of zinc-fingers. This family of zinc-fingers is known to bind RNA (Hudson et al. 2004, Lai et al. 2002, Liang et al. 2008). The position analogous to U2AF1's position 34 in ZFP36L2, a ZFP36 zinc-finger, binds to RNA through hydrogen bonding (Hudson et al. 2004). Serine is an amino acid is capable of forming hydrogen bonds with polar substances. This suggests that the zinc-finger in U2AF1 may bind with RNA and that the serine in position 34 is critical for that interaction. The S34F/Y mutation does not affect the amino acids that coordinate the structure of the zinc-finger. The mutation also does not result in a non-sense frame shift. The S34F/Y does not result in a loss of function for U2AF1, which is important to know, since the homozygous loss of U2AF1 function is lethal in many organisms (Golling et al. 2002, Rudner et al. 1996, Zorio & Blumenthal 1999).

Graubert et al. (2012) concluded that the S34F mutation may result in subtle increases in splicing efficiency or induce changes in isoform expression. The way the mutation will do this is by inducing alternative splicing. Alternative splicing is splicing that utilizes alternative splice sites. In normal splicing, introns are excised out and exon are retained and ligated together. Pre-mRNA that under

goes alternative splicing can result in exons that are excised out with introns. Introns can also fail to be excised. Splicing can also happen at cryptic splice sites, which are sites within the exon or intron that can undergo splicing. Each of these results is an altered transcriptome, which can contribute directly to cancer or may contribute indirectly by reengaging some other pathway (Grosso et al. 2008, David & Manley 2010). Alternative splicing has been previously related to levels of normal U2AF1 with cells (Fu et al. 2011, Kralovicova & Vorechovsky 2010, Pacheco et al. 2006). Graubert et al. (2012) report that the S34F mutation promotes exon skipping in *in vitro* assays. The S34F U2AF1 mutation may be responsible for the observed alteration of splicing in MDS.

In addition to the U2AF1 mutation, mutations have been found in other spliceosome genes in MDS patients (Visconte et al. 2011, Papaemmanuil et al. 2011, Yoshida et al. 2011) (Fig. 2). These mutations are believed to produce alterations in splicing that directly and/or indirectly contribute to the development of cancer. The majority of MDS patients who harbor a spliceosome mutation tend to only have one mutation (Graubert et al. 2012). It is believed that while one mutation can lead to the development of cancer, multiple mutations within the spliceosome will be deleterious for the cell. Based on this assumption, we have proposed a possible molecular targeted cancer therapy to treat MDS. A targeted therapy refers to the new generation of cancer drugs that are designed to interfere with a specific molecular target that has a critical role in tumor growth (Sawyers 2004). The U2AF1 mutation is believed to alter the spliceosome, which leads to tumor growth. It is also believed that the spliceosome can only handle one major alteration before become deleterious for the cell. If this is true, tumor cells with the U2AF1 mutation have a spliceosome that is more susceptible to

interference than the spliceosomes of cells that do not express the mutation. We have chosen to target the spliceosome in our investigation of a novel, cancer therapy.

Two products derived from nature have been shown to interfere with the spliceosome. A molecule named FR901464, is a drug isolated from the fermentation broth of a strain of *Pseudomonas sp.* which was isolated from a sample of Japanese soil (Nakajima et al 1996). Pladienolide B is a drug isolated from a strain of *Streptomyces platensis* (Kotake et al 2007). Both of these compounds interact and disrupt the function of the spliceosome by targeting and modulating SF3B1 (Kaida et al. 2007, Kotake et al. 2007). SF3B1 is a subunit of the SF3 spliceosome complex. This complex is believed to prevent inappropriate nucleophilic attack on the pre-mRNA by other members of the spliceosome (Lardelli et al. 2010). Like *U2AF1*, mutations within *SF3B1* have also been discovered within MDS cancer genomes (Visconte et al. 2011, Papaemmanuil et al. 2011, Malcovati et al. 2010). Interference of SF3B1 by these two natural products causes cell growth to stall in the G1 and the G2/M cell cycles of growth. Despite this ability, both of these compounds make poor candidates for treatment options. One reason for this is that both compounds are chemically complex. Pladienolide B contains 9 stereocenters and FR901464 contains 10. The high number of stereocenters makes synthesis very complicated. For example, FR901464 requires 40 independent reaction steps to be synthesized, making it impractical for production (Albert et al. 2007). Another reason is that both of these compounds are also very unstable and readily degraded in biological fluids.

The natural products FR901464 and Pladienolide B have very similar mechanisms of actions, but very dissimilar structures. Despite this dissimilarity, Lagisetti et al. (2008) identified the key structural

components that these two unrelated compounds share. A new class of molecules was designed based on this consensus pharmacore called Sudemycins (Lagiseti et al. 2008, Lagiseti et al. 2009) (Fig. 3). Sudemycins are structurally less complex than their natural analogues, containing 6 fewer stereocenters. Sudemycins have better stability and are not degraded within biological fluids (Albert et al. 2009). Sudemycins also have the same effects as the natural products. Sudemycins inhibited splicing, arrested cell growth in the G1 and G2/M phases, and modulated the function of SF3B1 (Lagiseti et al. 2008, Lagiseti et al. 2009). Treatment with Sudemycin in cell lines caused an accumulation of aberrantly spliced gene products.

Sudemycin has been shown to effectively modulate splicing by targeting SF3B1. We believe that Sudemycin's effects on splicing make it a good candidate for a potential targeted cancer therapy. As stated before, cells expressing the S34F *U2AF1* mutation cause alterations in splice isoforms. It is believed that this environment provides a selective advantage for tumor cell to grow and proliferate. We also believe that perturbation of this splice environment could be deleterious to the cell and cause a selective disadvantage for cells expressing these mutations. It is unknown what effect Sudemycin has on alternative splicing in cells expressing the S34F *U2AF1* mutation. We hypothesize that Sudemycin will modulate the alternative splicing induced by the S34F *U2AF1* mutation.

METHODS

S34F *U2AF1* Expression in Murine Hematopoietic Cells

Femurs and tibias were collected from C57BL/6 mice. Bone marrow was collected from these bones and pooled together in a single solution. From the bone marrow, c-kit positive cells were selected. C-kit is a cell

surface marker present on hematopoietic stem cells and progenitor cells. These c-kit positive cells were cultured with media enriched with stem cell factor (SCF), Flt-3, interleukin-3 (IL3), thrombopoietin (TPO), and other cytokines necessary for growth.

Murine stem cell virus (MSCV), was used to transduce these cells with *U2AF1-IRES-GFP*, an expression vector designed to introduce the *U2AF1* gene into the cells. This expression vector is designed to express two genes: *U2AF1* and *GFP* through the use of the internal ribosomal entry site (*IRES*). *IRES* allows the ribosome to initiate protein translation in the middle of mRNA. *GFP* is a gene that encodes for green fluorescent protein (GFP). This is a protein that fluoresces green under blue light. When the successfully transduced cell expresses the *U2AF1* gene, the *IRES* allows GFP to be expressed as well. Under a blue light, cells that were successfully transduced can be easily distinguished by the green fluorescence. The c-kit positive bone marrow cell culture was split into three cultures and transduced with one of three expression vectors. One expression vector contained a wild-type *U2AF1* gene along with *IRES* and *GFP*. This is the normal *U2AF1* found within humans. The second expression vector contained *U2AF1* with the S34F mutation that was discovered and identified in 8.7% of MDS patients. This vector also contained *IRES* and *GFP*. The third type of vector only contained *IRES* and *GFP* as a control. Cells were transduced twice with these vectors. The first transduction occurred initially after culture and the second transduction occurred 24 hours later.

After 24 hours of growth following the second transduction, the cells were sorted by flow cytometry. Flow cytometry is a technique that uses lasers to detect fluorescence of each cell. Cells are suspended in solution and ran through small tubes in the flow cytometer. The flow

cytometer then uses the laser to detect the fluorescence of each cell, one by one. The flow cytometer can then separate the cells based on a number of parameters, including fluorescence. Cells that were successfully transduced by MSCV were separated from the other cells to create cultures that expressed either wild-type U2AF1, mutant U2AF1, or an empty vector (Fig. 4).

Treatment with Sudemycin

After an additional 24 hours following GFP sort, the each culture was treated with either Sudemycin or a control. A concentration of 75nM Sudemycin in DMSO was used to treat the cells. This concentration was chosen based on previous unpublished experiments showing the most significant difference in cell death in cells expressing either mutant or wild-type U2AF1. A solution of DMSO was used a control. Cells were treated for 6 hours.

Generation of cDNA

After drug treatment, the RNA was isolated from each culture (Qiagen). The isolated RNA is primarily mRNA transcripts generated by the cell to be translated into protein. Unlike the DNA, the mRNA contains information as to how the gene was spliced. Since RNA is relatively unstable and subject to degradation, reverse transcriptase (Qiagen) was used to translate the mRNA back into DNA. This DNA is referred to as coding DNA or cDNA. cDNA was generated from both Sudemycin and DMSO treated cells from all three virus types.

RT-PCR

DNA primers were designed to amplify the FMR1 gene (Fig. 5). FMR1 is a gene endogenous to C57BL/6 mice and is biologically irrelevant gene to MDS. It was chosen for the PCR assay based on its ability to be alternatively spliced. Primers were designed using UC Santa Cruz's *in silico* PCR generator. The forward primer was complementary to a region in Exon 17 of

FMR1 while the reverse matched the sequence in Exon 18. Amplification of this region of *FMR1* produces three products of different size. The largest product of 160 base pairs (bps) results from normal splicing of the intron between Exon 17 and 18. The next largest product or 120 bps results from a splice event that occurs on the upstream cryptic splice site within Exon 18. The smallest product of 85 bps results from a splice event occurring on the downstream cryptic splice site. Each PCR reaction was repeated for a total of three technical repeats.

Densitometry

These PCR products can be easily discerned when run on a 10% polyacrylamide gel. Densitometry using Image J software was used to quantify the intensity of the bands within the gel. This quantification was used to calculate the percentage each splice event occurred $[(\text{Transcript Band})/(\text{Total Sum of Three Bands}) * 100\%]$.

RESULTS

Untreated Cells

cDNA from cells transduced by MSCV to express mutant or wild-type U2AF1 was used in a *FMR1* PCR assay. These cells were not treated with either 75nM Sudemycin or the DMSO control. Three separate PCR reactions were run on 10% polyacrylamide gels (Fig. 6).

The amount of the 120 bp transcript was quantified and the percentage it contributed to the total amount of transcripts was calculated and summarized in graph form in Figure 7. The 120 bp transcript constituted less than 20% of the total transcripts measured in the PCR product of cells expressing wild-type U2AF1 and an empty vector. The 120 bp transcript constituted about 25% of the total transcripts measured in the PCR product of cells expressing S34F U2AF1 (Fig. 7).

The amount of the 85 bp transcript was quantified and the percentage of it contributed

to the total amount of transcripts was calculated and summarized in graph form in Figure 8. The 85 bp transcript constituted less than 15% of the total transcripts measured in the PCR product of cells expressing wild-type U2AF1 and an empty vector. The 120 bp transcript constituted less than 20% of the total transcripts measured in the PCR product of cells expressing S34F U2AF1 (Fig. 8).

6-Hour Drug-Treated Cells

cDNA from cells transduced by MSCV to express mutant or wild-type U2AF1 was used in a *FMR1* PCR assay. These cells were treated with either 75nM Sudemycin or the DMSO control for 6 hours. Three separate PCR reactions were run on 10% polyacrylamide gels (Fig. 9).

The amount of the 120 bp transcript was quantified and the percentage it contributed to the total amount of transcripts was calculated and summarized in graph form in Figure 10. Of the cells treated with DMSO for 6 hours, the 120 bp transcript constituted less than 20% of the total transcripts for cells expressing both wild-type U2AF1 and the empty vector. The 120 bp transcript constituted about 25% of the total transcripts in cells expressing S34F U2AF1 (Fig. 10). These results are similar to the results seen in the untreated cells summarized in Figure 7.

Of the DMSO-treated cells, the 85 bp transcript constituted about 15% of the total transcripts measured in both the cells expressing wild-type U2AF1 and the empty vector. The cells expressing S34F U2AF1 produced more of the 85 bp transcript than the other cells at over 20% (Fig 11). These results are similar to the results seen in the untreated cells summarized in Figure 8.

When treated with 75 nM Sudemycin for 6 hours, the 120 bp transcript's contribution decreased from about 20% to about 10% of the total transcripts in cells expressing empty vector (n=3; p=0.1056). The 120 bp transcript's contribution decreased significantly from about 20% to about 10% of

the total transcripts in cells expressing wild-type U2AF1 (n=3; p=0.0089). In cells expressing S34F U2AF1, the 120 bp transcript's contribution also decreased significantly from about 25% to about 20% of the total transcripts measured in the PCR product (n=3; p=0.0022) (Fig. 10).

A similar result in the 75 nM Sudemycin-treated cells is seen in regards to the 85 bp transcript. When treated with 75 nM Sudemycin for 6 hours, the 85 bp transcript's contribution significantly decreased from about 15% to just over 5% of the total transcripts in cells expressing empty vector (n=3; p=0.0001). The 85 bp transcript's contribution also decreased significantly from about 15% to just over 5% of the total transcripts in cells expressing wild-type U2AF1 (n=3; p=0.0012). In cells expressing S34F U2AF1, the 120 bp transcript's contribution decreased significantly from about 20% to about 10% of the total transcripts measured in the PCR product (n=3; p<0.0001) (Fig. 11).

DISCUSSION

Untreated Cells

Cells expressing wild-type U2AF1 and the empty vector show a similar alternative splicing pattern when untreated with either 75 nM Sudemycin or DMSO. The 120 bp transcript constituted about 20% of the total transcripts for both virus types. The 85 bp transcript was also similar at about 15%. This suggests that overexpression of wild-type U2AF1 does not cause an alter alternative splicing patterns. When cells express S34F U2AF1, the percentages of both cryptically spliced transcripts increase significantly (120bp: n=3 p=0.008; 85bp: n=3 p=0.0068). Expression of S34F U2AF1 increases cryptic splice site use in *FMR1* when compared to wild-type U2AF1 expression. This suggests that S34F U2AF1 effectively alters alternative splicing.

6-Hour 75 nM Sudemycin-Treated Cells

DMSO-treated cells showed a similar alternative splicing pattern as cells that were treated with nothing. DMSO-treated cells that expressed either wild-type U2AF1 or the empty vector showed very similar alternatively spliced transcript percentages to each other. This suggests that, similar to untreated cells, wild-type U2AF1 does not alter alternative splicing when treated for 6 hours with DMSO. The similarity of the DMSO result to the untreated results suggests that DMSO does not elicit an effect on alternative splicing.

