THESIS

EFFECT OF FEAR AND REPRESENTATIONS OF GREAT WHITE SHARKS ON GREAT WHITE SHARK CONSERVATION BEHAVIOR

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ABSTRACT

EFFECT OF FEAR AND REPRESENTATIONS OF GREAT WHITE SHARKS ON GREAT WHITE SHARK CONSERVATION BEHAVIOR

Great white sharks are listed as a vulnerable species under the International Union for Conservation of Nature (IUCN) red list. This study uses the theory of planned behavior (TPB) to test how different factors such as attitudes, subjective norms, perceived behavioral control along with representations and fear of great white sharks affect great white shark conservation behavior intentions. This study (n= 218) used a 2 (fear) x2 (representations) between-subjects experimental design. The main findings from this study found that participants had higher positive attitudes toward great white sharks when exposed to the stimuli featuring the presence of fear image compared to the absence of fear image; however, there was no significant difference in great white shark conservation behavior intention based on the four conditions participants were assigned to. All other results in this study analyzing factors of TPB and great white shark fear and representation were expected and supported by TPB and previous research.

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CHAPTER 1. INTRODUCTION

A long history of negative representations of great white sharks in literature, movies, and documentaries has led much of the public perception of this species to focus on the danger and threats they can represent. Changing human perceptions about great white sharks and spreading awareness about shark conservation may help improve the conservation of these species and their habitats.

One of the successful efforts resulting in the conservation of sharks is shark-based ecotourism (Apps et al., 2018). Bornatowski et al. (2014), examined the ecological importance of sharks within a trophic network. Removing large sharks from an ecosystem could result in trophic cascade in which the reduction of a predator population changes the relative abundance of prey populations. However, the conservation status of sharks is not the only environmental issue worthy of immediate attention. Ocean conservation in general is becoming increasingly important, especially as the global climate crisis worsens (Ostrovski et al., 2021). There is a current annual pledge of $25 billion toward ocean conservation made by countries involved in the Convention on Biological Diversity, an international conservation treaty (Urevig, 2020); however, the need for conservation is much more significant, leaving a funding gap of $150 billion a year (Urevig, 2020). Solving the ocean crisis is an ambitious task; however, there are ways society can contribute to both ocean conservation and marine animal conservation. By starting with protecting the biodiversity within the oceans may be more practical at achieving immediate results. This study focused on the effect of representations of great white sharks and the role of fear of great white sharks in encouraging people to support shark conservation. If

people can value all biodiversity within the ocean, the hope is that they would then care more about conserving the ocean.

The practical implications of this study are to increase awareness of endangered species, especially ones that are considered predators to humans. One of the practical implications of this study is looking at how different populations affect conservation behavior. Since this study is looking specifically at shark conservation, and coastal populations of humans have previously been used (Ostrovski et al., 2021), this study takes a different approach and uses a population of participants who do not live near coastal areas. The findings can help identify barriers to shark conservation and one barrier this study assumes is geographical location. The findings will benefit both society and sharks by raising more awareness about misrepresentations in the media and encouraging active shark conservation. The theoretical implications of this study are to see how fear and representation influence attitudes, social norms and behavior intentions on great white shark conservation. Previous research on fear of great white sharks used methods such as surveys and literature reviews; however, this study used an experimental design to test how participants respond to different stimuli manipulating fear and representation of great white sharks. This study can help introduce experiments more frequently to research conservation behavior using the theory of planned behavior.

Goal and Research Question (s)

The purpose of this paper is to analyze the effect of different great white shark representations on great white shark conservation behavior intention. Previous studies have focused on media representations (Busque et al., 2021; Sabatier & Huveneers 2018), but this study will examine the topic from a more scientific approach and how great white sharks are represented as either a flagship species (Thomas-Walters & Raihani, 2016) or keystone species

(Bornatowski et al., 2014). Thomas-Walters and Raihani's definition of flagship species which are a popular "charismatic" species that serves as the focus for campaigns or to generate conservation through wildlife or eco-tourism (2016). The definition for keystone species is from Bornatowski et al. (2014) which defines them as "identified based on their ecological importance within a trophic network." This is important to study because there are contradicting scientific representations of great white sharks, which may significantly impact perceptions of them, and their conservation needs (Frazier). This study seeks to identify the inconsistency between great white shark representations and perceptions. The following research questions will be explored for this study:

CHAPTER 2. LITERATURE REVIEW

This section will provide an analysis of existing literature and the theoretical framework— Theory of Planned Behavior. This section will introduce each variable that was analyzed and introduce the hypotheses that were tested in this study.

2.1.1 Shark Perceptions

Media portrayals of sharks have had a significant influence on how people perceive them (Ostrovski et al., 2021). Multiple studies have confirmed that fear is commonly associated with sharks (Ostrovski et al., 2021; Sabatier & Huveneers, 2018). Prominent media portrayals of sharks have inaccurately represented them as "man-eating" predators, leading people to be fearful of them and less concerned with their conservation (Braccini, 2016). Many researchers consider the 1975 film Jaws to be one of the most notorious media portrayals of great white sharks.

The movie has had lasting negative impacts on perceptions of great white sharks ever since (Neff and Heuter, 2013). "The image of sharks as fearsome predators, cultural representation in movies such as Jaws and sensationalist media reports of shark attacks all contribute to frame sharks negatively in the public image" (Friedrich et al., 2014). Following the release of the film, American fisherman targeted and hunted great white sharks. "The enactment of anti-shark policies including shark hunts, shark derbies, and beach nets became punitive measures for the perceived public good" (Neff and Hueter, 2013). Recreational shark fishing and shark "kill" tournaments in the USA increased in 1975. Jaws-like shark hunts still occur following clusters of fatal shark attacks, motivated by the belief that until the responsible shark is identified and eliminated from the ocean, further attacks may occur (Neff and Hueter, 2013;

Thompson, 1970). The response to Jaws led people to become increasingly fearful of great white sharks, which influenced the media to continue to negatively exploit them to continue to captivate their audience (Neff and Heuter, 2013; Thompson, 1970). Another way great white sharks are exploited in the media is through news articles.

News articles that discuss shark attacks are five times more common than articles discussing shark conservation in both America and Australia (Panoch & Pearson, 2017). “Shark attack” is a blanket term used to label all human-shark interactions. Shark attacks are often misrepresented, as not all “attacks” have the same magnitude. “Under current labels, listing of shark attack may even include instances where there is no physical contact between shark and human” (Neff and Hueter, 2013).

According to Neff and Hueter (2013), to address misrepresentation in human-shark interactions, the word “attack” should be removed, and the interactions should be categorized based on the effect of the interaction. The first category is shark sighting, which they conceptualize as a shark sighting in the water near people with no physical contact between the humans or shark. The second category is shark encounter, which they conceptualize as physical contact between a shark and human or an object containing a human, that did not result in any injuries. The example of this they provide is a bite to a boat, kayak, or board of some kind, or “bumping” into a swimmer. The third category is shark bites, which they conceptualize as an incident where a shark bites someone resulting in a minor or moderate injury. The final category is fatal shark bites, which they conceptualize as a human-shark conflict resulting in a serious injury leading to death by significant blood or tissue loss.

Neff and Huenter (2013) tested their proposed categories through content analysis. They compared the classifications of Australian shark attacks between 1900 and 2009. After

recategorizing 200 reports of shark “attacks”, they found less than half of the attack were fatal (56), the majority were non-fatal bites (106), there were 37 encounters and one sighting. They concluded that their findings could help to communicate accurate threats of human-shark interactions.

Public perceptions of sharks have started to improve with increasing awareness and interest in their conservation (Braccini, 2016; Apps et al., 2018). Shark week is an annual television phenomenon that airs on Discovery. “Warner Bros. Discovery, a premier global media and entertainment company, offers audiences the world's most differentiated and complete portfolio of content, brands and franchises across television, film, streaming and gaming. The new company combines Warner Media's premium entertainment, sports and news assets with Discovery's leading non-fiction and international entertainment and sports businesses” (Warner Bros. Discovery, year?). Shark week first aired in July 1988 and since then, has grown to be one of the most anticipated and popular television series (Holmes, 2021). According to Howard Lee, president of Discovery networks, “Discovery Channel launched the programming event to "captivate and educate," adding that Shark Week started as a counterpoint to the negative representations of sharks in popular culture and to provide viewers with shows that explored sharks' strength, magnificence, and importance” (Bender, 2023). Shark week focuses on conservation and highlighting challenges sharks face within their natural habitat. “Public perception on sharks has changed from one that we need to protect humans from sharks to one where we must protect sharks from humans” (Braccini, 2016).

Research shows people who live near shark populations or have encountered sharks have different perceptions of sharks than those who do not. Ostrovski et al. (2021), found that people who lived in contact with these animals reported no fear of sharks. Additionally, they found the

population highly valued the ecological importance of sharks. Participants who experienced sharks in the wild had significantly more positive and stronger pro-conservation behavior attitudes than participants with no experience. A similar study found people with a personal connection to sharks or the marine environment had better knowledge and awareness of sharks and the threats they face than participants with no connection (Apps et al., 2018).