Cells treated with 75 nM Sudemycin showed a significant decrease in alternative splicing in *FMR1* for all virus types when compared to DMSO-treated cells. Cells expressing wild-type U2AF1 showed a similar decrease in cells expressing the empty vector when compared to DMSO-treated cells. Both virus types saw a decrease in 120 bp percentage from about 20% to about 10% (n=3; V p=0.1056; WT p=0.0089) and a significant decrease in the percentage of the 85 bp transcript from about 15% to about 5% (n=3; V: p=0.0001; W: p=0.0012). This suggests that Sudemycin modulates splicing.

Cells expressing S34F U2AF1 show a significant decrease in alternative splicing in *FMR1* after a 6-hour treatment with 75 nM Sudemycin when compared to cells treated with DMSO for the same time period (120bp: p=0.0022; 85bp: p<0.0001). Expression of S34F U2AF1 increased alternative splice in *FMR1* in both untreated cells and DMSO treated cells. The decrease in transcript levels did not reach levels seen by both wild-type U2AF1 and empty vector expressing cells. These results suggest that Sudemycin treatment can modulate alternative splicing induced by S34F U2AF1.

CONCLUSION AND FUTURE DIRECTIONS

The S34F *U2AF1* mutation alters alternative splicing in *FMR1*. Treatment with 75 nM of Sudemycin modulates this alteration in alternative splicing in *FMR1*.

Splice modulators, such as Sudemycin, warrant further investigation as a novel therapy for people harboring *U2AF1* mutations.

In the future, RNA sequencing will be used to identify any biologically relevant genes affected by both S34F U2AF1 mutation and Sudemycin modulation.

References

- Albert, B. J., McPherson, P. A., O'Brien, K., Czaicki, N. L., Destefino, V., Osman, S., Li, M., Day, B. W., Grabowski, P. J., Moore, M. J., Vogt, A., Koide, K. 2009. Meayamycin inhibits pre-messenger RNA splicing and exhibits picomolar activity against multidrug-resistant cells. *Molecular Cancer Therapeutics* 8: 2308–2318.
- Albert, B. J., Sivaramakrishnan, A., Naka, T., Czaicki, N. L., Koide, K. 2007. Total syntheses, fragmentation studies, and antitumor/antiproliferative activities of FR901464 and its low picomolar analogue. *Journal of the American Chemical Society* 129: 2648–2659.
- Cogle, C. R., Craig, B. M., Rollison, D. E., List, A. F. 2011. Incidence of the myelodysplastic syndromes using a novel claims-based algorithm: high number of uncaptured cases by cancer registries. *Blood* 117: 7121-7125.

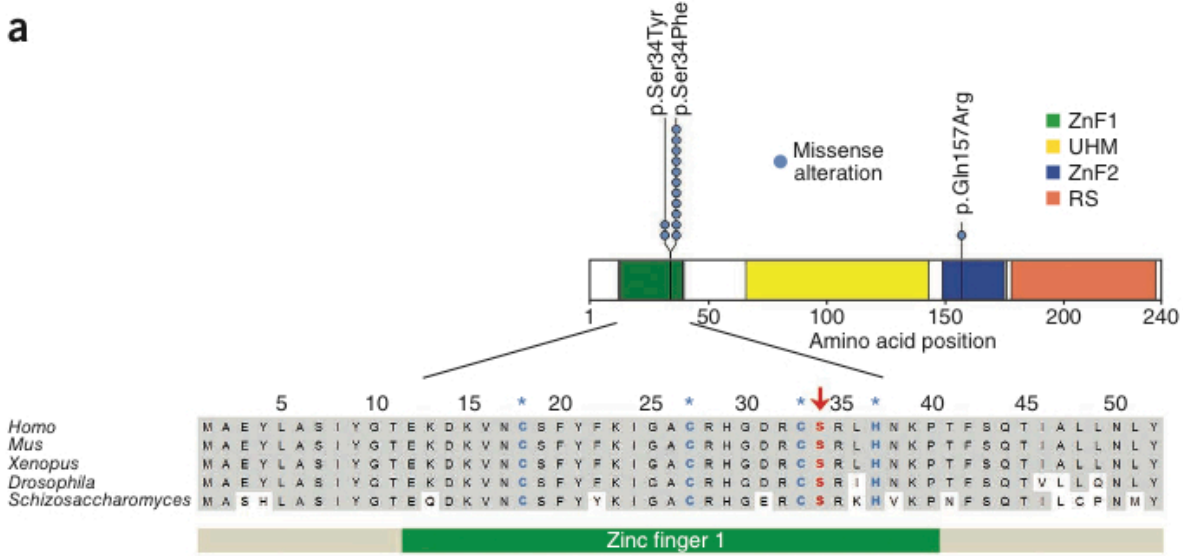
- Cumano, A. & Godin, I. 2001. Pluripotent hematopoietic stem cell development during embryogenesis. *Current Opinion in Immunology* 13(2): 166-171.
- Fan, L., Lagisetti, C., Edwards, C. C., Webb, T. R., & Potter, P. M. 2011. Sudemycins, novel small molecule analogues of FR901464, induce alternative gene splicing. *ACS Chemical Biology*, 6(6), 582-589.
- Golling, G. et al. 2002. Insertional mutagenesis in zebrafish rapidly identifies genes essential for early vertebrate development. *Nature Genetics* 31: 135–140.
- Graubert, T. A., Shen, D., Ding, L., Okeyo-Owuor, T., Lunn, C. L., Shao, J., Krysiak, K., Harris, C. C., Koboldt, D.C., Larson, D. E., McLellan, M. D., Dooling, D. J., Abbott, R. M., Fulton, R. S., Schmidt, H., Kalicki-Veizer, J., O’Laughlin, M., Grillot, M., Baty, J., Heath, S., Frater, J. L., Nasim, T., Link, D. C., Tomasson, M. H., Westervelt, P., DiPersio, J. F., Mardis, E. R., Ley, T. J., Wilson, R. K., Walter, M. J. 2011. Recurrent mutations in the U2AF1 splicing factor in myelodysplastic syndromes. *Nature Genetics* 44: 53–57.
- Greenberg, P., Cox, C., LeBeau, M. M. , et al. 1997. International scoring system for evaluating prognosis in myelodysplastic syndromes. *Blood* 89: 2079-2088.
- International Human Genome Sequencing Consortium. (2004). Finishing the euchromatic sequence of the human genome. *Nature* 431(7011): 931–945.
- Kaida, D., Motoyoshi, H., Tashiro, E., Nojima, T., Hagiwara, M., Ishigami, K., Watanabe, H., Kitahara, T., Yoshida, T., Nakajima, H., Tani, T., Horinouchi, S., Yoshida, M. 2007. Spliceostatin A targets SF3b and inhibits both splicing and nuclear retention of pre-mRNA. *Nature Chemical Biology* 3: 576–583.
- Kotake, Y., Sagane, K., Owa, T., Mimori-Kiyosue, Y., Shimizu, H., Uesugi, M., Ishihama, Y., Iwata, M., Mizui, Y. 2007. Splicing factor SF3b as a target of the antitumor natural product pladienolide. *Nature Chemical Biology* 3: 570–575.
- Lagisetti, C., Pourpak, A., Goronga, T., Jiang, Q., Cui, X., Hyle, J., Lahti, J. M., Morris, S. W., Webb, T. R. 2009. Synthetic mRNA splicing modulator compounds with in vivo antitumor activity. *Journal of Medicinal Chemistry* 52: 6979–6990.
- Lagisetti, C., Pourpak, A., Jiang, Q., Cui, X., Goronga, T., Morris, S. W., Webb, T. R. 2008. Antitumor compounds based on a natural product consensus pharmacophore. *Journal of Medicinal Chemistry* 51: 6220–6224.
- Lardelli, R. M., Thompson, J. X., Yates, J. R., Stevens, S. W. 2010. Release of SF3 from the intron branchpoint activates the first step of pre-mRNA splicing. *RNA* 16(3): 516-528.
- Ley, T.J. et al. 2008. DNA sequencing of a cytogenetically normal acute myeloid leukaemia genome. *Nature* 456, 66–72.
- Ley, T.J. et al. 2010. DNMT3A mutations in acute myeloid leukemia. *The New England Journal of Medicine* 363: 2424–2433.

- Link, D. C. et al. 2011. Identification of a novel TP53 cancer susceptibility mutation through whole-genome sequencing of a patient with therapy-related AML. *The Journal of the American Medical Association* 305: 1568–1576.
- Malcovati, L., Papaemmanuil, E., Bowen, D. T., Boulwood, J., Della Porta, M. G., Pascutto, C., Travaglino, E., Groves, M. J., Godfrey, A. L., Ambaglio, I., Gallì, A., Da Vià, M. C., Conte, S., Tauro, S., Keenan, N., Hyslop, A., Hinton, J., Mudie, L. J., Wainscoat, J. S., Futreal, P. A., Stratton, M. R., Campbell P. J., Hellström-Lindberg, E., Cazzola, M. 2011. Clinical significance of SF3B1 mutations in myelodysplastic syndromes and myelodysplastic/myeloproliferative neoplasms. *Blood* 118(24): 6239–6246.
- Mardis, E. R. 2011. A decade's perspective on DNA sequencing technology. *Nature* 470(7333): 198-203.
- Mardis, E. R. et al. 2009. Recurring mutations found by sequencing an acute myeloid leukemia genome. *The New England Journal of Medicine* 361: 1058–1066.
- Marz, M., Kirsten, T., Stadler, P. F. 2008. Evolution of spliceosomal snRNA genes in metazoan animals. *Journal of Molecular Evolution* 67: 594–607.
- Nakajima, H. et al. 1996. New antitumor substances, FR901463, FR901464 and FR901465. I. Taxonomy, fermentation, isolation, physico-chemical properties and biological activities. *The Journal of Antibiotics (Tokyo)* 49: 1196–1203.
- Pao, W. et al. 2004. EGF receptor gene mutations are common in lung cancers from “never smokers” and are associated with sensitivity of tumors to gefitinib and erlotinib. *Proceedings of the National Academy of Sciences of the United States of America* 101, 13306–13311.
- Papaemmanuil, E. et al. 2011. Somatic SF3B1 mutation in myelodysplasia with ring sideroblasts. *New England Journal of Medicine* 365: 1384–1395.
- Rudner, D. Z., Kanaar, R., Breger, K. S., Rio, D. C. 1996. Mutations in the small subunit of the *Drosophila* U2AF splicing factor cause lethality and developmental defects. *Proceedings of the National Academy of Sciences of the United States of America* 93, 10333–10337.
- Sanger, F., Nicklen, S., Coulson, A. R. 1977. DNA sequencing with chain-terminating inhibitors. *Proceedings of the National Academy of Sciences of the United States of America* 74 (12): 5463–5467.
- Sawyers, C. 2004. Targeted cancer therapy. *Nature* 432(7015): 294-297.
- Sjoblom, T. et al. 2006. The consensus coding sequences of human breast and colorectal cancers. *Science* 314: 268–274.
- Tefferi, A. & Vardiman, J. W. 2009. Myelodysplastic syndromes. *New England Journal of Medicine* 361(19): 1872-1885.
- Wahl, M. C., Will, C. L., Luhrmann, R. 2009. The spliceosome: design principles of a dynamic RNP machine. *Cell* 136, 701–718.

- Webb, C. J. & Wise, J. A. 2004. The splicing factor U2AF small subunit is functionally conserved between fission yeast and humans. *Molecular and Cellular Biology* 24: 4229–4240.
- Welch, J. S. et al. 2011. Use of whole-genome sequencing to diagnose a cryptic fusion oncogene. *The Journal of the American Medical Association* 305: 1577–1584.
- Will, C. L., Schneider, C., MacMillan, A. M., Katopodis, N. F., Neubauer, G., Wilm, M. et al. 2001. A novel U2 and U11/U12 snRNP protein that associates with the pre-mRNA branch site. *The EMBO Journal* 20: 4536–4546.
- Wood, L. D. et al. 2007. The genomic landscapes of human breast and colorectal cancers. *Science* 318: 1108–1113.
- Wu, S., Romfo, C. M., Nilsen, T. W., Green, M. R. 1999. Functional recognition of the 3' splice site AG by the splicing factor U2AF35. *Nature* 402: 832–835.
- Yoshida, K. et al. 2011. Frequent pathway mutations of splicing machinery in myelodysplasia. *Nature* 478: 64–69.
- Zorio, D. A. & Blumenthal, T. 1999. U2AF35 is encoded by an essential gene clustered in an operon with RRM/cyclophilin in *Caenorhabditis elegans*. *RNA* 5: 487–494.

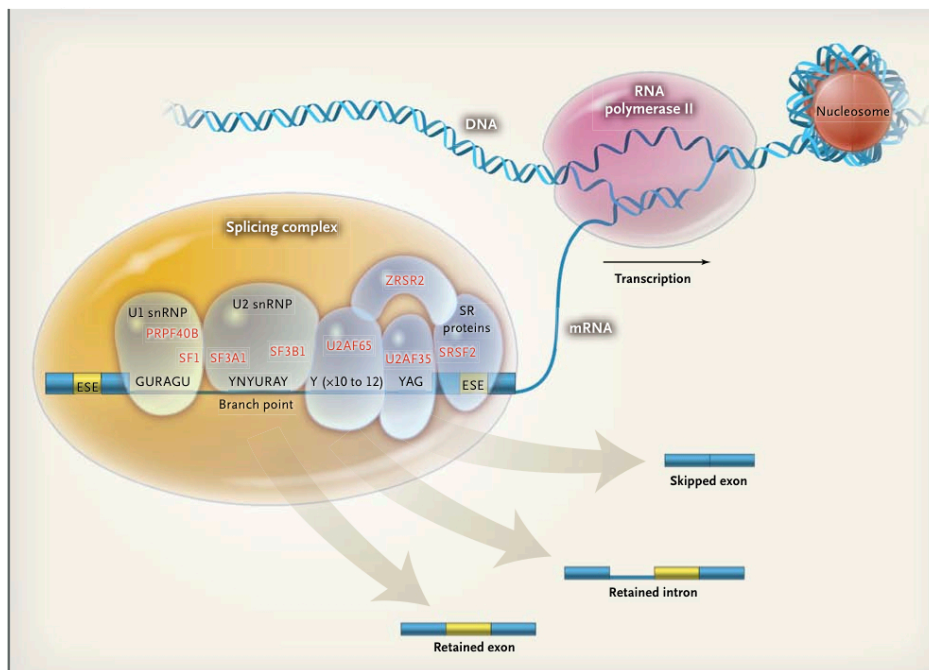
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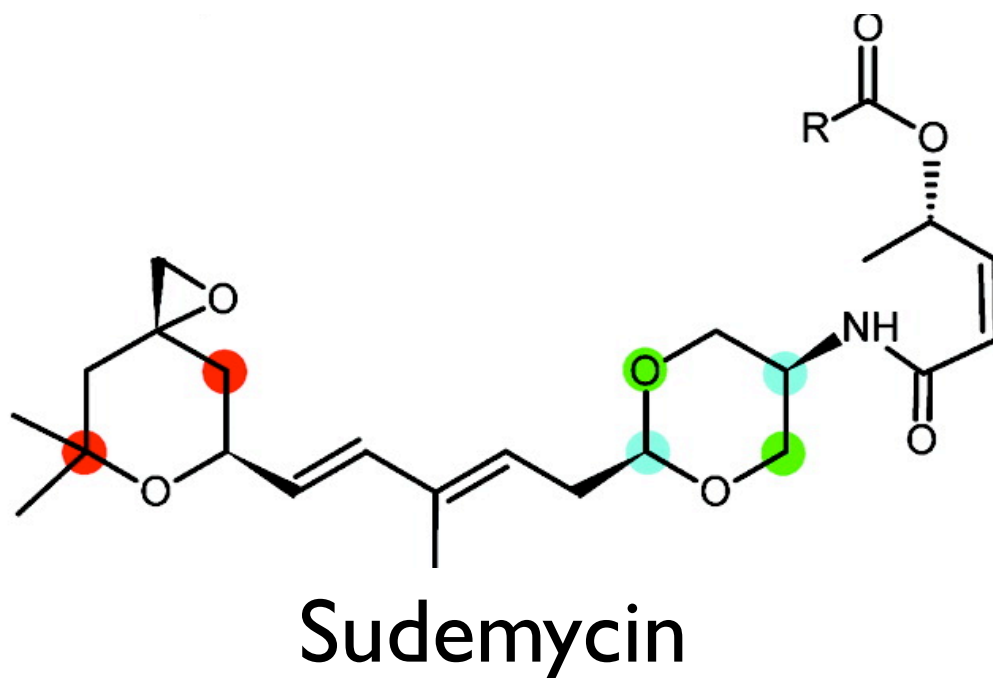
Graubert et al. *Nat. Gen.* 2011

Figure 1. U2AF1 mutations found in individuals with MDS. Missense mutations were detected in codon 34 of U2AF1. The ZnF1 (zinc finger 1), UHM (U2AF homology motif), ZnF2 (zinc finger 2) and RS (arginine-serine rich) domains are shown. The amino acid sequence of the ZnF1 domain is highly conserved (gray shaded area). The zinc coordinating and mutated residues are shown in blue (asterisks) and red (arrow), respectively.



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Figure 2. The S34F mutation is one of many mutation associated with MDS that are found in the spliceosome shown here. The S34F U2AF1 mutation results in an increase in aberrantly spliced gene products. Retention of introns, skipping of exons, and utilization of cryptic splice sites are all ways genes can be aberrantly spliced. These aberrantly spliced products create an environment that is believed to cause tumor growth.



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Figure 3. A summary structure for the class of synthetic splice modulators known as Sudemycins. Structure is color-coded highlighting of the atoms that have been modified in order to remove chirality and to give a less complex, and more chemically stable structure when compared to FR901464. Red – gain of symmetry and loss of a chemically destabilizing OH group; green – loss of a methyl group and/or atom type change to enhance solubility; cyan – gain of symmetry.

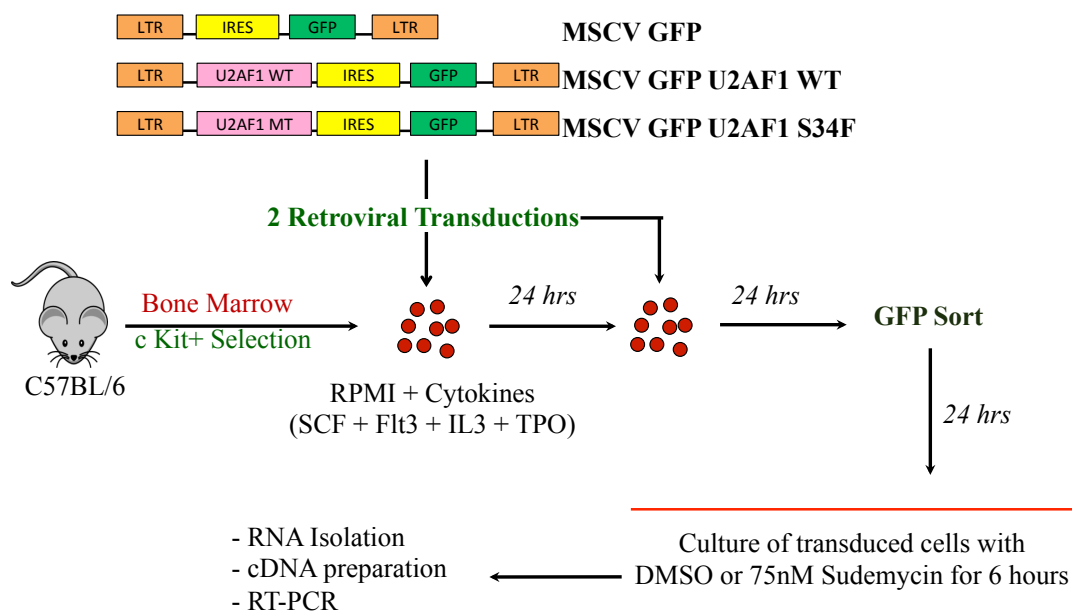


Figure 4. Overview of method used to generate murine hematopoietic cells that express either mutant or wild-type U2AF1.

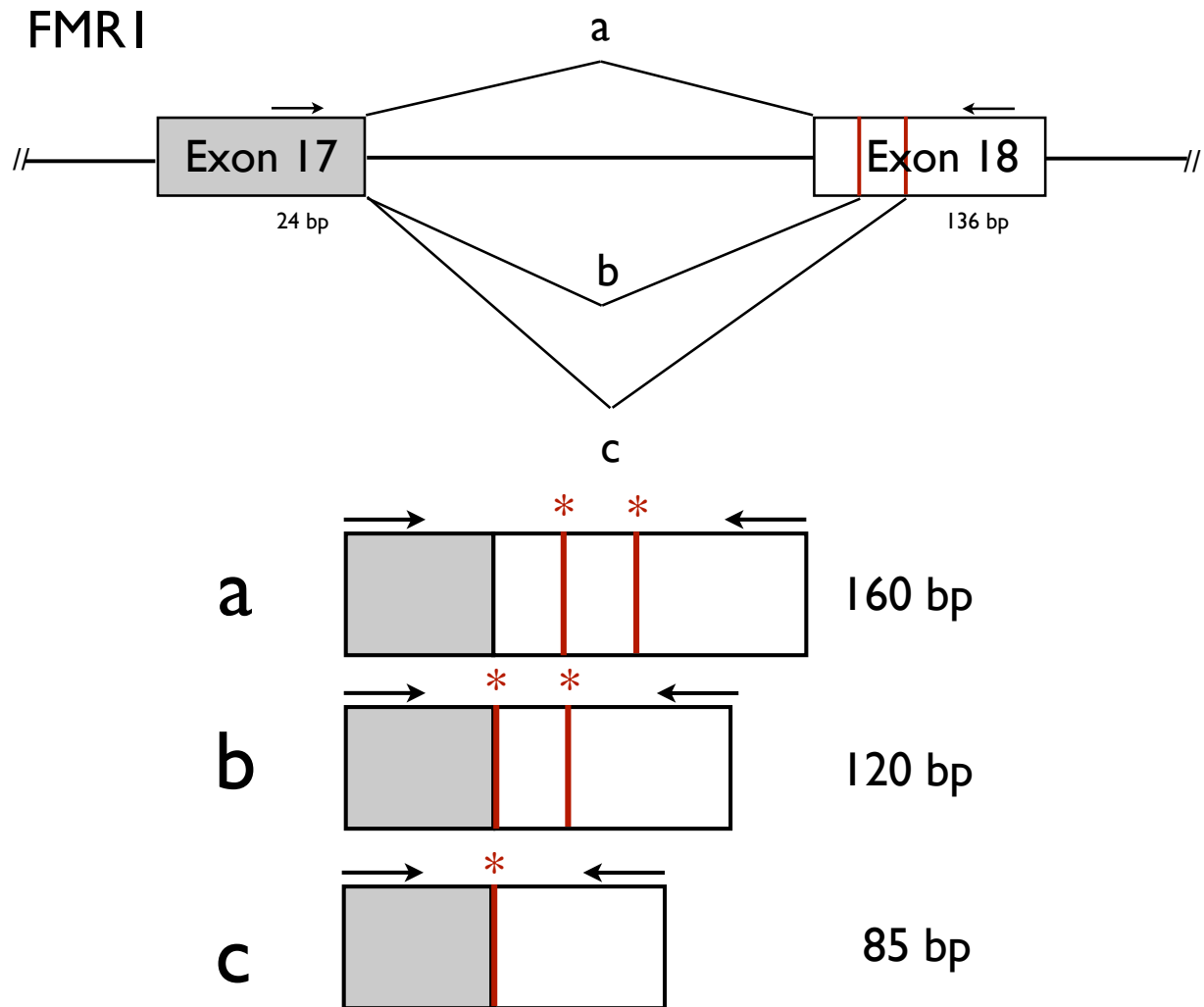


Figure 5. *FMRI*, endogenous to C57BL/6 mice, is shown. The forward primer sits on Exon 17, 24 bp upstream of the 3' end on the exon. The reverse primer sits 136bp downstream the 5' beginning of the exon. Three PCR products are seen using these primers to amplify cDNA obtained from retrovirally transduced murine hematopoietic cells that were treated with either 75nM of Sudemycin or DMSO control. Transcript (a) is a 160 bp product and is the result of normal splice events occurring at the intron-exon junction. Transcripts (b) and (c) are products that resulted from splice events that occurred at cryptic splice sites within Exon 18 highlighted in red. Transcript (b) is a 120 bp product that results from a splice event occurring at the upstream cryptic splice site. Transcript (c) is a 85 bp product that results from a splice event occurring at the downstream cryptic splice site.

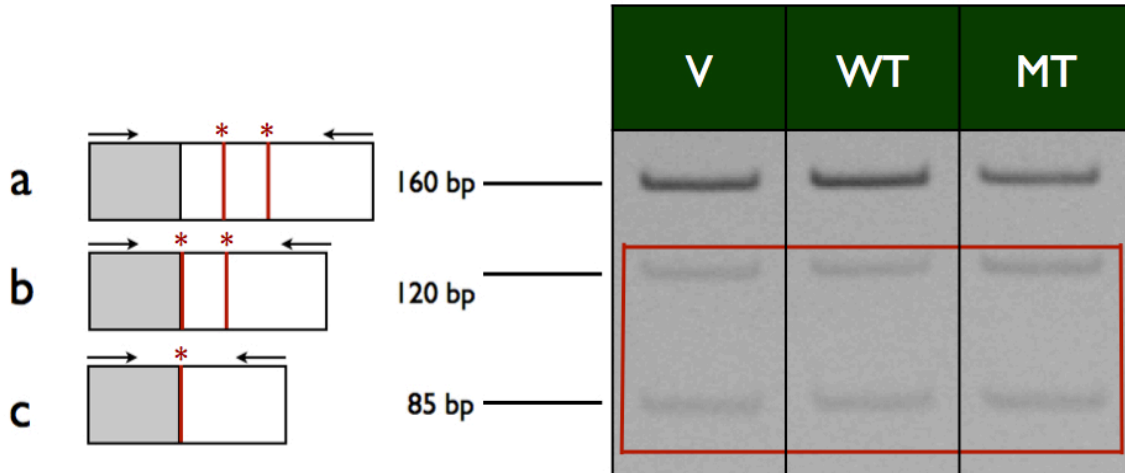


Figure 6. cDNA was obtained from c-kit⁺ murine bone marrow cells that either expressed empty vector+GFP, wild-type U2AF1+GFP, or S34F mutant U2AF1+GFP. These cells were not treated with either Sudemycin or DMSO. The region spanning Exons 17 and 18 in the *FMR1* gene was amplified using PCR and ran on a 10% polyacrylamide gel. Three transcripts were seen. Transcript (a) utilized normal splice sites, while transcripts (b) and (c), highlighted in the red box, utilized cryptic splice sites within exon 18.

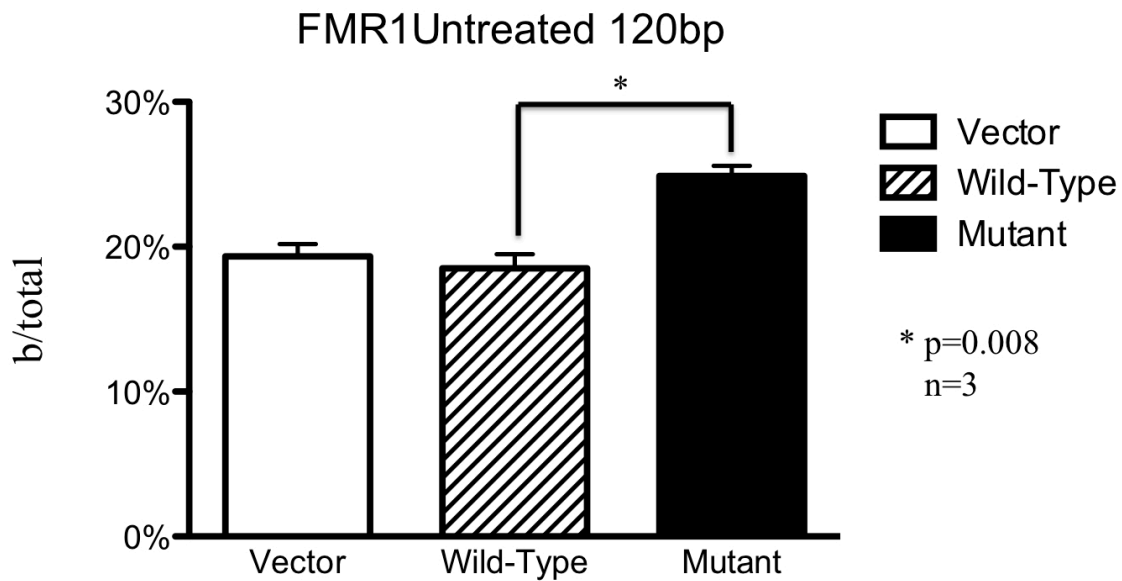


Figure 7. Image J was used to quantify the percentage of transcript abundance after in the polyacrylamide gels seen in Figure 6. Here, the percentage of the 120 bp cryptic splice site transcript (b) was calculated for all 3 virus types. A significant increase in utilization of the upstream cryptic splice site was observed in cells expressing S34F mutant U2AF1 when compared to cells expressing wild-type U2AF1. n=3, p=0.0008.