However, scientists and naturalists have different perceptions of sharks than the public, which can be a barrier in motivating the public to support the same efforts when it comes to shark conservation. These experts have become increasingly concerned with the global conservation status of sharks and several conservation organizations are motivated to preserve them. Conserving the ocean and marine life is an initiative that requires help from not only scientists or the government, but society as well. "The impacts that humans have on the oceans and their consequences to our own survival become increasingly evident each day" (Ostrovski et al., 2021). Additionally, one of the biggest challenges is convincing people to conserve such animals "as this pervasive negative image may restrict popular participation in defending shark conservation" (Ostrovski et al., 2021).

2.1.2 Conservation Representation of Great White Sharks

Great white sharks (Carcharodon carcharias) are "one of the most well-studied shark species in the world" (Fisheries, 2023), but the conservation status of great white sharks is often inconsistent. For example, some literature refers to sharks as being endangered ((Verlecar et al., 2007); however, according to the National Oceanic and Atmospheric Administration (NOAA), great white sharks are not listed as endangered under the U.S. Endangered Species Act (ESA), but are listed under Appedix II of the Covention on International Trade of Endangered Species of Wild Fauna and Flora (CITES). "Species listed in Appendix II of CITES are those species that

are not necessarily threatened with extinction but may become so if trade in these species is not regulated" (NOAA). White sharks are also listed as a vulnerable species under the IUCN red list (NOAA).

Additionally, there are many terms that are used to categorize different species based on need and conservation status. "The list is long, including vocabulary such as: competitor, dominant, economically important, endangered, endemic, exotic, exploited, flagship, focal, index, indicator, indigenous, invasive, keystone, management indicator species (mis), native, protected, pest, plague, predator, prey, priority, rare, spokesperson, star, surrogate, target, threatened, vulnerable, and so on" (Frazier, n.d.). According to Frazier, since there are many different terms used, the terms often gets confused even by practitioners. "For decades, activists, biologists, conservationists, ecologists, and protected area managers have been debating how to define and organise concepts that have been in common use since the beginnings of modern ecology" (Frazier, n.d.).

A previous study conducted by Home et al. (2009), researched how different organizations selected their 'flagship' species for their marketing campaigns. They found that respondents valued different characteristics and classifications for their representative species. In four cases, flagship species were selected and in two cases indicator species were selected. "The finding that a non-charismatic species has the potential to fill the role of a flagship species when information that it is also an indicator species is provided, suggests that the ideal flagship species will be both a charismatic and an indicator species." While some species have clear classifications such as other species' classifications may not be as concrete, as implicated by Home et al. (2009). This identification communicates different information that may influence perceptions of conservation needs. For example, sharks have been categorized as keystone species (Thomas-

Walters & Raihani, 2016), while sea turtles are categorized as flagship species (Bornatowski et al., 2014).

Keystone species are identified based on their ecological importance within a trophic network (Bornatowski et al., 2014). “In some areas, the removal of large sharks has led to cascading changes in the balance of marine food webs, as the predatory release of sharks’ prey species allows their populations to increase, causing changes to lower trophic levels” (Panoch & Pearson, 2017). The keystone index identifies the importance of certain species within a particular ecosystem. “The keystone index is used to characterize the importance of a species within an ecosystem according to its position in the trophic network” (Bornatowski et al., 2014). The keystone index also measures additional information, such as predator-prey relationships within the ecosystem. The keystone index is used to measure the number of species susceptible to secondary extinction after a species is removed from the network. Recognizing sharks as a keystone species confirms their role in maintaining an ecosystems balance and biodiversity.

Flagship species are a popular “charismatic” species that serves as the focus for campaigns or to generate conservation through wildlife or eco-tourism (Thomas-Walters & Raihani, 2016). Sea turtles have been commonly represented as a flagship species to promote conservation (Frazier, 2005). “Major environmental organisations, such as the World Wide Fund for Nature, or World Wildlife Fund (wwf), have declared that all seven species of marine turtle are ‘flagship species’ for mobilizing public support (wwf 2005a, 2005b)” (Frazier, 2005). While great white sharks have been described as a “charismatic” shark species, they are still not considered to be a flagship species. “While sharks are not generally seen as flagship species, the decline in global shark populations is a significant conservation issue that warrants immediate attention” (App et al., 2018). Flagship species are a key marketing tool for successful

conservation campaigns. Existing research indicates that campaigns featuring a flagship species are more successful than campaigns featuring non-flagship species. (Thomas-Walters & Raihani, 2016).

2.1.3 Human-Shark Interactions

2.1.4 1916 Jersey Shore Attacks and the Rogue Shark Theory

In the early twentieth century, little was known about sharks or shark-human interactions. Prior to the infamous 1916 Jersey Shore attacks, Americans did not consider sharks to be a threat to humans. Many of the scientists of the time believed sharks were harmless and dismissed claims of sharks attacking humans, but the string of attacks on the Jersey shore challenged their knowledge of sharks (Mccall 2021).

The victim of the first fatal attack on the Jersey shore was 25-year-old Charles Vansant, followed by 27-year-old Charles Bruder five days later. Lester Stillwell was the third victim of a fatal attack while swimming in Matawan Creek. Watson Fisher was fatally attacked in Matawan Creek while looking for the body of Lester Stillwell, and the final victim, 14-year-old Joseph Dunn was bitten on the leg, but pulled to safety. The identity of the sharks involved in the Jersey shore attacks remains inconclusive with an ongoing debate amongst experts believing it is between a bull shark or a great white. George Burgess, founder of the international shark attack file, credits the Matawan Creek attacks to a juvenile great white (Mccall, 2021), leaving the remaining Jersey Shore attacks unsolved.

Following the 1916 Jersey shore shark attacks, the same attacks that inspired the book jaws and then the cinema film (Thompson, 1970), Victor Coppleson introduced the ‘rogue shark theory’ (Neff & Heuter). This theory attempted to explain multiple attacks that occur within the same area, thought to be by the same shark. The rogue shark theory suggested that once a shark

attack on a human occurred, that shark developed a taste for humans, causing them to commit repeated attacks. Coppelson based his theory on the previous research of Dr. William Bryce Orme (Thompson, 1970), who documented similar research. Dr. Orme was a British medical examiner stationed at Port Said, Egypt. Following a cluster of attacks in Port Said within a few hours apart, he suggested that a single shark could be responsible for more than one attack (Thompson, 1970). Coppelson published his theory of rogue sharks in a publication titled Sharks and Survival. Other shark scientists adopted his theory with little to no skepticism (Thompson, 1970).

Though there is always the possibility of encountering a shark when entering the ocean, the statistics of attacks on humans are low and unlikely. The International Shark Attack files provides extensive data on the likelihood of shark encounters and shark attacks. In 2022, there were 108 confirmed shark attacks worldwide, five being fatal. Great white sharks, bull sharks, and tiger sharks are the "big three" shark species credited with the most attacks on humans (Species Implicated in Attacks.). According to the International Shark Attack Files, there have been 292 non-fatal unprovoked attacks on humans by great white sharks and 59 fatal unprovoked attacks on humans by great white sharks to date (Species Implicated in Attacks). In comparison, an estimated 100 million sharks are killed each year by humans due to overfishing and by-catch.

2.1.4.1. Overfishing

One of the most devastating impacts humans have on shark populations is overfishing. Sharks can either be hunted for their fins and meat, or fall victim to by-catch, both of which are drawing shark populations closer to extinction. "Fishermen sometimes catch and discard animals they do not want, cannot sell, or are not allowed to keep, creating what we know as bycatch. Bycatch can be fish, but also includes marine mammals, sea turtles, and seabirds that become

hooked or entangled in fishing gear" (Fisheries, NOAA Fisheries). An estimated 100 million sharks are killed each year, causing butterfly-effects through marine ecosystems (Verlecar et al., 2007). Sharks are particularly vulnerable to extinction due to their slow-growth rates, late sexual maturity, long gestation periods, and low fertility (Panoch & Pearson, 2017). Though many countries have passed legislation banning recreational shark fishing, it is still a thriving industry. There are currently no international laws in favor of shark conservation.

2.1.4.2. Shark Products

Shark finning is considered the act of catching sharks, cutting off their fins, and discarding their live remains back into the ocean for the sharks to drown. According to Verlecar et al. (2007), shark fin soup is an Asian delicacy, increasing the demand for shark fins. Shark fins are graded by type, size, color, and other factors. The color is classified into two groups—white and black. Shark fins in the white group typically come from species in shallow waters such as sandbar sharks and hammerheads. Subsequently, fins in the black group come from species in deeper water such as mako sharks and blue sharks (Verlecar et al., 2007).

Great white sharks are also among the list of shark species targeted for shark liver oils. "Shark liver oils have also been used in the textile and tanning industries, as lubricants, in cosmetics and skin healing products, in health products and in traditional food" (Vannuccini & Kuang, 1999). Squalene is a product harvested from shark livers and used as an ingredient in the cosmetics industry. "Squalene has been used for centuries in many countries in skin creams to soften skin, reduce small facial wrinkles, speed up wound healing, as a moisturizer and as a bactericide" (Vannuccini & Kuang, 1999). According to Vannuccini and Kuang (1999), there is little evidence supporting the use of shark liver oils as an effective ingredient. "Conservationists

say that shark liver health products do not have any beneficial effects, and that they just result in the killing of more sharks" (Vannuccini & Kuang, 1999).