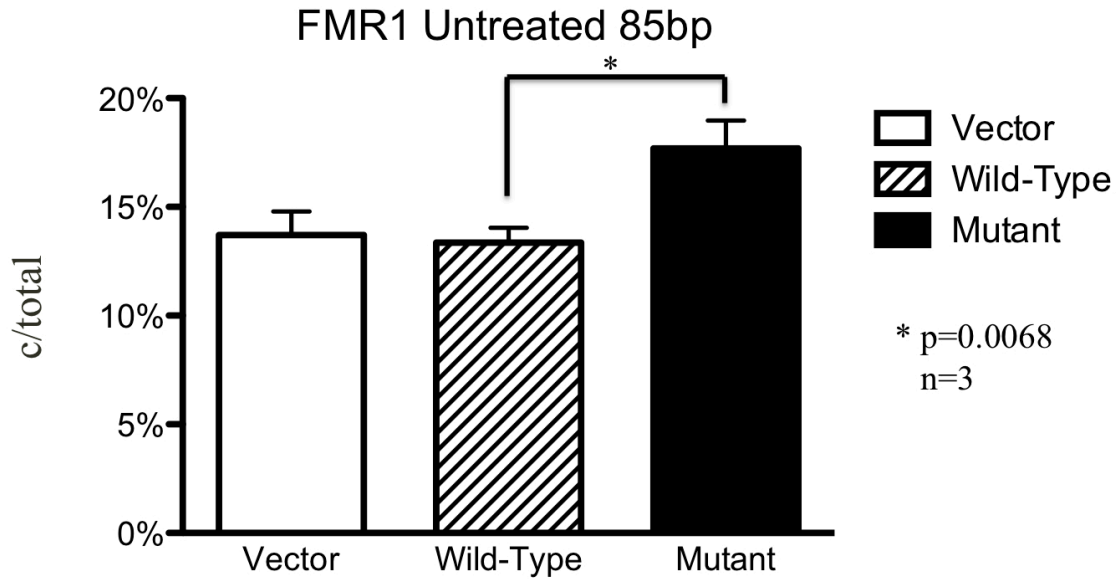


Figure 8. Image J was used to quantify the percentage of transcript abundance in the polyacrylamide gels seen in Table 6. Here, the percentage of the 85bp cryptic splice site transcript (c) was calculated for all 3 virus types. A significant increase in utilization of the downstream cryptic splice site was observed in cells expressing S34F mutant U2AF1 when compared to cells expressing wild-type U2AF1. n=3, p=0.0068.

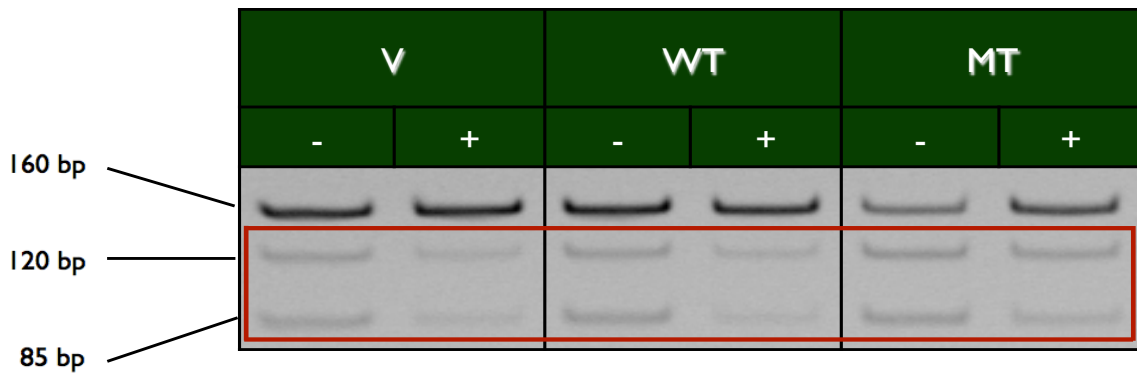


Figure 9. cDNA was obtained from c-kit⁺ murine bone marrow cells that either expressed empty vector+GFP, wild-type *U2AF1*+GFP, or S34F mutant *U2AF1*+GFP. These cells were treated with either DMSO (-) or 75 nM Sudemycin (+) for 6 hours. The region spanning Exons 17 and 18 in the *FMR1* gene was amplified using PCR and ran on a 10% polyacrylamide gel. Three transcripts were seen. Transcript (a) utilized normal splice sites, while transcripts (b) and (c), highlighted in the red box, utilized cryptic splice sites within Exon 18.

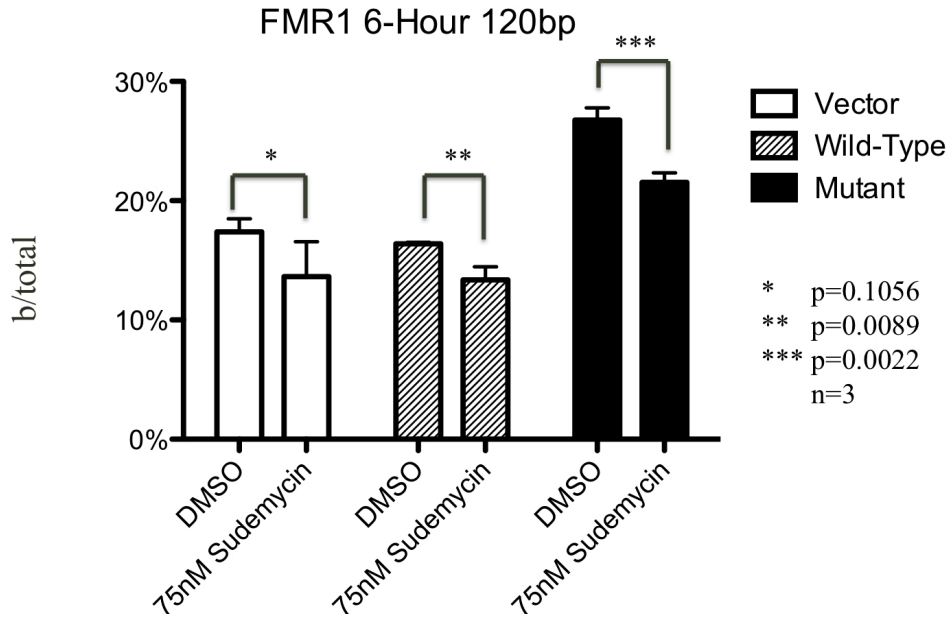


Figure 10. Image J was used to quantify the percentage of transcript abundance in the 10% polyacrylamide gels seen in Figure 9. Here, the percentage of the 120 bp cryptic splice site transcript (b) was calculated for all three virus types and both treatments. A significant decrease in utilization of the upstream cryptic splice site was observed in cells expressing both S34F mutant *U2AF1* and wild-type *U2AF1* after treatment with 75nM Sudemycin when compared to cells treated with DMSO. n=3, WT p=0.0089, MT p=0.0022.

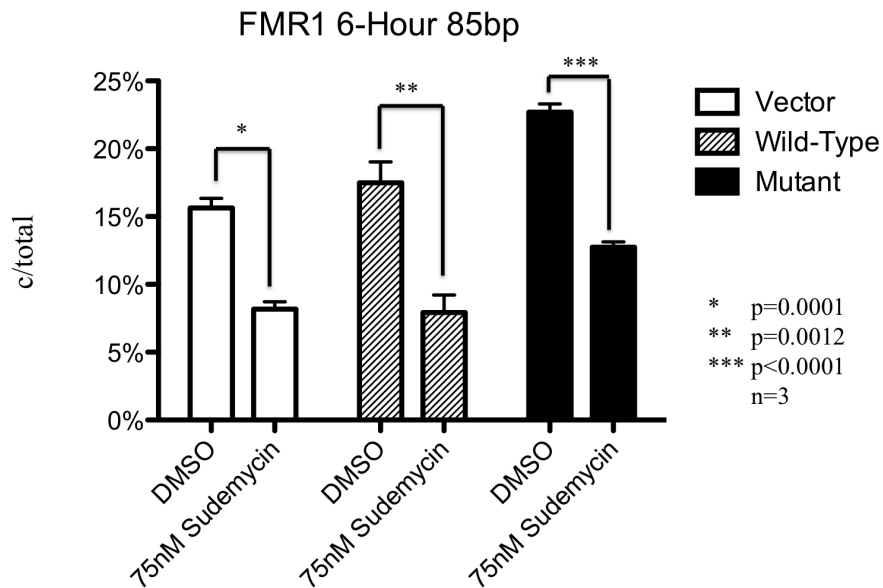


Figure 11. Image J was used to quantify the percentage of transcript abundance in the polyacrylamide gels seen in Figure 9. Here, the percentage of the 85 bp cryptic splice site transcript (c) was calculated for all 3 virus types and both treatments. A significant decrease in utilization of the downstream cryptic splice site was observed in cells expressing both S34F mutant *U2AF1* and wild-type *U2AF1* after treatment with 75nM Sudemycin when compared to cells treated with DMSO. n=3, WT p=0.0012, MT p<0.0001.

Sex Trafficking in the United States

Vanessa Yee

“It’s like being an animal in a cage at the zoo and everybody comes and looks at you and does whatever they want to do with you and then you go back to your cage,” explained sex trafficking survivor, Melissa Woodward. “You are chained to a bed, not allowed to sit, and only given a sandwich and cup of water when your pimp allows it.” Every day is a nightmare of pure torture and agony. You are always at the mercy of your violent and unpredictable pimp or john (customer) who has the power to do whatever he pleases. Each night is different; sometimes you have 5 customers but other times it’s more like 30. Being tortured, burned, beat, starved, raped, and forced to do anything you are told is the norm. They try to cover the external wounds with layers of thick make-up but inside your soul is bleeding to death. You are lowered to the status of an animal or piece of property and you begin to lose hope that life will ever get better—that you’ll ever be rescued. Sometimes the pain is so excruciating that you want to cry but you can’t so you bite your lip so hard that blood begins to drip. Your customer gets grossed out about that and wants to deny that you are hurting so he duck tapes your mouth to prevent the blood and sounds of despair from spilling out. Sometimes you get extremely sadistic customers that find pleasure in pouring gasoline over your frail body intending to kill you. After you miraculously survive that atrocity, you return to your pimp who decides that you are now worthless and useless because you are so severely burned that no one would ever want to have sex with you again. Instead of feeling relieved, you feel scared because now you are a 14 year old girl who is homeless and has to learn to survive the streets alone. Supporting your alcohol and drug addiction to cope with traumatic memories and flashbacks that can arise at any time of the day is not easy. Thoughts of suicide are your closet companion and you find comfort in thinking about ending everything to escape the unbearable pain. Life can’t get any worse or better so why should you continue to live? This is Melissa Woodward’s story but her account of abuse and brokenness is very representative of the 27 million people trapped in bondage to human trafficking around the world. (Woodward, 2012).

Under Article 3 of the *United Nations Protocol to Prevent, Suppress, and Punish Trafficking in Persons*, human trafficking is defined as:

the recruitment, transportation, transfer, harboring or receipt of persons, by means of the threat or force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power, or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Exploitation shall include, at a minimum, the exploitation of the prostitution of others or other forms of

sexual exploitation, forced labor or services, slavery or practices similar to slavery, servitude or the removal of organs. (Clawson et al., 2009, p. 3).

The project I am developing here focuses initially on identifying the major risk factors that foster or contribute to sex trafficking practices. The *Trafficking Victims Protection Act of 2000* characterizes sex trafficking as “the recruitment, harboring, transportation, provision, or obtaining of a person for the purposes of a commercial sex act, in which the commercial sex act is induced by force, fraud, or coercion, or in which the person induced to perform such an act has not

attained 18 years of age” (Clawson et al., 2009, p. 1; 22 USC § 7102; 8 CFR § 214.11).

Every year, some 14,500-17,500 victims are trafficked into the United States; 82% of the human trafficking cases recorded by the U.S. Department of Justice are sex trafficking cases (Clawson, H., Dutch, N., Solomon, A., & Grace, L., 2009; Robinson, 2011). The majority of these victims are females (94%) and 87% are 25 years old or younger (Robinson, 2011). The average age for female sex trafficking victims is between 12-14 years old; surprisingly, for males it is even younger—between 11-13 years old (Clawson et al., 2009). Many assume these victims live or came from outside the borders of the United States; however, that is not the case at all. Around 83% of the victims are documented as US citizens; 26% of these are Caucasian and 40% are African American (Robinson, 2011).

We have allowed this abominable crime to drop too far off our radar. Sex trafficking has now become the second most prolific crime in America (Woodward, 2012). The purpose of this project is to determine effective intervention strategies for individuals who are victims of sex trafficking, or vulnerable to becoming a victim.

Assessing for Major Risk Factors

There are many reasons why individuals become easy prey for predators. The risk factors that will be discussed in this paper are the following: age, poverty, a corrupt and violent environment, a history of childhood sexual abuse, unemployment or dissatisfaction with a job, a dysfunctional family home, and mental health problems such as identity issues and learning disabilities. As alluded to in the paragraph above, age is one of the risk factors that can make individuals more vulnerable. The younger the individuals are, the more impressionable, and naïve they tend to be; and since girls can enter this trade as early as 12 and boys at 11, they are at the ideal age for

predators to exploit them (Clawson et al., 2009). Most of these victims are also from low socioeconomic status, but contrary to stereotypical beliefs, not all of the victims live in poverty. Some are from upper and middle class families because interestingly enough, sex trafficking crosses all socioeconomic levels and also ethnic backgrounds (Clawson et al., 2009). In America, the victims are either Caucasian or African American with African American girls and women being the majority (Clawson et al., 2009).

Individuals who come from an environment that promotes political and police corruption, high crimes, and gender inequality are also more susceptible to becoming victims (Clawson et al., 2009). Shockingly, some of the buyers driving the demand for this trade are law enforcement officers (Johnson, 2011). Because secretive bribes are exchanged between officers and traffickers, many of the victims continue to go undiscovered. This police corruption easily leads to high crime rates and violence that protect the traffickers and buyers from ever getting caught. Gender inequality, which is most prevalent in the more ethnically and culturally diverse regions—specifically California, New York, Texas, and Florida—clearly contributes to the fostering of environments conducive to sex trafficking (Johnston, 2013). Even though the gap between the rights of men and women has greatly diminished, male supremacy is still honored in regions where religious and cultural traditions and beliefs hold sway over the rights and privileges of women. Women do not always have the opportunity or permission to speak out against abuse or neglect for fear of being castrated in their religious circles or cultural activities. As absurd as it sounds, some religions or cultures permit violence against women and children and believe that the man/husband has the right to treat his wife and family however he sees fit.