Similarly, shark cartilage is another motive for shark harvesting. "Recent interest in shark cartilage is concentrated almost entirely on its use in health supplements and as an alternative cure for certain diseases" (Vannuccini & Kuang, 1999). It is believed that shark cartilage is an effective treatment for rheumatism, hemorrhoids, shingles, psoriasis, diabetic retinopathy, and even certain forms of cancer (Vannuccini & Kuang, 1999). An internet release from the University of Florida (1998) stated that no convincing clinical trials were found to support the claim that it cured cancer" (Vannuccini & Kuang, 1999).

Great white sharks are a valuable species for leather. "Shark skin is tanned in much the same way as the skin of land animals" (Vannuccini & Kuang, 1999). Shark and whale leather was produced in Japan until the 1940s. After the leather market was infiltrated by "considerable quantities of land animal hides" (Vannuccini & Kuang, 1999) shark and fish skins became a niche-market product. Similarly, the shark leather market was unsuccessful in the USA, unlike in Mexico. Mexico has a sustainable industry of tanneries as well as a ready market for shark skin products (Vannuccini & Kuang, 1999). "Products made from shark skin… include shoes, cowboy boots and sandals, wallets/purses, coin/key fabs, belts, key cases, lighter cases, cigar cases, watch bands, gun holsters and knife holders" (Vannuccini & Kuang, 1999).

Shark teeth come in many shapes and sizes and can be used for different purposes. "Rose (1996) cited earlier sources indicating the Mako, Great White and Tiger sharks as the species preferred for their teeth, because of their large size" (Vannuccini & Kuang, 1999). Shark teeth have a cultural significance in Hawaii as cutting tools (Vannuccini & Kuang, 1999). Tourism has also increased the demand for shark teeth and jaws as souvenirs. "The display of teeth and jaws

for sale is usually confined to tourist areas in Asia, America, Europe and Africa" (Vannuccini & Kuang, 1999). Shark teeth are a commonly displayed as jewelry in the form of necklaces accompanied by precious metals and/or jewels (Vannuccini & Kuang, 1999).

2.1.5 Theory of Planned Behavior

Theory of planned behavior is a foundational theory for this study because it is expanding on previous research on great white shark conservation behavior. The theory of planned behavior was introduced by Icek Ajzen in 1991 as an extension of the previous theory, theory of reasoned action. According to the theory of reasoned action, behavior intentions alone should be enough for one to perform a certain behavior if they have control over the behavioral performance; however, intentions and perceived behavioral control both significantly effect one's behavior (Ajzen, 1991).

Theory of reasoned action has been successful in explaining behavior based solely on behavior intentions if the desired behavior is not restricted by volitional or voluntary control. Volitional control can be established if one has the control to perform the behavior or not, but behavior without volitional control is a behavior that one does not have control to perform, i.e., a forced behavior or a behavior that is restricted by other factors. The theory of planned behavior further explores the relationship between behavior intentions and behavior focusing on situations beyond complete human behavioral control or "incomplete volitional control" (Ajzen, 1991). It is used to predict behavior intention by measuring an individual's attitude toward the behavior, subjective norms, and perceived behavior control.

According to the theory of planned behavior, behavior intentions are "assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the

behavior" (Ajzen, 1991). Therefore, the stronger the behavior intention is, the more likely one is to follow through performing the behavior. The behavior intention can only lead to the behavior if the behavior is under volitional control, meaning the person must be willing to perform the behavior. However, behavioral achievement is dependent on motivation (intention) and ability (behavioral control). If the person has the opportunity and resources, intention to perform the behavior, they should be able to do so.

Behavior is influenced by three factors: attitude toward the behavior, subjective norms, and perceived behavioral control. The first factor predicting behavior intention is attitude toward the behavior. Attitude toward the behavior is conceptualized as "the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question" (Ajzen, 1991).

Research Question 1: How do different representations of great white sharks affect attitudes toward great white sharks?

H1: Higher shark knowledge increases attitudes towards great white sharks.

H2: Higher consumption of shark media increases negative attitudes towards great white sharks.

The second predicting factor is subjective norms. Subjective norms are conceptualized as "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991).

H3a: Higher subjective norms increase shark conservation behavior intentions

The final predictor is perceived behavioral control, which is conceptualized as "the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles" (Ajzen, 1991).

H3b: Higher perceived behavioral control of shark conservation increases shark conservation behavior intention.

Therefore, the more favorable the attitude and subjective norm toward the behavior, and the greater the perceived behavioral control, the stronger the behavior intention.

However, the three factors have relative importance according to the behavior and situation. Meaning, in some cases, only attitudes may significantly impact behavior intention, while in other cases the behavior is significantly impacted by both attitude and perceived behavior control, or each factor may interpedently contribute to the behavior intention (Ajzen, 1991).

H4: Lower risk perceptions increase attitudes towards great white sharks. (attitudes and behavior needs to be introduced first)

H5: Great white shark conservation behavior intention is higher in flagship stimuli than keystone stimuli.

2.1.6 Conservation Behavior

Using the theory of planned behavior, Apps et al. (2018) explored the relationship between great white shark cage-diving and conservation behavior. The study focused only on attitudes and behavior intention, rather than all three factors previously discussed.

H6: More positive attitudes toward great white sharks increase shark conservation behavior.

Additional concepts were also used to measure conservation behavior. Conservation can also be referred to as environmental stewardship or citizenship (Apps et al., 2018). All these terms are used to describe individuals' daily lives and their sustainable practices of using and protecting the natural environment. "Three key themes are noted in the development of marine citizenship: marine education, personal attachment to the marine environment, and a sense of responsibility for the condition and management of the marine environment" (Apps et al., 2018). An increase in all three of these areas also increases conservation behavior.

Shark ecotourism has become increasingly popular which has played a critical role in conservation. Sharks were once considered a nuisance to marine tourism but have become a popular tourist attraction. “Exposing tourists to sharks in their natural environment has considerable potential to enhance participant’s knowledge, attitudes, and behavior toward sharks and their conservation” (App et al., 2018).

H7a: More marine experiences decrease fear of great white sharks.

H7b: More marine experiences increase great white conservation behavior intentions.

Shark conservation behavior was measured before and after the shark-diving tour. Apps et al. (2018) used 8 survey items to operationalize shark conservation behavior: talk positively about white sharks to others or on social media, talk positively about sharks in general to others or on social media, follow shark conservation organizations via social media and/or email lists, access shark information, write or email government with regard to sharks, sign a shark conservation petition, choose sustainably caught seafood, and donate money to shark conservation. Shark conservation behavior increased following the shark-diving tour.

To advance research on human perceptions of great white sharks and great white shark conservation behavior, this study used the theory of planned behavior by introducing an experimental design manipulating fear and representation of great white sharks. This study measured how risk perception, shark knowledge and shark media consumption contributed to fear of great white sharks and how fear and representation influenced great white shark attitudes, social norms about great white sharks and perceived behavior control affected great white shark conservation behavior intention.

Research Question 2a: What is the effect of representation on great white shark conservation behavior intention?

Research Question 2b: What is the effect of fear on great white shark conservation behavior intention?

Research Question 2c: What is the effect of fear and representation on great white shark conservation behavior intention?

Research Question 3: What is the association between fear of great white sharks and great white shark conservation behavior intention?

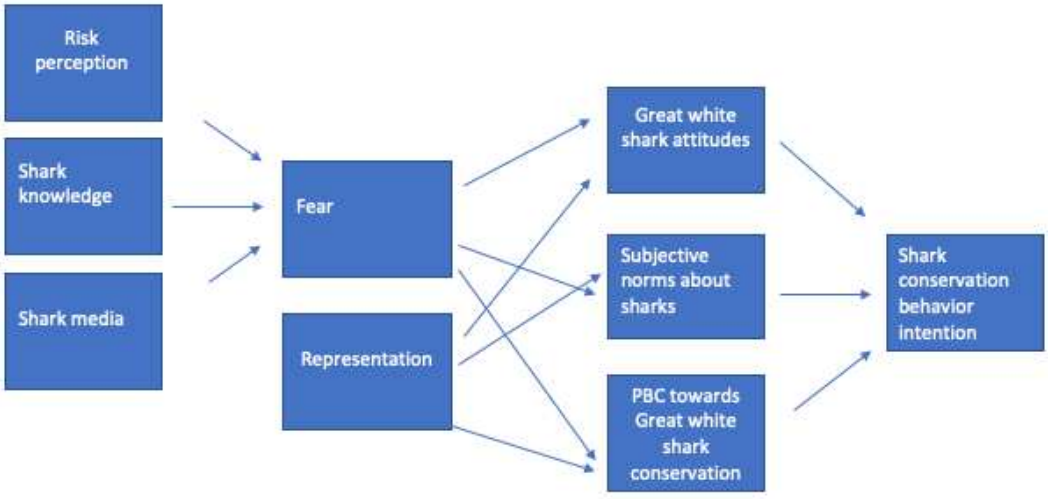

Figure 1. Conceptual Model of Variables

CHAPTER 3. METHOD

This study used a 2x2 between-subjects experimental design to test the influence of representation and fear on great white shark conservation to answer the RQs 1 to 3. There are two independent variables being tested, fear and representation, each with two levels for the 2x2 experimental design. Fear is being manipulated by presence and absence of fear and representation is being manipulated by flagship or keystone representations. This study used MTurk participants and undergraduate students from Colorado State University who are enrolled in journalism and media communication classes using the SONA student pool.

Study Overview

A 2 (representation: flagship vs keystone) x 2 (fear: presence vs. absence) between-subjects experimental design was conducted to test how participants responded to different representations of great white shark conservation status and if fear of great white sharks influences the participants attitude and conservation behavior towards great white sharks.

		Representation	
		Flagship	Keystone
Fear	Presence	Condition 1	Condition 3
	Absence	Condition 2	Condition 4

Figure 2. Study Design: 2 (representation: flagship vs keystone) x 2 (fear: presence vs. absence)

3.1 Procedure and Stimuli

Participants completed the study using a Qualtrics survey. Participants were first asked to indicate their consent prior to participation. Paritcipants that gave consent were prompted to continue to the experiment. If they did not consent, their surveys were terminated. Participants were asked their attitude toward great white sharks, fear of great white sharks, attitude toward great white shark conservation, past marine experiences, and conservation behavior intention.

Once they answered all the precondition questions, they were randomly assigned to one of the four conditions: flagship species and presence of fear stimuli, flagship species and absence of fear stimuli, keystone species and presence of fear stimuli, and keystone species and absence of fear stimuli. Participants had one minute to read through the passage representing great white sharks as either a flagship species or a keystone species, along with a picture of a great white shark with a presence of fear stimuli or an absence of fear stimuli. Immediately following the treatment, participants were asked a manipulation check to ensure they were paying attention to the information that was presented.

Participants were then asked about their subjective norms and perceived behavioral control as well as conservation behavior intentions they answered before the treatment to see if their intentions have changed after learning new information about great white sharks. (See Appendix A for stimuli.)

3.1.1 Measures

All scales used in this study were adapted from previously published studies. For this study, there were five main independent variables: representation, fear, attitudes, subjective norms, and perceived behavioral control. There was one main dependent variable: conservation behavior.

There were five secondary variables: marine experiences, media consumption, risk perception, knowledge, and demographics.

Table 1. Variables

Dependent Variables	Independent Variables
Conservation behavior intention	**Primary Variables**
	Attitude
	Fear of great white sharks
	Subjective norms
	Perceived behavioral control
	Representation
	Secondary Variables
	Marine experiences
	Risk perception
	Media consumption
	Knowledge
	Demographics

3.1.1.1. Independent Variables

Attitude toward great white sharks was measured using three items. The first item adapted from Mackenzie and Lutz (1989) asked participants using a 7-point bipolar scale "My attitude toward great white sharks is" the options were: bad/good; unpleasant/pleasant; and unfavorable/favorable. The next two items were adapted from Zapetis et al., (2017). The original variable was humpback whales, which was changed to great white sharks for this study. Both items used a 5-point Likert scale anchored by 1= strongly disagree and 5= strongly agree, which is adapted to a 7-point Likert scale for this study. Participants were asked "I care about the well-being of great white sharks" and "I feel a special connection to great white sharks in the wild." Cronbach's α of shark attitudes was .90. Attitude toward great white shark conservation was

measured using the same scale adapted from Mackenzie and Lutz (1989). Cronbach's α of shark conservation attitudes was .89.

Fear of great white sharks was measured using seven items. The first item "How frightened are you of sharks" was adapted from Pepin-Neff and Wynter (2018) to use a 7-point Likert scale anchored by 1= not at all frightened and 7= extremely frightened. Six items asked participants to "Indicate to what extent the following associations describe sharks," using a 7-point Likert scale with the options scary; dangerous; vicious; peaceful; beautiful; and graceful, anchored by 1= not at all and 7= very much. Cronbach's α of fear of great white sharks was .78.

Subjective norms were measured using seven items. "Most people who are important to me…" adapted from Liang et al., (2018), used the following six items using a 7-point bipolar scale: think I should not save great white sharks/ think I should save great white sharks; do not want me to conserve great white sharks/ do want me to conserve great white sharks; and do not expect me to conserve great white sharks/expect me to conserve great white sharks. The next item, adapted from Zapetis et al., (2017), "protecting great white sharks will have a positive impact for the entire ecosystem" is adapted by a 7-point Likert scale anchored by 1=strongly disagree and 7=strongly agree. Cronbach's α of subjective norms is .76.

Perceived behavioral control was measured using two items. The first item adapted from Zapetis et al., (2017) "it is too difficult for someone like me to help protect great white sharks" was measured with a 7-point Likert scale anchored by 1= strongly disagree and 7=strongly agree. The second item adapted from Liang et al., (2018), "I have control over shark conservation" was measured using a 7-point Likert scale anchored by 1=strongly disagree and 7=strongly agree. Cronbach's α of perceived behavioral control was .22. Perceived behavioral control was not a reliable variable and was not used in the analysis.

3.1.1.2. Dependent Variables

Conservation behavior was the single dependent variable for this study. Behavior intention was measured by nine items. The first item was adapted from Nosal et al., (2016), "to what extent do you support measures to restore depleted shark populations (such as banning or regulating shark fishing, establishing no-fishing reserves, etc.), effectively increasing the number of sharks in the ocean?" was measured using a 7-point Likert scale anchored by 1= not at all and 7= very much. "Indicate your participation in the following conservation actions" adapted by Apps et al., (2018), used a 7-point Likert scale anchored by 1=never and 7= always with the options: talk positively about white sharks to others or on social media; talk positively about sharks in general to others or on social media; follow shark conservation organizations via social media and/or email lists; access shark information; write or email government with regard to sharks; sign a shark conservation petition; choose sustainably caught seafood; and donate money to shark conservation. Cronbach's α of behavior intention was .91.

3.1.2 Other Variables

Past marine experience was measured using two survey items to analyze any possible relationships between experience and attitudes and conservation behavior. Both items were adapted from Manson et al., (2021). The first item asked participants "have you visited the ocean before?" The options were 0= no and 1= yes. The second item asked participants "indicate your frequency of visiting the ocean over the past twelve months." The original scale was 0= zero, 1=once, 2= twice, 4= four times, 12= monthly, 24= twice a month, 52= weekly, 365= daily, but for this experiment a 7-point Likert scale was used anchored by 0= never and 7= very frequently.

Risk perception was measured using 4 items adapted from Zajac et al., (2012). All items were measured using a 7-point Likert scale anchored by 1= strongly disagree and 7= strongly

agree. The first item asked participants “I am not familiar with the risks posed by great white sharks.” The second item asked participants “I am vulnerable to the risks posed by great white sharks.” The third item asked participants “encounters with great white sharks are likely to result in fatal consequences.” The final item asked participants “I fear having an encounter with a great white shark.” Cronbach’s α of risk perception was .73.

Media consumption was measured by the variables information source and media source. Both items measuring media consumption were adapted by Ostrovski et al., (2021). Information source was measured using one item which asked participants “what is your source of information on sharks?” They were prompted to select all that apply with the options: articles, newspapers/magazines, movies, news, sites/social media, documentaries, and none. Media source was measured using one item which asked participants “which of the following shark media have you seen?” Participants were prompted to select all that apply with the following options: “Zig & Sharko” (2010), “47 Meters Down” (2017), “Shark” (Netflix), “The Meg” (2018), “Open Water” (2003), “Baby Shark” (2016), “The Shallows” (2016), “JabberJaw” (1976), “Jaws” (1975), “Shark Tale” (2004), “Finding Nemo” (2003), and none.

Knowledge was measured using 5 items adapted from Chandler (2020). The original quiz had 10 questions, but only 5 were used for this study. The first question asked participants “which is the largest of all sharks?” The options were: great white shark; whale shark; bull shark; tiger shark. The correct answer was whale shark. The next question asked, “what are shark skeletons made of?” The options were: bone; cartilage; keratin; they don’t have them. The correct answer was cartilage. The next questions asked, “how many shark species are there?” The options were: 170; 500; 70; 770. The correct answer was 500. The next question asked, “which organ helps sharks to float?” The options were: heart; spleen; liver; stomach. The correct

answer was liver. The last question asked, “after eating a seal or sea lion, how long can a great white shark go without another big meal?” The options were: A few hours; a day; a week; a month. The correct answer was a month.

Demographics were measured to conduct a descriptive statistics analysis on the participants. The following demographics were measured:

- Age
- Sex
- Ethnicity
- Highest level of education

3.1.3 Manipulation Check

A single item was designed for this study to test the success of the manipulation. Participants were asked “great white sharks are identified as a…” the two options were keystone species or flagship species. Participants who failed to correctly answer the manipulation check question based on the treatment they were assigned to were removed from the data pool.