Having a history of childhood sexual abuse is the most strongly determinant risk factor when it comes to predicting whether individuals will become sex trafficking victims (Clawson et al., 2009). The Huckleberry House Project in San Francisco estimated that about 90% of the women who are living at their shelter as recent victims of sexual exploitation had experienced some form of childhood sexual abuse (Clawson et al., 2009). Another study from a Boston prison reported that of the 106 adult women incarcerated for prostitution, 68% were sexually abused before age 10 and approximately half were raped before age 10 (Clawson et al., 2009). A third study of two sets of juvenile delinquents discovered that about 70-80% of the girls locked up for prostitution had been sexually molested or abused (Clawson et al., 2009). As mentioned in the beginning, the earlier a victim becomes sexually abused, the greater the psychological damage and the greater the likelihood that she will end up a victim of sexual exploitation (Clawson et al., 2009). In fact, girls who have experienced some form of physical, emotional, or sexual abuse are twenty-eight times more likely to be arrested for prostitution than someone without this abusive background (Clawson et al., 2009).

To avoid confusion or misunderstanding, I want to emphasize a distinction between prostitution and sex trafficking, because they differ in significant ways. Prostitution is voluntary and does not involve a pimp, whereas sex trafficking is involuntary and involves a pimp and the use of force, fraud, or coercion (Kaya, 2012). Because of ignorance, and sometimes indifference, law enforcement officers do not typically make a distinction between the two, so when victims of sex trafficking are arrested, they are immediately labeled as prostitutes, who voluntarily chose this lifestyle and should be held responsible for all of their actions (Okech, Morreau, & Benson, 2012). A vagueness is introduced

into the statistics addressing the prevalence of sex trafficking whenever law enforcement officials fail to distinguish between prostitutes and victims of sex trafficking. We do not know how many of the girls and women labeled “prostitutes” actually represent victims of sex trafficking and how many were actively engaged on their own terms in prostitution. Nevertheless, the statistics still support my argument in an interesting way. The statistics show that although most people assume women choose prostitution, many prostitutes appear to be victims compelled into this lifestyle as a result of abusive backgrounds and traumatic experiences suffered in their past.

The victim’s unemployment or dissatisfaction with a current job is another major factor causing them to get caught up in this trade (Clawson et al., 2009). In America, traffickers, both male and female, recruit girls and boys at local high schools, malls, and shopping outlets (Kehe, 2013). Debbie Johnson, the founder of Without Permission, an organization fighting to end sex trafficking in the Stanislaus County, shared a true account of a girl who worked at a store in the Vintage Fair Mall (2011). One evening a deceptively smooth-talking woman approached this naïve girl and first made small talk with her. Then she proceeded to ask her if she enjoyed her job, her hours, her employer and co-workers, and most of all her paycheck. Once she got this girl to tell her how much she was making per hour, she told her, “I make twice, sometimes even triple what you make. My job has flexible hours and you will just love my boss. Come on; let me introduce you to him.” This is a true story and unfortunately the girl bought into these lies and is still entangled in this disaster.

A dysfunctional family environment is another major risk factor causing girls and boys to run away from home and get caught up in risky behaviors that could lead them to the wrong crowds (Clawson et al., 2009).

Several key factors are the use of substances by family members; physical, emotional, and sexual abuse within the home; the loss of a parent/caregiver; being characterized as a throwaway or unwanted; and the lack of a strong support system (Clawson et al., 2009). Carissa Phelps's story is a close-to-perfect example of how these dysfunctional family dynamics played a role in forcing her onto the streets, where she became a victim of sex trafficking (Sauvage, 2009). In her documentary called *From Juvie to Justice*, Carissa describes life at home with eleven other siblings as unbearable because of the lack of food, care, and parental attention, as well as physical and sexual violence that her stepdad was able to get away with (Sauvage, 2009). By the time she was twelve, Carissa had dropped out of school and was frequently running away from home (Sauvage, 2009). After she returned home one day, her mom drove her to the juvenile hall center and abandoned her there (Sauvage, 2009). She didn't last long there but instead ran back onto the streets where she encountered Icey, her future pimp, and Natara, a crack addict and prostitute, both of whom instigated unimaginable brutalities and incessant sexual abuse upon her (Sauvage, 2009). Carissa attributes her reasons for becoming vulnerable to choosing life on the streets and Icey because she didn't receive any positive support from anyone, which lead her to feel isolated, hopeless, and desperate (Sauvage, 2009). In fact women and girls incarcerated for prostitution say that "their isolation, lack of connectedness, and feelings of separation [are] the single most important factors in making them vulnerable to prostitution..." (Clawson et al., 2009, p.10). Living in a dysfunctional family also means that the possibility of one of your parents or siblings selling you to a pimp increases. About 25% of all sex trafficking victims in America are sold to a pimp by an immediate family member (Woodward, 2012). Melissa Woodward is one

example of this sobering fact because one of her family members sold her into sex slavery when she was only 12 years old (2012). Children who don't feel safe and protected in their own home tend to believe that life on the streets is better. Unfortunately about 90% of child runaways are approached by a trafficker within the first 48 hours and over 50% become a victim of sex trafficking (Woodward, 2012).

A couple other risk factors are girls and boys with mental health problems, sexual identity issues, and learning disabilities (Clawson et al., 2009). The sexual identity issues seems to be more of a factor among boys who run away from home because they are transgender, gay, or bisexual and their families do not accept them (Clawson et al., 2009).

At first-glance, the solutions to decreasing some of these risk factors seem obvious. For example, if a girl seems at-risk for becoming a victim of sex trafficking, she would simply need to be given an education and a secure job to be financially stable, have transportation, relocate to a safer and structured environment, receive counseling and therapy for her history of childhood sexual abuse and dysfunctional family life, receive medical care, and have list of short term and long terms goals to keep her focused and motivated. However, there are many barriers for both the front-line responders and the victims that prevent victims from receiving these resources and help. The solutions to this problem seem to be educating front-line responders to be aware of the risk factors, recognize the indicators of a potential victim or trafficking case, and be equipped to assist the survivor in receiving the most effective treatments and resources. Another solution is formalizing a standard national definition and check-list that defines victimization so that victims will not be treated as criminals, which only deepens the tender scars that they are already suffering.

Effective coordination of adequate services and culturally adept providers is another part of this solution. The solution for victims seems to be in the prevention aspect by educating them on what sex trafficking is, the tricks that pimps use to lure them, the detrimental consequences of life as a prostitute, and most importantly—all the alternative and beneficial paths that they can choose instead.

The most daunting barrier for front-line responders (law enforcement officers, social service providers, medical providers, and educational providers) is ignorance about the reality of sex trafficking and being unaware of the indicators of a potential sex trafficking case which are very extensive and depend on whether the victim is from within or outside the United States (Macy & Graham, 2012). Some general indicators are the following: lacks control over his/her schedule and/or money, has health concerns (HIV/AIDS, pain, pregnancy), has signs of physical abuse (bruises/scars) that he/she doesn't want to discuss or tells an inconsistent stories about, has signs of addictions/substance abuse, has no personal belongings, has poor living and working conditions (restrictions), does not have family support, has been previously victimized physically and/or sexually, is living in a brothel, is living with extensive security and/or restricted public areas, is monitored while at appointments with service providers, has moved residences often, fears police and/or authorities, lives with employer, appears to have been coached how to speak, is paid in a way that is not comparable to the work being done, is unable to leave a job or place of residence, has an inconsistent life story, comes to the office with different individuals each time, can't speak for his/herself, and reports exceptionally high numbers of sexual partners much older than he/she (Macy & Graham, 2012).

The situation is even more complex for international victims. Some more specific

indicators include being controlled (not being able to speak for herself, needing a translator or third party); being new to the country; not having any educational opportunities; being from countries with considerable corruption, crime, and poverty; being unable to speak English; lacking knowledge about where she lives and how to live with her community; not possessing travel documents or any form of identification; having a large debt and not being able to pay it off; or claiming that she is “just visiting” (Macy & Graham, 2012).

Researchers Gozdziaik and MacDonnell give an example of a typical case study where front-line responders failed a girl named Analis multiple times (2007). Although Analis was victim of labor trafficking instead of sex trafficking, her story still supports the fact that front-line responders are ignorant of the red flags (identification factors) and are not equip to assist victims of trafficking. When Analis was illegally brought over to America from Honduras, immigration officials failed to realize that her documents were fraudulent. When a neighbor noticed that Analis was not attending elementary school and reported this to this police, the police did not do a thorough investigation of the situation and simply demanded that Analis be taken to school. Analis barely attended school before the school required Carmen, her stepsister, to send in Analis's birth certificate and immunization records. Carmen didn't have those documents so Analis quit school a couple days later and was forced to continue working for her stepsister. Unfortunately, the educational providers failed to further investigate who was taking care of Analis and why she didn't have these basic medical records. Fearing the police's potential interrogations, Carmen moved Analis from the West coast to the South. When Carmen was arrested for fraud, Child Protection Services (CPS) took Analis into custody. Again the system failed and CPS didn't ask the right questions or recognize any unusual

characteristics about this situation that would have lead them to discover that Analis was a victim of labor trafficking. Analis continued to remain undiscovered even when she was placed in a detention center for eight months and in foster care for one year all while continuing to come into contact with the FBI, law enforcement, immigration officials, and counselors. Analis's case is an accurate reflection of the majority of these instances and proves that front-line receivers need to work on tightening up the numerous gaps in the system that are allowing sex and labor victims to stay under the radar (Gozdziak & MacDonnell, 2007).

Another barrier for front-line responders in identifying and assisting victims of sex trafficking is that there is no standard definition of a victim so many officers overlook, dismiss, or incorrectly define the individual as a criminal (Clawson et al., 2009). To illustrate this point further, a study reported that from 241 juvenile prostitution arrests, 229 were convicted as offenders and only 61 were treated as victims (Clawson et al., 2009). Even when the officers do arrest victims for prostitution, the officers have sometimes disregarded the prostitution offense and recorded a different or more minor offense out of sympathy for the victim. The lack of unification among the front-line responders means that there is no effective way to coordinate the many services the victims will need. Successful treatment only follows when a team of providers collaborates throughout the entire process of a victim's recovery. Front-line responders are not the only ones contributing to this problem.

Victims have many barriers to receiving and accepting help from front-line responders. First of all, perpetrators have most likely taught their victims to fear law enforcement and social service providers by telling them that officers and social workers are only going to arrest or deport them from the country (Johnson, 2013). Unfortunately, many victims

believe this lie because of their negative experiences with officers in the past and reject legal/law enforcement help. Secondly, because of the psychological abuse they have undergone, many victims have a distorted mindset preventing them from realizing that they are indeed victims being abused (Johnson, 2013). They tend to believe that their pimp really does love them because he always tells them how beautiful and special they are and only starves, beats, or rapes them once a week compared to every day. They are very emotionally dependent on their pimp for all their needs that he provides and therefore, they feel that they owe it to their pimp to protect him no matter what.

In the grooming stage of sex trafficking, pimps repeatedly engrain rules of domination and submission into each of their victims. Here are some examples reported by one victim: "never disrespect your pimp, never let anyone [else] disrespect your pimp, trust your pimp, stay loyal...[and] honest with your pimp, never let black people see your face or eyes..., respond and talk to your pimp with manners and respect at all times using 'daddy' in each sentence, be down and dirty and side or die for your pimp even if it involves sacrificing yourself. Your pimp is your priority...[so] you are to see to his every need, when in doubt ask your pimp, and always obey your pimp" (Johnson, 2011).

Thirdly, language and cultural barriers inhibit victims, especially victims who are trafficked from outside of the United States, from receiving proper help (Clawson et al., 2009). This barrier particularly applies to individual and group therapy and having culturally appropriate curriculum and discussions. Fourthly, victims experience an enormous load of shame and guilt from this lifestyle and eventually believe that they are worthless, helpless, and only good for sex (Johnson, 2011). This destructive mindset disables them from hoping that life can and should be better than this and that they were

made for a much richer and satisfying life. Fifthly, some victims, when they do get rescued, refuse to accept help for fear of the medical ramifications of being diagnosed with a mental health disorder or substance abuse problem (Clawson et al., 2009). Many of them do not have the financial or emotional support to drive to and pay for services to help them cope in healthy and safe ways with their stressful lives. They need a strong, consistent, and patient support system—one that stays with them whether they move forward or fall a few steps back; more often than not, they will not receive this level of support, for many providers have overloaded caseloads and do not have the capacity to invest the necessary amount of time and energy into each starving and emotionally needy survivor. As a result, relapse is an unfortunate and undeniable result.

Because these barriers affect both front-line responders and survivors, the initial steps in solving the problem of sex trafficking seem to require efforts to educate front-line responders to become aware of the risk factors, to recognize the indicators of a possible victim or trafficking case, and be equipped to assist the survivor in receiving the most effective treatments and resources. The solution also calls for formalizing a standard definition and check-list of indicators pointing to a victim of sex trafficking so these victims will not be treated as criminals, which can only deepen the wounds and repress the tender scars they already suffer from. Effective coordination of adequate services and culturally adept providers is another part of the solution. The best angle of intervention lies in prevention, by educating potential victims about the ensnaring side of sex trafficking, the tricks used by pimps to lure them in, the detrimental consequences of living their life as a prostitute, and, most importantly, some perspective on the alternative and beneficial paths they can choose instead.

Methods Guiding the Study

To better understand these issues and identify possible interventions, I will select 150 male and 150 female survivors of sex trafficking between the ages of 11 to 50 and 18 front-line responders. I will choose 30 survivors from juvenile halls; the adult prisons; orphanages; child protective services; and anti-trafficking organizations such as *Without Permission*, *Shared Hope International*, and *ForthesakeofOne*. Front-line responders will include law enforcement officers, social service providers, educational providers, medical providers, child protective services, and founders of anti-trafficking organizations.

First, I will have each survivor complete a survey about which risk factors apply to them and to what degree, background information about their childhood and family life, how many intervention programs and resources they have utilized so far and how long they have utilized them, and how many years since they had been trafficked. Next, I will randomly choose 4 survivors, 2 females and 2 males, with whom to conduct an in-depth case study. If they consent, they will go through a process of 3, 1 hour 30 min interviews where they answer a series of questions that will help them tell their story. Then, I will have all of the front-line responders answer a questionnaire gauging their knowledge about the nature of human trafficking, risk factors, identification factors, and the most effective solutions to a variety of cases involving minors, children, and other complications. Finally, I will randomly choose half of the front-line responders to interview. They will answer a series of questions to help them tell me about their experiences with victims of sex trafficking.

My analysis of the survivor's surveys will help me to revise the list of risk factors researchers have already produced and assess the number of resources they are currently using so as to have a base line to compare it to after five years of making improvements in

the system. I will use the information I learn from the interviews to figure out the short-term and long-term needs of the survivors and the resources that can most effectively fulfill those needs. I will create charts, tables, and graphs of the different community resources available and which resources pertain to which needs. For the questionnaires that the front-line responders will answer, I will use this information to put together training workshops and conferences that will equip them with the knowledge and skills to more effectively rescue and restore survivors. I will use the answers from the interviews to revise the list of barriers for front-line responders and create and implement a step-by-step plan of action to counter those barriers. I will also create a working document for the services that survivors at different stages in the recovery process would benefit from.