3.2 Sample

A convenience sample was used for this study. Based on G*power (Faul et al., 2007), a sample size of 218 was recommended for a properly balanced study. 228 undergraduate students enrolled in Journalism & Media Communication courses at Colorado State University were recruited using JMC SONA Studies. SONA awards participants extra credit in eligible JMC courses. The number of required participants according to G*power was not being reached with just the SONA platform therefore, a further 52 participants were recruited through MTurk to supplement the required number for power, for a total of 280 responses. “Amazon Mechanical Turk (MTurk) is a crowdsourcing marketplace that makes it easier for individuals and businesses to outsource their processes and jobs to a distributed workforce who can perform these tasks virtually. This could include anything from conducting simple data validation and research to

more subjective tasks like survey participation, content moderation, and more" (Amazon Mechanical Turk). 62 participants were removed for failing the manipulation check of answering how a great white shark is identified according to the article they were assigned. Others were removed for missing data, leaving 218 valid responses. Per G*power, 218 participants are required for a study with 4 treatment groups: presence and flagship (n= 50), absence and flagship (n=44), absence and keystone (n=72), and presence and keystone (n=52).

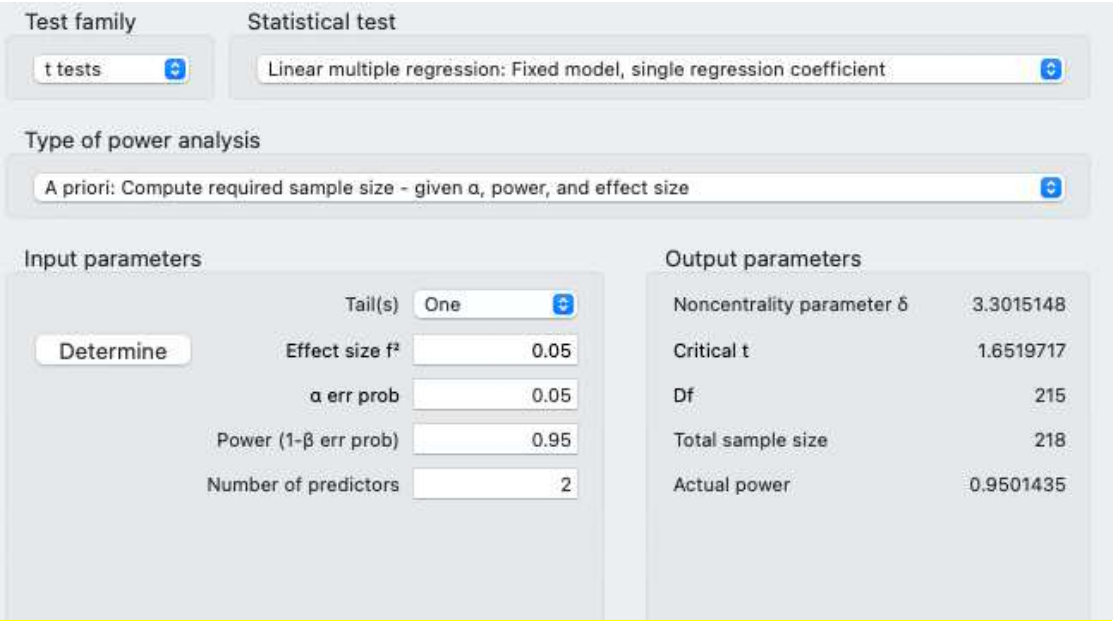

Figure 3. G*Power Results

3.3 Pretest of Stimuli

A pretest study was conducted to identify the stimuli used within the formal study. The purpose of the pretest was to identify a single image of a great white shark with the least fear index and a single image of a great with shark with the highest fear index. These two images were converted into the stimuli as absence of fear (lowest fear index) and presence fear (highest fear index). A survey was built in Qualtrics and responses were collected using a convenience

sample. The Qualtrics link was posted onto a private Instagram in the bio and advertised on an Instagram story. The story was live for 24 hours and then deleted. A total of 28 participants were collected for the pretest.

Participants were exposed to 10 different images of great white sharks. Images were selected based on characteristics from previous research that increase fear of sharks, one of those features being their teeth (Friedrich et al., 2014; Ostrovski et al., 2021) five images portraying sharks with their teeth were selected at random from an internet image search and five images not portraying their teeth were selected at random from an internet image search. Participants were then asked to rate the images using a 3-item scale adapted from Leshner et al., 2010, (scary, fearful, frightening) anchored by 1=not at all and 7=extremely. The fear index was determined by taking the means of each image. Shark two absence had the lowest fear index (M= 1.70, SD= 1.17); therefore, it was selected as the absence of fear image. Shark two presence had the highest fear index (M= 4.02, SD= 1.80); therefore, it was selected as the presence of fear stimuli image. See appendix A for stimuli.

Table 2. Comparative Means of Stimuli Pretest

Shark Image	Mean
Shark 1 Presence	3.67
Shark 1 Absence	1.99
Shark 2 Presence	4.02
Shark 2 Absence	1.70
Shark 3 Presence	3.87
Shark 3 Absence	1.94
Shark 4 Presence	3.31
Shark 4 Absence	2.02
Shark 5 Presence	2.88
Shark 5 Absence	2.04

CHAPTER 4. RESULTS

Research Question 1 asked, "How do different representations of great white sharks affect attitudes?" A one-way ANOVA was conducted to examine the relationship between the four conditions (presence and flagship, absence and flagship, presence and keystone, and absence and keystone) and shark attitudes. There was a statistical significance between condition and shark attitudes. $F(3, 207) = 3.64$, $p<.05$. Respondents exposed to the presence and flagship stimuli had the highest attitudes toward great white sharks ($M= 6.07$, $SD= 0.98$) compared to presence and keystone ($M= 5.91$, $SD= 0.99$), absence and keystone ($M= 5.90$, $SD= 1.13$), and absence and flagship ($M= 5.38$, $SD= 1.11$). All other pairwise comparisons were not significant.

Research Question 2a asked, "what is the effect of representation on great white shark conservation behavior intention?" To test the main effect, a one- way ANOVA was conducted. There was no statistical significance between keystone ($M= 4.50$, $SD= 1.49$) and flagship ($M= 4.68$, $SD= 1.13$) representations of great white sharks and great white shark conservation behavior intentions. Research Question 2b asked "what is the effect of fear on great white shark conservation behavior intentions?" To test the main effect, a one-way ANOVA was conducted to examine the relationships between fear stimuli of great white sharks on great white shark conservation behavior intention and representations of great white sharks on great white shark conservation behavior intention. There was a statistical significance between the fear stimuli of great white sharks and great white shark conservation behavior intention. $F(1, 207) = .6.10$, $p<.05$. Participants in the presence of fear stimuli conditions reported higher behavior intentions ($M= 4.82$, $SD= 1.31$), compared to participants in the absence of fear stimuli conditions ($M= 4.37$, $SD= 1.34$).

Table 3. Main Effect of Fear Stimuli on Behavior Intention

Variable	N	Mean	SD	Minimum	Maximum
Presence	97	4.82	1.31	1.00	7.00
Absence	112	4.37	1.34	1.00	7.00
Total	209	4.58	1.34	1.00	7.00

RQ 2c asked, "what is the effect of fear and representation on great white shark conservation behavior intentions?" To test the interaction effect, a one-way ANOVA was conducted to examine the relationship between condition (presence and flagship, absence and flagship, presence and keystone, and absence and keystone) and the dependent great white shark conservation behavior intention. There was no statistical significance between condition and behavior intention; however, it was approaching statistical significance. $F(3, 205) = 2.49$, $p=.06$. Respondents exposed to the presence and flagship stimuli reported higher great white shark conservation behavior intention ($M=4.98$, $SD=1.00$) compared to respondents exposed to the presence and keystone stimuli ($M=4.66$, $SD= 1.53$), absence and keystone ($M=4.37$, $SD= 1.45$), and the absence and flagship stimuli ($M=4.35$, $SD=1.17$).

Research Question 3 asked, "what is the association between fear of great white sharks and great white shark conservation behavior intention?" A correlation was conducted between the dependent variable behavior intention and the independent variable fear of great white sharks. There was a significant negative relationship between behavior intention ($M= 4.58$, $SD= 1.34$) and fear of great white sharks ($M= 3.74$, $SD= 1.12$); therefore, fear of great white sharks

was positively associated with great white shark conservation behavior intention. r^2=0.064, F (1, 207) = 14.27, p<.001[b].

H1 predicted that higher attitudes towards great white sharks increases great white shark conservation behavior intention. A correlation was conducted between behavior intention and great white shark attitudes. There was a significant positive relationship between behavior intention (M= 4.57, SD= 1.34) and shark attitudes (M= 5.82, SD= 1.09); therefore, there was an association between shark attitudes and conservation behavior intention. r^2=0.28, p<.001[b]. The higher the attitudes towards great white sharks, the higher the intention to support great white shark conservation; therefore, H1 is supported.

H2 predicted that higher media consumption decreases great white shark attitudes. A regression was conducted between information source and media source and shark attitudes. r^2=0.01, F (2, 208) = .674, p>.05. There was no significant difference between information source (M=3.74, 1.68) and media source (M=3.69, SD=1.85) and great white shark attitudes (M=5.84, SD=1.08). Information source and media source are not predictors of great white shark attitudes; therefore, H2 is not supported.