Anticipated Results

I anticipate that my results will reflect and support previously documented research showing that many victims of sex trafficking begin between the age of 11-14; that they are from all socioeconomic levels and all ethnicities/nationalities; that they live or once lived in environments that fuel political and police corruption, violence, and high crimes; and that they have a history of childhood sexual abuse, haven't had a stable job sufficient to pay for their basic needs, come from a dysfunctional family home with hidden or explicit history of sexual violence, and perhaps have had other mental health problems. I also anticipate that front-line responders will know very little about the risk factors or identification factors to keep in mind when confronting a possible sex trafficking case, nor much about the most effective resources to offer victims, or potential victims, of sex trafficking. I anticipate finding very little awareness of the problem, the resources, or the feasible interventions that have been tested and shown to be effective.

The results are likely to show that although the solution seems easy enough to implement, the barriers involved undermine the effort. We can control the barriers with law enforcement and providers by training them on identification factors, but I don't know if we would be successful countering the barriers regarding the victims unless we focused on prevention with at-risk girls and boys who look like they might be heading in that direction. But it might be too late by then.

But even if we were able to identify potential or at-risk girls and boys earlier and give them secure jobs, access to education, tutoring, counseling/therapy for trauma background, medical care, legal assistance, or other support services, this still might not be enough. The victims or potential victims might not want the help, might not be consistent in coming and doing their school work, might not believe they need counseling, or might be afraid of authority figures. In my volunteer work, I am working with girls who have been juvenile delinquents and can be characterized by many of the risk factors I have identified in this overview. I have discovered that even though we provide GED tutoring, job skills/character-building classes, community college programs to prepare them for success in college, and information about additional support services available to them, many have rejected our assistance, are not consistent in attending, or have low self-motivation. Sometimes I feel we want them to be successful more than they want to be successful. I can think of several girls who have rejected help despite our many attempts to reach out to them.

Girls who do get a job often can't maintain the job because they don't come on time, don't talk appropriately, take their complaints/bitterness in personal life to work, gossip, steal, lie and cheat, are lazy, don't ask questions when they don't understand or need help, don't dress appropriately because don't have enough money to buy professional

clothes, don't have dependable transportation, don't have child care (most have kids)...and the list goes on. Many are so defeated, hopeless or beaten down emotionally and psychologically I think it is no longer about changing their environment/circumstances but about changing their way of thinking and their perceptions of themselves, their past, their present, and the people who want to help them.

Conclusion

Although serious efforts to raise awareness and target sex trafficking are relatively recent in origin, the reality of the practice is striking:

sex trafficking and other forms of human trafficking have been spiraling out of control for so long that researchers recently estimated there are now 27 million enslaved people worldwide (Clawson et al., 2009). These slaves are thrown into and lost to a life of horror, where they are treated as mere animals and considered nothing more than a commodity or object. We have allowed this atrocious and appalling crime to flourish long enough; it is time that Americans and nations around the world unite in taking a bold stand to protect the honor and dignity of these vulnerable human beings.

References

- Clawson, H., Dutch, N., Solomon, A., & Grace, L. (2009). Human trafficking into and within the United States: A review of the literature. *U.S. Department of Health and Human Services*: <http://aspe.hhs.gov/hsp/07/HumanTrafficking/LitRev/index.shtml#top>
- Gozdziak, E. M. & MacDonnell, M. (2007). Closing the gaps: The need to improve identification and services to child victims of trafficking. *Society of Applied Anthropology*, 66(2), 171-184.
- Johnson, D. (2011, April). *Be a Hero: Stop Human Trafficking*. Without Permission presented at Modesto Junior College, Modesto, CA.
- Johnson, D. (2013, February). *Navigator Training*. Without Permission presented at The House
- Johnston, C. (2013, February 28). Panels: Human trafficking is local. *Tampa Bay Times*, p. B3.
- Kaya, O. (2012). Analyzing the voluntary and involuntary foreign sex workers: A case study of Turkey. *Dissertation Abstracts International Section A*, 73.
- Kehe, M. (2013, March 15). Kimberly Ritter stands up to child sex trafficking in US hotels. *The Christian Science Monitor*, world section. Retrieved from: <http://www.lexisnexis.com.ezproxy.lib.csustan.edu:2048/hottopics/lnacademic/>
- Macy, R.J. & Graham, L.M. (2012). Identifying Domestic and International Sex-Trafficking Victims During Human Service Provision. *Trauma, Violence, and Abuse*, 13(2), 59-76.
- Okech, D., Morreau, W., & Benson, K. (2012). Human trafficking: Improving victim identification and service provision. *International Social Work*, 55(4) 488-503.
- Robinson, L. (2011). Most suspected incidents of human trafficking involved allegations of prostitution of an adult or child. *Department of Justice Office of Justice Programs*. Retrieved from: <http://www.ojp.usdoj.gov/newsroom/pressreleases/2011/BJS11093.htm>
- Sauvage, D. (2009, June 22). *Carissa: From Juvie to Justice* [Youtube video]. Retrieved from <http://www.youtube.com/watch?v=92pN8XMvurM>
- Woodward, Melissa. (2012, April 18). *Sex Trafficking in America: A Former Sex Slave's Story of Hope and Forgiveness* [Youtube video]. Retrieved from: http://www.youtube.com/watch?v=9L5Ibg_aCd4&list=PLA9A0E9C5362C5D36

What Can Be Learned From A Fossil Tooth? An Inquiry Into The Life & Diet Of A Small Theropod Dinosaur

Karolyn Hamlin

The Hell Creek and Lance Formations of Montana, North Dakota, South Dakota, and Wyoming (Fig. 1) are valuable sources of Maastrichtian age (Late Cretaceous) fossils. The Maastrichtian is the last age before the well-known Cretaceous-Paleogene (K-Pg) extinction that marked the demise of the non-avian dinosaurs. Studying the fossils of these formations is not only key to understanding the effects the K-Pg extinction had on biodiversity, but understand the biodiversity trends leading up to it. Through understanding these trends as well as the characteristics of

the animals alive at the time, paleontologists strive to understand why the K-Pg extinction seemed to affect dinosaurs so heavily compared to other organisms. Diverse vertebrate remains have been found at these sites, including fish, sharks, amphibians, mammals, reptiles, and birds. The phrase “non-avian dinosaurs” hints that birds are considered dinosaurs, the avian dinosaurs, and this paper will focus on the group that includes birds, their close ancestors, and near cousins: the theropods.

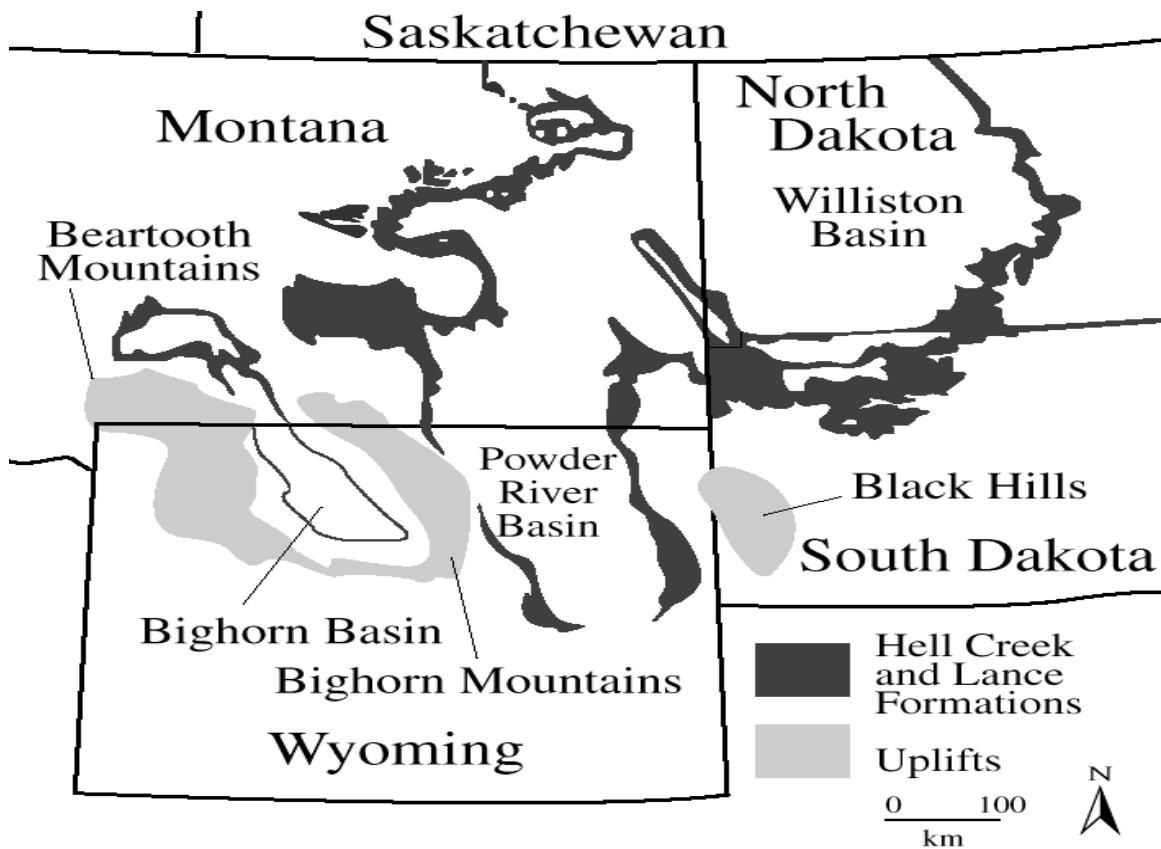


Figure 1: Map of the Hell Creek and Lance Formations. (Modified from Johnson, 1992)

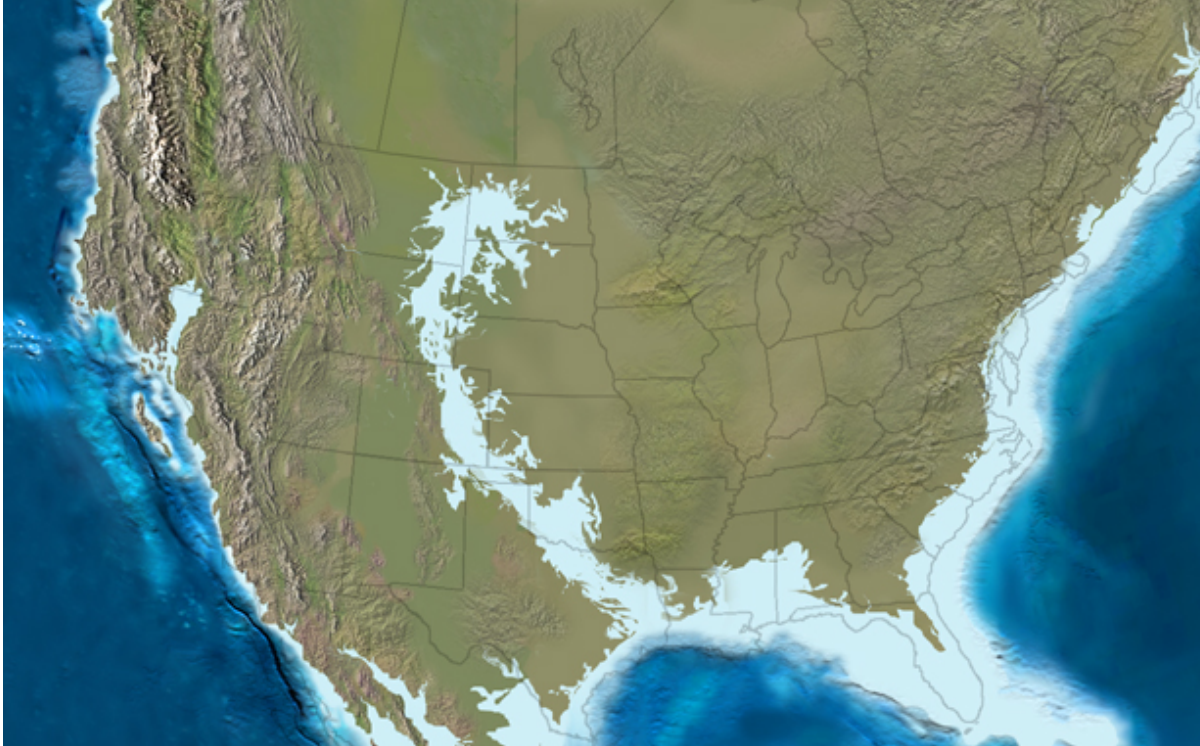


Figure 2: Recreation of the Late Cretaceous Western Interior Seaway. The Hell Creek and Lance Formations cover areas that were very near water, making fish available as prey animals. (Blakey, 2006)

If you have ever been to a museum with a dinosaur exhibit, you may have seen a recreation of a large theropod such as *Tyrannosaurus rex* or *Allosaurus*. Indeed, fossil remains of Tyrannosaurids have been found in the Hell Creek and Lance Formations (Longrich, 2008). However, not all theropods are as massive or as well documented as *T. rex*. Two such enigmatic taxa are *Richardoestesia isosceles* and *Paronychodon*, which are known only from teeth. Interestingly, even though only teeth have been found, these two taxa compose over half of all small theropod teeth from Maastrichtian microsites (Sankey, 2008). What were these creatures? Why were they so abundant? To answer these questions, we must first consider what can be learned from a fossil tooth.

PREVIOUS STUDIES

Teeth can offer numerous clues about an animal's diet. We know from our own

mouths that flat teeth for grinding are useful for consuming fibrous plant material, and sharp teeth for puncturing or shearing are good for eating meat. Beyond these very general types, teeth can be grouped for more specific functions. For carnivores, one very important function is the method of seizing and disabling prey. It has been suggested that the straight, isosceles triangle shape of *Richardoestesia isosceles* teeth would be suitable for catching and eating fish (Sankey 2008, Longrich 2008). Because of these observations, we chose to focus on characteristics of piscivorous, or fish-eating, vertebrates.

Judy Massare's "Tooth Morphology and Prey Preference of Mesozoic Marine Reptiles" established 'feeding guilds' for ancient marine predators by relating records of stomach contents to the overall shape, robustness, and wear of their teeth. A guild is "a group of species that exploit the same

class of environmental resources in a similar way” (Root, 1967) without considering taxonomy. Therefore, a feeding guild for predators would include animals that consume the similar prey items in similar ways, without necessarily being related. To determine these guilds, Massare used both quantitative and qualitative methods. For the quantitative, two types of ratios were measured from the Mesozoic marine reptile teeth as well as the teeth of modern marine predators such as dolphins and whales for comparison. First was the crown height (the height of the tooth not including the root) to gullet width (the distance between the jaws) ratio to demonstrate the size of the tooth relative to the size of the mouth. Second was the crown height to basal width (the width at the bottom of the crown) ratio for measuring the robustness of the tooth. Qualitatively, wear patterns were examined to further determine robustness, as well as to make inferences about what kind of surfaces those teeth were striking. These ratios and characteristics of taxa with known diets (either from observation of the modern predator’s feeding behavior or fossilized stomach contents) were compared and

contrasted. From this research, Massare was able to make inferences about the diets and ecological niches of the Mesozoic marine reptile taxa for which no stomach content data was available.