H3a predicted more marine experiences decrease fear of great white sharks. H3b predicts more marine experiences increase great white conservation behavior intentions. A frequency analysis was conducted to measure the participants' previous marine experience. Out of 218 participants, 201 have previous marine experience, 11 participants have no previous marine experience, and 6 participants did not report whether they have marine experience. Then, a regression was conducted between marine experiences, fear of great white sharks, and behavior intention. r^2=0.16, F (2, 205) = 19.06, p<.001[b]. There was a significant positive relationship

between marine experiences and fear of great white sharks and behavior intention. The more marine experiences (M= 5.95, SD= 4.33), the higher the fear of great white sharks (M= 3.73, SD=1.13) and behavior intention (M= 4.58, SD=1.35). H3a is not supported, but H3b is supported.

H4 predicted higher shark knowledge increases attitudes towards great white sharks. A correlation was conducted between knowledge and great white shark attitudes. Knowledge (M= 2.89, SD= 1.23) was not a significant predictor of shark attitudes (M= 5.84, SD= 1.08); therefore, H4 is not supported.

H5 predicted lower risk perceptions increase attitudes towards great white sharks. A correlation was conducted between risk perception and great white shark attitudes. r^2=0.023, F (1, 209) = 4.98, p<.05). There was a significant negative relationship between risk perception (M= 3.85, SD= 1.43) and great white shark attitudes (M= 5.84, SD= 1.08). Lower risk perceptions increase great white shark attitudes; therefore, H5 is supported.

H6 predicted great white shark conservation behavior is higher in the flagship condition than keystone condition. A one-way ANOVA was conducted between representation and behavior intention. There was no significant difference between participants assigned to the flagship (M= 4.68, SD= 1.13) and keystone (M= 4.49, SD= 1.49) conditions on behavior intention; therefore, H6 is not supported.

H7a predicted higher subjective norms increase shark conservation behavior intention. H7b predicts higher perceived behavioral control of shark conservation increases shark conservation behavior intention. A correlation was conducted between subjective norms and behavior intention. There was a significant positive relationship between both subjective norms (M= 4.89, SD= 1.31) and behavior intention (M= 4.59, SD= 1.34). r^2=0.43, F (1, 205) = 102.2,

p=<.001[b]. Higher subjective norms increase great white shark conservation behavior; therefore, H7a is supported. Perceived behavioral control was not a reliable variable; therefore, H7b is not supported.

Table 4. Descriptive Statistics of Subjective Norms on Participants' Shark Conservation Behavior Intentions.

Variable	N	Mean	SD
Subjective Norms	207	4.89	1.31
Behavior Intention	207	4.59	1.34

Demographics

Age- The age of participants ranged from 18-68 (M= 26.02, SD= 9.51). An additional 25 participants did not disclose their age.

Sex- Participants were asked which of the following best describes their sex with 1 representing male, 2 representing female, and 3 representing non-binary/third gender. An additional 5 participants did not respond.

Table 5. Sex of Participants

Sex	N
Male	88
Female	122
Non-binary/ third gender	3

Education- Participants were asked their highest level of education obtained with 1 representing no high school diploma, 2 representing high school diploma or GED, 3 representing

some college, 4 representing associate degree, 5 representing bachelor's degree, 6 representing master's degree or professional degree, and 7 representing doctoral degree (M= 3.57, SD= 1.17). 5 participants did not respond.

Table 6. Participants' Highest Level of Education

Level of Education	N
No high school diploma	4
High school diploma or GED	23
Some college	106
Associate degree	18
Bachelor's degree	51
Master's degree or professional degree	11
Doctoral degree	0

Ethnic background- Participants were asked which of the following best described their ethnic background with 1 representing Asian, 2 representing Non-Hispanic White (Caucasian), 3 representing African American, 4 representing Spanish or Hispanic origin, 5 representing multi-racial or mixed race, and 6 representing Native American (M= 2.35, SD= 1.18). 5 participants did not respond.

Table 7. Participants' Ethnic Background.

Ethnic background	N
Asian or Pacific Islander	27
Non-Hispanic White (Caucasian)	146
African American	4
Spanish or Hispanic origin	17
Multi-racial or mixed race	12
Native American	7

CHAPTER 5. DISCUSSION

The purpose of this paper is to analyze the effect of different great white shark representations on great white shark conservation behavior intention. There were six theoretical implications and three practical implications of note that will be discussed within this section. For the theoretical implications, a significant finding from the main effects of fear and representation was that presence of fear stimuli increased great white shark conservation behavior; however, representation did not have a significant effect on great white shark conservation behavior intention. When analyzing the interaction effect of fear and representation, participants exposed to the presence of fear and flagship stimuli condition reported higher positive attitudes towards great white sharks compared to the other conditions. Another significant finding for theoretical implication was that there was an association between great white shark attitudes and great white shark conservation behavior intention. To further test the Theory of Planned Behavior, this study explored the variables subjective norms and perceived behavioral control. There was a positive relationship between subjective norms and behavior intention, meaning the participants intentions to support great white shark conservation was influenced by society and people close to them; however, perceived behavioral control was not a reliable variable and was not used in the analysis.

For the practical implications great white shark media consumption, previous marine experience, and risk perception were analyzed. Shark media consumption was not statistically significant, and therefore did not affect participants' attitudes toward great white sharks. There was a significant positive relationship between marine experiences and fear and behavior

intention, meaning previous marine experiences do affect fear and behavior intention. Finally, this study did find an association between risk perception and great white shark attitudes.

5.1 Theoretical Implications

While analyzing the main effects it was unexpected to find that presence of fear stimuli increased great white shark conservation behavior intention compared to absence of fear stimuli; however, existing research has found that fear is commonly associated with great white sharks (Ostrovski et al., 2021; Friedrich et al., 2014), meaning people do fear great white sharks., and while fear of great white sharks has been researched from a media approach, it has not been researched from a conservation approach. Due to misrepresentations of great white sharks, negative media portrayals of great white sharks influence people's perceptions (Ostrovski et al., 2021; Friedrich et al., 2014). While research suggests that perceptions have started to improve with increased awareness and conservation interest (Braccini, 2016), fear of great white sharks may be an asset to encourage great white shark conservation behavior. This study found a statistically significant negative relationship between fear and behavior intention, meaning, the higher the fear, the higher the intention toward great white shark conservation behavior. Based on this study's findings, the more that people fear great white sharks, the more they care. On the contrary, the less that people fear great white sharks, the less they seem to care. This is quite contradictive to the theory of planned behavior which uses attitudes, subjective norms and behavior intentions to predict behavior. As explained by TPB, the higher the attitudes, perceived behavior control, and subjective norms, the higher the behavior. A key concept in the theory of planned behavior is the concept of volitional control as previously discussed. Since volitional control influences behavior as explained by the ability to accomplish the behavior by choice, fear could be a factor that is beyond volitional control. People do not have much control over their

fear and therefore fear can have an unpredictable affect on things such as behavior. So, while this study has been able to identify that fear does increase great white shark conservation behavior, it is beyond the explanation of the theory of planned behavior.

While fear of great white sharks did increase great white shark conservation behavior intention, representation did not have a significant effect. Contrary to the hypothesis, participants assigned to the flagship stimuli conditions did not report higher great white shark conservation behavior intention compared to participants assigned to the keystone stimuli conditions. One explanation could be that since participants did not experience a higher fear response to the stimuli, they were not as motivated to support great white shark conservation behavior intentions. As this study has found, fear is a motivating factor in great white shark conservation behavior. The representation of a flagship species compared to a keystone species did not portray great white sharks with fear appeals, and participants did not have a fear response to the stimuli. To get people to support great white shark conservation, this study shows that fear is a factor in increasing great white shark conservation behavior through images; therefore, great white shark conservation materials should target higher fear appeals and more images to increase response to great white shark conservation behavior. One explanation for this can be that images evoking fear have a greater impact on response compared to reading. Images are easier to process and require less comprehension; therefore, people can respond better toward an image than a body of text. This study suggests that when people see a presence of fear image of a great white shark they have a higher fear response. Since people have been predisposed to fear great white sharks, it makes them more interested in an image with a high fear index than a low fear index. When people see an absence of fear image, it does not create a high fear response, so people do not care as much because it may be less interesting.

Additionally, participants exposed to the presence of fear flagship stimuli reported higher positive attitudes towards great white sharks compared to the other conditions with presence of fear and keystone being the second highest, absence of fear and keystone being the third highest, and absence of fear and flagship being the lowest attitudes toward great white sharks. While the data supports higher positive attitudes toward great white sharks after reading the flagship stimuli, one flagship stimuli had the highest positive attitudes, and one flagship stimuli had the lowest positive attitudes; therefore, this research indicates that attitudes cannot rely on representation alone, but when manipulated by fear, images also effect how people respond to information. The presence of fear image creates a higher fear response than the absence of fear image, which could also increase their emotional response to the flagship or keystone representation. When participants saw the presence of fear image and read the passage about great white sharks being in need for conservation, they had more positive attitudes towards great white sharks than when seeing the absence of fear image and reading that great white sharks are dominant in the ecosystem leading people to believe they are not in need of conservation. Participants could have been more interested by the presence of fear image than the absence of fear image, which resulted in them paying more attention to the passage. The keystone representations had similar results, with the presence of fear image and keystone condition having higher positive attitudes, and the absence of fear and keystone having lower positive attitudes.