METHODS

Quantitative: Using data sets from Sankey, 2008, we calculated basal width to crown height ratios of *Richardoestesia isosceles* teeth and compared them to ratios from Massare, 1987. Because *Richardoestesia isosceles* teeth have ovoid cross sections, we averaged the values of cross-sectional thickness (CST, Fig. 3) and fore-aft to basal length (FABL, Fig. 3) for the basal width values. We calculated ratios from the data set from specimens where the height, CST, and FABL were available and certain. Specimens where some measurements were not listed or the teeth were chipped (making the actual height uncertain) were excluded in the calculations. Because *Richardoestesia isosceles* is only known from teeth, we were unable to calculate the crown height to gullet width ratio.

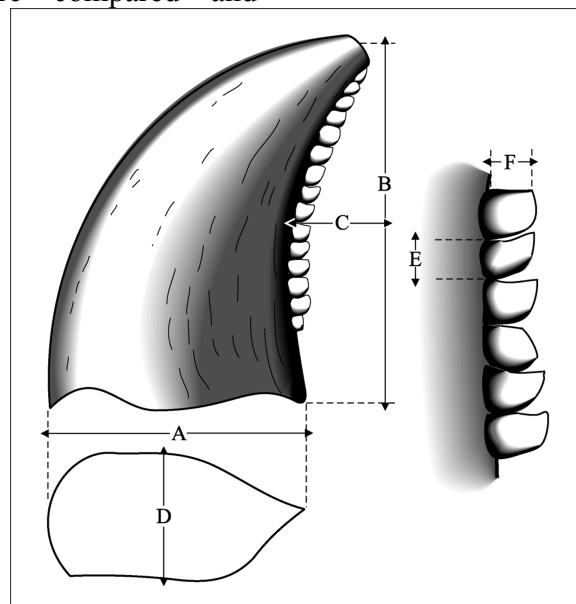


Figure 3: Diagram of measurements of a ziphodont tooth. Ziphodont teeth are characterized by the presences of denticles, like the serrations of a knife, as well as recurvature and lateral compression. A = Fore-Aft Basal Length (FABL). B = Crown Height. C = Recurvature. D = Cross-Sectional Thickness (CST). E = Denticle Width. F = Denticle Height. (Sankey, 2008)

Qualitative: We compared the overall tooth shape and wear patterns of *Richardoestesia isosceles* to the tooth morphology feeding guilds presented in Massare 1987.

RESULTS

Quantitative: Values were available and complete for twenty-two specimens from the *Richardoestesia isosceles* data set. The averaged basal width to crown height ratio was 2.9. This ratio falls within the ranges for the General, Pierce II, and Smash feeding guilds described in Massare (1987).

Qualitative: *Richardoestesia isosceles* teeth are elongated triangles with slightly rounded yet acute apices. The triangular silhouettes of the teeth (Fig. 4) were most consistent with the Smash guild, and not dissimilar from the General and Pierce II guilds (Fig. 5). However, all of the guilds had teeth with circular cross sections, most of which came from conical teeth. *Richardoestesia isosceles* teeth differ considerable in this respect, as they exhibit the lateral compression of ziphodont dentition characteristic to theropods.

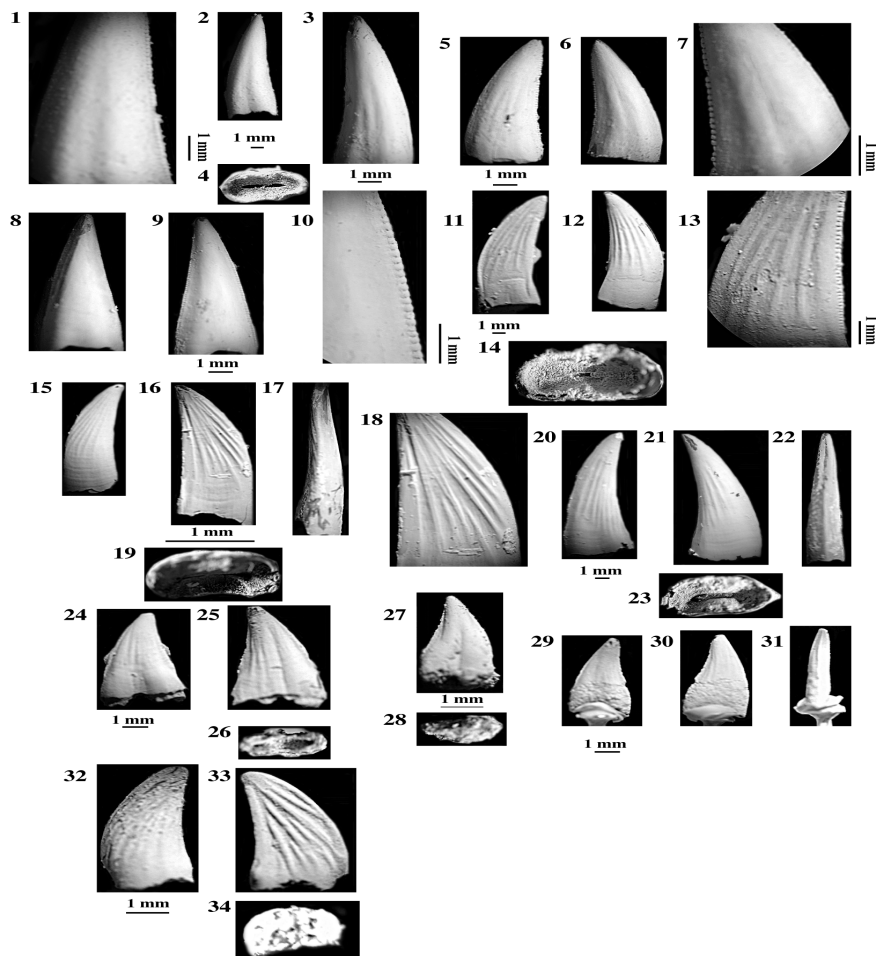


Figure 4: Small theropod teeth from the Lance and Hell Creek Formations. 1-10, *Richardoestesia isosceles*; 11-23, *Paronychodon lacustris* Morphotype A; 32-34, *Paronychodon lacustris* Morphotype B; 24-31 are bird teeth. (Sankey, 2008)

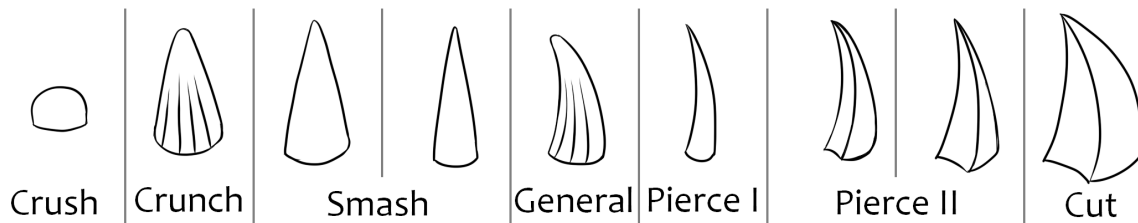


Figure 5: Tooth morphology-prey type guilds. (Modified from Massare, 1987.)
Richardoestesia isosceles fit the Smash, General, and Pierce II morphologies and had similar shape ratios.

DISCUSSION

The basal width to height ratio of *Richardoestesia isosceles* corresponds to tooth morphology feeding guilds called General, Pierce II, and Smash. The General guild and Pierce II guild are similar in that they consist of long yet not delicate teeth suitable for piercing. They are different in that the Pierce II guild has smooth teeth and the General guild has teeth with longitudinal ridges with wear indicative of both piercing and smashing actions. However, Massare notes that this distinction may not be very significant. The Smash guild is characterized by small teeth with rounded tips. Unfortunately, because *Richardoestesia isosceles* is only known from isolated teeth, comparing tooth size relative to the size of the jaw is not possible.

CONCLUSIONS

Because of the similarity in relative shape, *Richardoestesia isosceles* teeth would be suitable for prey similar to the prey of metriorhynchids, teleosaurs, plesiosaurs, pliosaurs, and ichthyosaurs. This includes small fish and other small aquatic life. Given its tooth shape and environment, it is very possible that *Richardoestesia isosceles* was a fish-eater.

FURTHER RESEARCH

Additional Data Collection. Additional data collection is in progress. Currently, specimens

of piscivorous vertebrates are being examined for comparison at UC Berkeley. In addition to the previous methods, we are looking for qualitative information on the tooth placement and orientation within the jaw, as well as more detailed accounts of tooth wear. Although we do not have any jaw bones for *Richardoestesia isosceles*, we plan to see if there is consistent tooth orientation and wear patterns across fish eating vertebrates. In addition to this, a trip to the University of Washington, Seattle is planned. Many of the teeth identified as *Richardoestesia isosceles* from the UC Berkeley collections are in their possession. While there, more detailed accounts of tooth wear will be recorded. This will be compared with the data collected at UC Berkeley to potentially make further conclusions.

Stable Isotope Analysis. Stable isotope analysis is useful for studying aquatic ecosystems. The basic principle is that the higher the trophic level (the higher up in the food chain), the higher the number of heavy isotopes in the animal's body. These heavy isotopes can still be detected even after millennia. The concept is similar to carbon dating. The reason this method is good for aquatic ecosystems is because of the large number of trophic levels within them. In a terrestrial environment, a plant might be eaten by a grazer, and the grazer might be eaten by a predator. But in an aquatic environment,

many predators are themselves prey to larger predators. This dramatically increases the number of trophic levels (links in the food chain) and this in turn increases the levels of heavy isotopes. A chemical comparison of *Richardoestesia isosceles* enamel with enamel of a theropod known to eat terrestrial prey would demonstrate the difference in the number of trophic levels between them, and therefore give clues as to the diet of *Richardoestesia isosceles*.

There are, unfortunately, a few issues with this method. The first is that the sampling method is destructive, and special permission would be needed to destroy the specimens. Secondly, *Richardoestesia isosceles* teeth have thin enamel layers. So it would be difficult to properly sample them, and even then, many teeth would be needed. Although this method would provide some solid information, it is currently impractical. However, if the methodology or equipment

used for analysis is improved, this could be a viable option.

Biomechanical Analysis. A biomechanical analysis assesses the forces a body is capable of exerting. In this context, the analysis would focus on the strengths and weaknesses of *Richardoestesia isosceles* for different types of biting motions. Because some believe *Richardoestesia isosceles* and *Paronychodon* may be mutant teeth from many different species, rather than teeth from species of animals, this might help demonstrate whether they are capable of withstanding the forces needed to bite into prey.

Microwear Analysis

Microwear analysis examines the minute scratches and pits in teeth from their use. This method has been primarily used for mammal teeth, but this may be suitable for our goals. Microwear data from piscivorous vertebrates would need to be collected for comparison.

Works Cited

- D'Amore, Domenic C. "A Functional, Behavioral, and Taphonomic Analysis of Ziphodont Dentition: Novel Methodology for the Evaluation of Carnivorous Dinosaur Feeding Paleocology." Diss. Rutgers University, 2009. *Rutgers University Community Repository*. Rutgers University. Web.
- Johnson, K.R. 1992. Leaf-fossil evidence for extensive floral extinction at the Cretaceous-Tertiary boundary, North Dakota, USA. *Cretaceous Research* 13:91-117.
- Longrich, Nick. "Small Theropod Teeth from the Lance Formation of Wyoming, USA." *Vertebrate Microfossil Assemblages: Their Role in Paleocology and Paleobiogeography*. Bloomington: Indiana UP, 2008. 135-58. Print.
- Massare, Judy A. "Tooth Morphology and Prey Preference of Mesozoic Marine Reptiles." *Journal of Vertebrate Paleontology* 7.2 (1987): 121-37. *JSTOR*. Web. 11 Sept. 2012.
- Peterson, B. J., and B. Fry. "Stable Isotopes in Ecosystem Studies." *Annual Review of Ecology and Systematics* 18.1 (1987): 293-320. Print.
- Root, Richard B. "The Niche Exploitation Pattern of the Blue-Gray Gnatcatcher." *Ecological Monographs* 34.4 (1967): 317-50. *JSTOR*. Web.
- Sankey, Julia T. "Chapter 8: Diversity of Latest Cretaceous (Late Maastrichtian) Small Theropods and Birds: Teeth from the Lance and Hell Creek Formations." *Vertebrate Microfossil Assemblages: Their Role in Paleocology and Paleobiogeography*. Bloomington: Indiana UP, 2008. 117-34. Print.

Female Sports Books and the Values of Athletic Experience: Influencing Value Formation in Young Girls Who Are Not Athletes

Andrea Fett

Sport books aimed at teenage boys have often been studied to determine if they help teachers and other adults convince boys to read and help connect them to literature. Sport books written for boys typically focus on a young male as a protagonist whose friends are primarily other boys. These books tend to promote the themes of teamwork, self-esteem and working hard to create success. These themes are less often addressed to sports in books aimed at teenage girls. Would teenage girls benefit from reading sport books where the protagonist is a female athlete whose friends are primarily girls, and who has to deal with problems that girls in high school have to face, such as problems with friends, relationships, or questions about the future? I am interested in evaluating these books and researching whether sport books aimed at girls produce the same themes and values created in girl's sports, such as teamwork, friendship, recognition, and developing a more positive self-concept (Angove 12). These social benefits are thought to influence girls who play sports, helping them to perform well in school and to have higher self-esteem, more self-confidence and more self-awareness. In addition to reviewing the themes produced in sports literature, I am also interested in researching whether reading these books can provide girls with examples of how to handle situations they come across as they enter high school. I am curious whether girls who do not participate in sports can become better prepared for difficult choices some are likely to face in high school by reading sports books featuring girl athletes and written for girls. Would this type of reading help them make positive decisions? I also want to see if girls who participate in sports find the lessons and experiences in these books more valuable and pertinent than

do the girls who do not participate in sports.

Rationale and Research Question

My research seeks to address the following questions: what values do sport books portray when they are written for girls? How do they relate to boys sport books? Can teenage readers gain the values portrayed in these books simply by reading them? How much does the experience of reading a sports book supplement the athletic experience? I also want to discover how closely the values portrayed in girls sport books relate to the values girls gain while playing sports.