Attitudes toward great white sharks also affected great white shark conservation behavior intention. Based on the results, there is an association between great white shark attitudes and great white shark conservation behavior intention. Respondents who reported positive attitudes towards great white sharks also reported higher great white shark conservation behavior intention

compared to respondents who reported negative attitudes toward great white sharks. As explained by TPB, the higher the attitudes, the higher the behavior. Since attitude directly influences behavior, the more positive attitudes towards great white sharks, the higher people think about great white sharks, the more they are motivated to participate in great white shark conservation behavior.

To further test the theory of planned behavior, this study analyzed how subjective norms and perceived behavioral control affect great white shark conservation behavior intention. Respondents who reported higher subjective norms about great white shark conservation behavior also reported higher great white shark conservation behavior intention; however, perceived behavioral control could not be analyzed, since the scale was not reliable. The variables subjective norms and perceived behavioral control can be explained by the theory of planned behavior. Participants who feel more social pressure to support great white conservation, reported higher great white shark conservation behavior intention. While perceived behavioral control was not a significant variable, one explanation could be that participants did not feel they could make a difference by supporting great white shark conservation.

5.2 Practical Implications

This study also analyzed how great white shark media consumption affects attitude toward great white sharks and had three main findings: shark media consumption had no affect on participants' attitudes toward great white sharks, there was a significant positive relationship between marine experiences and fear and behavior intention and risk perception was associated with great white shark attitudes.

This study did not find any statistical significance between great white shark media consumption and attitudes toward great white sharks, therefore hypothesis 2 was not supported.

One explanation could be that since great white sharks are a well-known species, people already have pre-existing attitudes toward great white sharks. If the options were also common choices, a larger population has likely seen them and had preexisting attitudes toward great white sharks regardless of consuming more great white shark media. For future research, it would be interesting to see positive media versus negative media, and whether or not that affects people's attitudes toward sharks.

This study also explored how past marine experiences affect great white shark conservation behavior. This study did find a significant positive relationship between marine experiences and fear and behavior intention. While hypothesis 3a was not supported since respondents with more marine experiences reported higher fear of great white sharks, hypothesis 3b was supported because they also reported higher great white shark conservation behavior intention. Contrary to Ostrovski et al., (2020), this study found that previous marine experience does not decrease fear of great white sharks, it does, however, increase great white sharks conservation behavior similar to findings by Apps et al., (2017). As this study has found, people are motivated by fear of great white sharks. One explanation could be that while people with marine experiences do fear great white sharks, they still think they are an important species to conserve.

The final practical implication of this study supports hypothesis 5, "Lower risk perceptions increase attitudes towards great white sharks." There is a significant negative relationship between risk perception and attitudes toward great white sharks. Participants who have lower risk perception about great white sharks have more positive attitudes toward great white sharks; therefore, there is an association between risk perception of great white sharks and attitudes toward great white sharks. People who do not report great white sharks as a direct threat think

more positively toward great white sharks. One explanation could be that people do not engage in activities that would result in a direct encounter with great white sharks, which would not lead them to have negative attitudes toward them. Overall, participants reported fear of sharks, but positive attitudes towards them. So, while people do acknowledge fear of great white sharks that does not make people think negatively about them.

5.3 Conclusion

In conclusion, while many of the results were significant and some unexpected, this study accomplished the purpose of analyzing how fear and representation of great white sharks affect great white shark conservation behavior intention. Generally, people do fear great white sharks, but the fear does not negatively affect their attitudes or conservation behavior intention. This study found that fear of great white sharks motivates people to support great white shark conservation. While participants report fear of great white sharks, they also reported higher attitudes and conservation behavior intention. This study also found that fear appeals have a stronger effect than non-fear appeals. Additionally, the stimuli representing great white sharks as a flagship species had increased behavior intention from participants than the keystone representation, which was expected. This is also important to consider in analyzing great white shark representations. Different representations do affect how society perceives great white sharks; therefore, great white shark representations are critical in encouraging people to support great white shark conservation. People seem to be more interested in a great white shark that is framed as scary, but also represented as a species in need of conservation.

This study provided many implications; both theoretical and practical. This study aimed to explore fear as an extension of the theory of planned behavior. Based on this study, fear can be a motivating factor in behavior intention and in this case, fear of great white sharks is a

motivating factor on great white shark conservation behavior intention. This study analyzed each element of the theory of planned behavior such as attitude, perceived behavioral control, and subjective norms, as it applies to great white sharks and great white shark conservation behavior intention and all of the findings in this study align with previous research on the theory of planned behavior. Additionally, this study introduced experiments as a new method to research great white sharks and great white conservation.

The practical implications of this study were to identify barriers between society and great white shark conservation behavior intention. While this study was unable to represent the population of people with no marine experience, it still accomplished the goal of increasing awareness about great white sharks as an endangered species and promote different ways to support great white shark conservation. The results of this study provide multiple opportunities for future research to continue changing people's perceptions of great white sharks and their need for conservation.

5.4 Limitations and Future Research

While this study produced many significant results, there were a few limitations. One of the main limitations to this study was the population. This study used a convenience sample of mostly students. By using a student population, this study is not representative of society and cannot be generalized. Further, this study is only valid to the population represented which would be limited to adults between the ages of 18 and 68. To see how the results of this study could be applicable to additional populations further research is needed. Additionally, the intended population of this study was not represented by the participant pool. Part of this study wanted to analyze the difference between people who have previous marine experiences and people who do not have any previous marine experience; however, out of 218 participants, 201

have previous marine experience, 11 participants have no previous marine experience, and 6 participants did not report whether they have marine experience. This study did find an implication that people with less marine experience had It is still worth exploring the population with no previous marine experience for future research, to compare if marine experience is a factor in fear of great white sharks and supporting great white shark conservation. Additionally, since this study found that fear can be a motivating factor in behavior, it would be interesting to research other topics that fear may be a motivating factor in behavior. One example could be if fear is a motivating factor in reducing behavior that is contributing to climate change.

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APPENDICES

5.5 Appendix A: Stimuli

5.5.1.1. Condition 1: flagship x presence of fear

A1. Stimuli for condition 1: flagship x presence of fear

Case Study: The Great White Shark *(Carcharodon carcharias)*

Endangered in the Mediterranean

This flagship species has long been the focus of negative media attention as a result of its occasional lethal interactions with humans and perceived nuisance to commercial fisheries. Due to this much exaggerated threat the species has been targeted in the past for sportfishing income, commercial trophy hunting or human consumption.

The IUCN 2000 global assessment found the species to be Vulnerable globally, and this is currently under review. New information from the San Marino Workshop found the Great White Shark to be Endangered in the Mediterranean Sea. It has previously been listed as Endangered under Appendix I in the Convention of Migratory Species, Bonn 1983. It is also listed under Appendix II of the Bern Convention (Strictly Protected Fauna Species) and Barcelona Convention (Endangered or Threatened species) for the protection of the marine and coastal environment of the Mediterranean. Malta, however, is the only state to have provided legal protection for this species in its national legislation.

5.5.1.2. Condition 2: flagship x absence of fear

A2. Stimuli for condition 2: flagship x absence of fear

Case Study: The Great White Shark *(Carcharodon carcharias)*

Endangered in the Mediterranean

This flagship species has long been the focus of negative media attention as a result of its occasional lethal interactions with humans and perceived nuisance to commercial fisheries. Due to this much exaggerated threat the species has been targeted in the past for sportfishing income, commercial trophy hunting or human consumption.

The IUCN 2000 global assessment found the species to be Vulnerable globally, and this is currently under review. New information from the San Marino Workshop found the Great White Shark to be Endangered in the Mediterranean Sea. It has previously been listed as Endangered under Appendix I in the Convention of Migratory Species, Bonn 1983. It is also listed under Appendix II of the Bern Convention (Strictly Protected Fauna Species) and Barcelona Convention (Endangered or Threatened species) for the protection of the marine and coastal environment of the Mediterranean. Malta, however, is the only state to have provided legal protection for this species in its national legislation.

5.5.1.3. Condition 3: keystone x presence of fear

A3. Stimuli for condition 3: keystone x presence of fear

Case Study: The Great White Shark *(Carcharodon carcharias)*

The importance of sharks

Sharks are what scientists call a ‘keystone species’. This basically means that they are responsible for keeping the intricate ocean ecosystem in balance. As apex predators sharks keep everything below them in harmony. They do this by keeping the predatory species that they prey on at a healthy but balanced number. This in turn keeps the species below their prey balanced and so on. This balance flows down the food chain even effecting oxygen levels.

As well as keeping the ocean food web in balance, sharks also play a pivotal role in keeping populations that they prey on genetically healthy as well as removing disease and sickness from the ocean (hence the term doctors).

Sharks keep populations genetically healthy by removing the weaker individuals. Therefore any weak/mutated gene will not get passed on.