Specifically, I want to know if girls who read these books actually begin to experience the same values and positive mindsets that female athletes typically gain by actually playing sports. If I can show this is the case, I will want to learn more about how this reading experience affects athletes and non-athletes, respectively, and how the sports experiences and interests of these two subgroups impact their reading experiences.

If I can demonstrate that girls sport books have a positive impact on girls similar to the impact athletics has on girls, this might indicate that girls can learn and experience a lot of other things just as vicariously, like travel, people's life experiences, love, adventure, magic, and history, simply through reading books. It would also support a direct correlation between what people read and how they look at life, how they act, and what type of person they are likely to be.

Background/Literature Review

My research grows out of evidence that girls sports have positive influence on grade point average and self-esteem, and that reading has positive influence on the development of a teen's lexicon, their communication skills and

the lessons they learn from reading.

A recent Master's thesis on *The Relationship between Athletic Participation and Academic Achievement* provides evidence that high school athletes perform better than non-athletes on standardized tests like the California High School Exit Exam (Powers 22). Powers has conducted research to show there is a

statistically significant difference in the mean ELA [English-Language Arts] scores and the mean mathematic scale scores on the CAHSEE [California High School Exit Exam] between athletes and non-athletes. The mean scale scores in ELA and mathematics were higher for those students who participated in at least one sport when compared to those students who had not (Powers 22).

The statistical data discussed by Powers suggests an interesting relationship between athletics and academics. While there is not enough evidence to demonstrate that playing sports caused test scores to be higher, it does provide a basis for asking whether the relationship between athletics and academics should be fostered, and whether reading athletic books might help to establish a connection between the two worlds. Powers also reports research conducted by Carlson showing that athletes were "significantly ($p < .05$) more likely to have enrolled in postsecondary education and earned a bachelor's degree than non-athletes" (Powers 9). She intimates that participating in athletics provides certain skills and a certain mind-set that helps the athletes throughout their lives. The difference in the scores and statistics between non-athletes and athletes suggests that participating in athletics is beneficial and that there might be a relationship between higher test scores, grade point averages and the motivation to continue with their education through participation in athletics.

Angove, in her Master's thesis on *Girls' Participation in School Athletics and Grade Point Averages*, explores why girls participate

in sports, why they view participating in sports to be helpful, and how it affects their grade point average. The reasons the girls listed for choosing to participate in athletics included teamwork, friendship, exercise, competitiveness, recognition, and development of a more positive self-concept (Angove 12). These reasons indicate the potential values and positive social benefits that girls gain from participating in a sport, in addition to the positive impact athletics has on their grades and test scores. There are numerous reasons these values and positive social benefits arise from participating in athletics; some contributing elements include team atmosphere, working towards a common goal, and dedication and commitment to achieving the common goal. Angove's thesis also suggests the connection between athletics and academics may actually influence the framing of goals and beliefs. She notes, following Duda and Nicholl, that "the beliefs about success both in the classroom and in athletic activities included cooperation, effort, and collaboration" (Angove 23). Reflecting on these connections, Angove determines that skills students learn by participating in athletics can be beneficial both on and off the field. If the positive social and academic achievements students gain from participating in sports can be inspired by reading a sport book, reading these books might provide a supplementary opportunity for non-athletes to acquire these important life lessons.

The knowledge, communication skills, and other well-known benefits people gain from reading support the notion that novels can be used as an effective tool for acquiring important values in life. If people get so much out of reading in general, is it a stretch to wonder if people can learn important values and lessons from reading sports books? This supports my research goal, which is to discover if the benefits of participating in athletics can be acquired through reading, because if people already gain so much through reading avidly, it is likely they would

gain positive life assets by reading sports books. In their article “Literacy As A Leisure Activity: Free Time Preferences of Older Children And Young Adolescents,” Nippold, Duthie, and Larsen review significant lexicon improvements that occur when adolescents begin reading with more proficiency. They find that after fifth grade “decoding and fluency skills have improved in most students to the point where reading has become a tool for gaining new knowledge” (Nippold 94).

These results reinforce the value of reading as a tool for acquiring new information and highlight the young age at which avid readers can attain these skills. Their research also suggests that “reading is a prime source of word exposure,” and that “there is evidence from research that the amount of time spent reading is closely associated with word learning,” which in turn “suggests that reading should be promoted, not only as a school-based activity, but as a leisure-time activity as well” (Nippold 95).

People gain more than a larger lexicon from avid reading, as Cunninghame has determined through her research into “What Reading Does for the Mind.”

Results indicated that the more avid readers in our study—regardless of their general abilities—knew more about how a carburetor worked, were more likely to know who their United States senators were (Cunninghame 6).

Cunninghame’s research indicates that avid readers are simply more knowledgeable about their world and tend to collect and retain useful pieces of information more frequently than those who are not avid readers. In “Reading in the Real World and Its Correlates,” West, Mitchell, and Stanovich illustrate the positive benefits of reading and the numerous benefits of being able to learn from the literature. They note that “Print exposure, whether measured by the 10-minute airport probe or by the recognition checklist measures, was significantly linked to vocabulary and cultural knowledge even after

controls for age and education were invoked” (West 44). Their research indicates much can be learned from reading and intimates positive benefits for those who read frequently.

These articles illustrate how much can be learned from reading and the benefits of being an avid reader. If this line of research can be applied to my study, not only would girls be able to gain more from reading girls sports books, they might also reap the positive benefits sown from participating in sports even if they are only able to participate in a vicarious manner.

If the experiences of athletic participation and avid reading can be combined, then perhaps benefits gained from sports can be gained through reading about the athletic experience. The benefits acquired in these two ways may not be entirely the same, but if there are at all similar, the connection would be worth exploring. Evidence of such a connection would mean more can be acquired from reading than just a higher vocabulary; a mindset can be embedded in the reader and a novel can change a person’s view and attitude towards situations in life.

I want to focus on three books where I discovered common themes of overcoming an obstacle, establishing connections and making friends, and learning about how to handle life situations by surmounting the athletic difficulties faced. In *Throwing Like a Girl* Mackey portrays the life of a character, Ella, who has just moved from her urban home in Chicago to the suburbs of Texas. Ella has to make new friends in the middle of the semester and has to leave her old ones behind. During her first day at school she is not really noticed, but the P.E. coach makes a suggestion, join the softball team. Ella never really participated in sports at her old school but decided to give the team a try anyways. On her first day of try-outs she has to learn completely new skills, but by their second day she has met some new friends and is finding the connections she was hoping to find. As

the season goes on her friendships grow stronger and she has to learn how to deal with a bully, improving her skills to become a starter, and go to the Prom on a date. Throughout it all softball is her support. Ella uses it as her escape from life's complications she says, "Softball seems like something I may actually have a little control over. Something in my new life that isn't possibly complicated" (Mackey 100). Her ability to fall back on softball shows how sports provide support in a teen's life. It also provides a kind of friendship. Looking back, Ella recalls "Being out there, playing together with these other people, even some you don't get along with, working toward the same thing. I never knew how complete it would make me feel" (Mackey 150). Her recollection of all the positive things softball has given her illustrates the positive influence sports has had on her life and how beneficial it has been in helping her start a new life in a new place. Ella is even able to help her friend Rocky with her family life and get her back into playing softball, which helps Rocky handle some tough obstacles. *Throwing like a Girl* supports my idea that the values girls gain from participating in a sport because of the story Ella tells about how softball helped her start her new life and find new friends.

In *Pretty Tough*, Tigelaar explores similar themes for a different story. This book focuses on two sisters who have had a tough year, but for different reasons. Charlie is a sophomore in high school and has recently become an outcast from her friends. She does not feel like she belongs anywhere and despises her sister for not sticking up for her when Charlie's best friend put her down. Charlie's sister, Krista is quite the opposite. She is Miss Popular, has a boyfriend, and is a star soccer player, but she is also going through some hard times her senior year because she must make some choices between her friend's expectations and her own values. Soccer intertwines these two sister's lives and helps them begin to understand their

differences. By joining the team Charlie finally begins to feel like she's accepted. She says, "It was becoming glaringly obvious to anyone in school which girls played soccer: they all had permanent shin guard tan lines. And for the first time, Charlie felt like a part of them" (Tigelaar 100). Soccer gives Charlie a place to finally fit in and find herself a new group of friends. Her friends become her support group and with them around her she feels like she can do anything. Krista feels like she can do anything on the field, off the field she has pressures about what to wear and how to act but she says that, "On the field she had permission to shine. It was the one place she felt free and uninhibited, not plagued by how she looked or what people thought of her. It was the one place she felt truly herself" (Tigelaar 117). By having this place to call her own she is able to gain confidence and when she has confidence in one area of her life it shines in other places too and allows her to stick to her values under peer pressure. The sister's coach even tells them that, "What matters isn't what everyone else thinks. It's what you know" (Tigelaar 192). The coach's independent, confident words give the sisters the confidence they need to reestablish their friendship and put their life in order.

The Beautiful Game, Littman develops a story that encompasses the values of finding confidence through friendship and teamwork, learning how to handle life situations and working as a team towards a common goal. In this book two groups of girls from two opposing teams unite together under one twenty-one year old, All-American, female soccer coach. She pushes them harder than they've ever been pushed before but that is the beginning of what unites these girls together. The narrator says how, after their first conditioning practice, "They hadn't played a game, but they [already] had something in common. Parched throats and newly muscled legs" (Littman 37). Their coach pushes them harder than they've ever been pushed before, but this constant pushing

from their coach challenges the girls as much as it unites them. The book follows several of the girls through their own personal stories, and one in particular illustrates how the hard work and discipline of soccer helps her.

[S]uddenly the discipline of practice became a sanctuary. Not just the physical exhaustion, but the fun, the exultation at finishing the hill climbs or making a great pass. For the first time in a long while, Angela felt really good about herself” (Littman 53).

This anecdote illustrates how being pushed by and succeeding with the support of her teammates helps her find more confidence. By working through tough times on the basis of her relation to teammates, she is able to see how something can be accomplished that seemed impossible at first.

The three books I have chosen to focus on illustrate how sports literature can portray some of the important values and life lessons girls acquire through participating in sports. Granted these are only a few examples, they do indicate the potential of sports literature to demonstrate similarities shared between sports literature and sports participation.

Methods/Research Design

In her article “Studying Masculinit(ies) in Books about Girls,” Harper offers a model for the research method I will be using. In this article, Harper performs a close reading of eight books and compares and contrasts the different themes, symbols and messages in the books. She also performs a character analysis of all the female protagonists, showing how they illustrate masculine qualities in their different cultures. I will use this method in a similar way to collect data from the three teenage novels chosen for my study. I will be analyzing these texts to discover the themes, values, and social connections that can be drawn out from reading them.

Doing a close reading best fits my research objective because I am analyzing whether the same social benefits gained by

girls through participation in athletics can also be acquired through reading books about female athletes. These social benefits include, among others, connection to other people, feeling a sense of belonging, accepting guidance from adults and peers, and self-efficacy (a person’s belief in their ability to learn or perform behavior at a designated level, or the belief that if someone else could do it, so could they) (Angove 8). I need to see whether these social benefits are portrayed in the books before I can make the connection to high school female athletes. I will seek to determine whether female sports protagonists portraying these assets and social benefits actually serve as role models for non-athlete girls who read the books.

I will look for these traits by comparing and contrasting the themes emphasized in each book, and by analyzing how each author narrates the sports story. I will examine the specific characters and analyze their development as portrayed in the novels. I will also investigate the specific themes, values, and social connections emphasized in each book. I will look to see if specific stereotypes are portrayed in the novels, such as gender links in the roles of coaching and teaching. I will examine the context in which the narrative of the book is placed, and highlight adversities the girls have to face in and out of the sport. The three books I have chosen to analyze (*The Beautiful Game: Sixteen Girls and the Soccer Season that Changed Everything*; *Throwing Like a Girl*; and *Pretty Tough*) are about teenage females and team sports and focus primarily on the sports story rather than romance or adventure, which are common themes in the majority of books aimed at teenage girls.

Significance and Conclusion

My project will shed light on whether reading novels about team sports can help teenage girls who cannot or do not participate in athletics acquire similar values and life skills as girls learn from playing sports. The

knowledge I gain by comparing these texts will be beneficial because studies show that girls who participate in sports perform better in school and have a better self-concept than those who do not. The research supports my research question and illustrates the potential for sports books to portray some of the life lessons girls typically acquire by participating in sports. If even just some of these advantages can be gained from reading a book about girls sports then female non-athletes and athletes who read this type of literature could expand their exposure to different ways of addressing difficult situations in life.

The next step would be to ask athletes and non-athletes to read a sports novel and answer a survey or participate in an interview about the impact the novel had on them and whether they find what they learned from the book

interesting or useful. I would also like to see if, after reading several sports novels, a teenage girl's attitude changes and she begins to act differently in her approach to school, friends and authority figures. There will be many variables in this part of my research, including whether the subject considered herself a "reader" or a "non-reader," whether readers have a strong preference for a certain genre, whether they actually finished the book, how much time they spent reading the book, and what kind of lifestyle they are already living. These results would benefit my research into what girls actually gain from reading these books and how sports books influence the way young girls view the world and act towards it.

Works Cited

- Angove, Kristy D., *Girls Participation in School Athletics and Grade Point Averages*. California State University, Stanislaus. April 2004. Print.
- Cunningham, Anne E., and Keith E. Stanovich. "What Reading Does for the Mind." *The American Educator* Spring/Summer (1998): 8-15. Aft: A Union of Professionals. Web. 19 Mar. 2012.
- Harper, Helen. "Studying Masculinity(ies) in Books about Girls." *Canadian Journal of Education* 30.2 (2007): 508-30. JSTOR. Web. 6 Mar. 2012.
- Littman, Jonathan. *The Beautiful Game: Sixteen Girls and the Soccer Season That Changed Everything*. New York: Avon, 1999. Print.
- Mackey, Weezie Kerr. *Throwing like a Girl*. New York: Marshall Cavendish, 2007. Print.
- Nippold, Marilyn A., Jill K. Duthie, and Jennifer Larsen. "Literacy As A Leisure Activity: Free Time Preferences Of Older Children And Young Adolescents." *Language, Speech & Hearing Services In Schools* 36.2 (2005): 93-102. Academic Search Elite. Web. 26 Feb. 2012.
- Northrup, Mary. "Women In Sports." *Book Links* 14.4 (2005): 10-13. Academic Search Elite. Web. 26 Feb. 2012.
- Powers, Leah M., *The Relationship Between Athletic Participation and Academic Achievement*. California State University, Stanislaus. June 2011. Print.
- Tigelaar, Liz. *Pretty Tough: A Novel*. New York: Razorbill, 2007. Print.
- West, Richard F., Harold R. Mitchell, and Keith E. Stanovich. "Reading in the Real World and Its Correlates." *Reading Research Quarterly* 28.1 (1993): 34-50. JSTOR. Web. 19 Mar. 2012.



INTIMATIONS