Sharks remove sickness and disease from being passed on by preying and or scavenging on those sick or already dead individuals. This is not only efficient for the sharks (as they exert less energy to feed) it also provides an extremely valuable function in keeping the ecosystem healthy.

5.5.1.4. Condition 4: keystone x absence of fear

A4. Stimuli for condition 4: keystone x absence of fear

Case Study: The Great White Shark *(Carcharodon carcharias)*

The importance of sharks

Sharks are what scientists call a 'keystone species'. This basically means that they are responsible for keeping the intricate ocean ecosystem in balance. As apex predators sharks keep everything below them in harmony. They do this by keeping the predatory species that they prey on at a healthy but balanced number. This in turn keeps the species below their prey balanced and so on. This balance flows down the food chain even effecting oxygen levels.

As well as keeping the ocean food web in balance, sharks also play a pivotal role in keeping populations that they prey on genetically healthy as well as removing disease and sickness from the ocean (hence the term doctors).

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Sharks remove sickness and disease from being passed on by preying and or scavenging on those sick or already dead individuals. This is not only efficient for the sharks (as they exert less energy to feed) it also provides an extremely valuable function in keeping the ecosystem healthy.

5.6 Appendix B: Qualtrics Survey

Representations of Great White Sharks

Start of Block: Consent

Q21 Dear Participant,

My name is Emily Montgomery and I am a researcher from Colorado State University in the JMC department. I am conducting a research study on perceptions of great white sharks and their conservation needs. I am exploring how fear in media representations of great white sharks influences perceptions of great white shark conservation. The title of my project is The Influence of Great White Shark Representations on Great White Shark Conservation. The Principal Investigator is Samuel Tham, JMC Assistant Professor, and I am the Co-Principal Investigator. This study is not funded.

We invite you to take an anonymous online survey. Participation will take approximately 10 minutes. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data to others, we will combine the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on the influence of media representations on the perception of great white sharks and the need for their conservation. This research is not only applicable to great white sharks, but it can also be used to further explore the perception of other predatory species and their conservation. Participation may be eligible for SONA credit towards eligible JMC courses.

It is not possible to identify all potential risks in research procedures, but the researchers have taken reasonable safeguards to minimize any known and potential but unknown risks.

If you have any questions about the research, please contact Emily Montgomery via e-mail at Emily.montgomery@colostate.edu. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: CSU_IRB@colostate.edu; 970-491-1553.

Emily Montgomery M.S. JMC

To indicate your consent to participate in this research and to continue to the survey, please select one of the following options.

☐ I agree to participate (1)

☐ I do not agree to participate (2)

End of Block: Consent

Start of Block: Marine experiences

Q35 The following questions will ask you about your previous experiences with the ocean.

Q13 Have you visited the ocean before?

○ Yes (1)

○ No (2)

Q14 Indicate your frequency of visiting the ocean over the past twelve months

	1=Never (1)	2 (2)	3 (8)	4 (9)	5 (10)	6 (11)	7=Very Often (12)
Indicate your frequency of visiting the ocean over the past twelve months (16)	○	○	○	○	○	○	○

End of Block: Marine experiences

Start of Block: Shark media

Q36 The following questions will ask you about your media consumption relating to Great White Sharks.

Q30 What is your source of information on sharks? Select all that apply.

- [ ] Articles (1)
- [ ] People (2)
- [ ] Newspapers/Magazines (3)
- [ ] Movies (4)
- [ ] News (5)
- [ ] Sites/Social media (6)
- [ ] Documentaries (7)
- [ ] None (8)

Q31 Which of the following shark media have you seen? Select all that apply.

- [ ] "Zig & Sharko" (2010) (1)

- [ ] "47 Meters Down" (2017) (2)
- [ ] "Shark" (Netflix) (3)
- [ ] "The Meg" (2018) (4)
- [ ] "Open Water" (2003) (5)
- [ ] "Baby Shark" (2016) (6)
- [ ] "The Shallows" (2016) (7)
- [ ] "Jabberjaw" (1976) (8)
- [ ] "Jaws" (1975) (9)
- [ ] "Shark Tale" (2004) (10)
- [ ] "Finding Nemo" (2003) (11)
- [ ] None (12)

End of Block: Shark media

Start of Block: Shark knowledge

Q37 The following questions will ask about your knowledge of sharks.

Q25 Which is the largest of all sharks?

- Great white shark (1)
- Whale shark (2)
- Bull shark (3)
- Tiger shark (4)

Q28 What are shark skeletons made of?

- Bone (1)
- Cartilage (2)
- Keratin (3)
- They don't have them (4)

Q29 How many shark species are there?

- 170 (1)
- 500 (2)
- 70 (3)
- 770 (4)

Q31 Which organ helps sharks to float?

- Heart (1)
- Spleen (2)
- Liver (3)
- Stomach (4)

Q32 After eating a seal or a sea lion, how long can a great white shark go without another big meal?

- ○ A few hours (1)
- ○ A day (2)
- ○ A week (3)
- ○ A month (4)

End of Block: Shark knowledge

Start of Block: Conservation Attitudes

Q40 The following question will ask how you feel about great white shark conservation.

Q11 My attitude toward great white shark conservation is	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	
Not important	○	○	○	○	○	○	○	Important
Bad	○	○	○	○	○	○	○	Good
Negative	○	○	○	○	○	○	○	Positive
Useless	○	○	○	○	○	○	○	Useful
Unreliable	○	○	○	○	○	○	○	Reliable

End of Block: Conservation attitudes

Start of Block: Risk Perception

Q41 The following questions will ask your perception of great white sharks.

Q32 Please respond to the following statements...	1= Strongly Disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7= Strongly Agree (7)
I am not familiar with the risks posed by great white sharks (1)	○	○	○	○	○	○	○
I am vulnerable to the risks posed by great white sharks (2)	○	○	○	○	○	○	○

Encounters with great white sharks are likely to result in fatal consequences (3)	○	○	○	○	○	○	○
I fear having an encounter with a great white shark (4)	○	○	○	○	○	○	○

End of Block: Risk Perception

Start of Block: PBC

Q42 The following questions will ask about your behavior.

Q17 Respond to the following statements ...	1=Strongly Disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7=Strongly Agree (7)
It is too difficult for someone like me to help protect great white sharks (1)	○	○	○	○	○	○	○

My day-to-day actions impact great white shark conservation (2)	○	○	○	○	○	○	○
I am willing to make changes to support great white shark conservation (3)	○	○	○	○	○	○	○

End of Block: PBC

Start of Block: Subjective norms

Q43 The following question asks about your behavior.

Q15 People important to me...	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	
Think I should not save great white sharks	○	○	○	○	○	○	○	Think I should save great white sharks
Do not want me to conserve great white sharks	○	○	○	○	○	○	○	Do want me to conserve great white sharks
Do not expect me to conserve great white sharks	○	○	○	○	○	○	○	Do expect me to conserve great white sharks

End of Block: Subjective norms

Start of Block: Manipulation instructions

Q44 Next, you will read an article about great white sharks and their conservation status. You will have 1 minute to read the article, then the button to continue will appear. You can take longer than 1 minute if you need; however, you must spend at least 1 minute reading the article. Then, you will answer questions.

End of Block: Manipulation instructions

Start of Block: Presence&Flagship

End of Block: Presence&Flagship

Start of Block: Absence&Flagship

End of Block: Absence&Flagship

Start of Block: Absence&keystone

End of Block: Absence&keystone

Start of Block: Presence&Keystone

End of Block: Presence&Keystone

Start of Block: Manipulation check

Q6 Based on the information you read great white sharks are identified as a...

- ○ Keystone species (1)
- ○ Flagship species (2)

End of Block: Manipulation check

Start of Block: Post Shark Attitudes

Q38 The following questions will ask how you feel about great white sharks.

Q1 My attitude toward great white sharks is	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	
Not important	○	○	○	○	○	○	○	Important
Bad	○	○	○	○	○	○	○	Good
Negative	○	○	○	○	○	○	○	Positive
Harmful	○	○	○	○	○	○	○	Beneficial
Boring	○	○	○	○	○	○	○	Exciting

Q8 Respond to the following statements...

	1=Strongly Disagree (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7=Strongly Agree (7)
I care about the well being of great white sharks (1)	○	○	○	○	○	○	○
I feel a special connection to great white sharks in the wild (2)	○	○	○	○	○	○	○

End of Block: Post Shark Attitude

Start of Block: Post Shark Fear

Q39 The following questions ask how you feel about sharks.

Q10 Indicate to what extent the following associations describe great white sharks

	1=Not at all (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7=Very much (7)
Scary (1)	○	○	○	○	○	○	○
Dangerous (2)	○	○	○	○	○	○	○
Vicious (3)	○	○	○	○	○	○	○
Peaceful (4)	○	○	○	○	○	○	○
Beautiful (5)	○	○	○	○	○	○	○
Graceful (6)	○	○	○	○	○	○	○

Q9 Respond to the following statement ...	1=Not frightened at all (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7=Extremely frightened (7)
How frightened are you of great white sharks (1)	○	○	○	○	○	○	○

End of Block: Post Fear

Start of Block: Behavior intention-poststim

Q18 After reading the article...	1=Not at all (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7=Very much (7)

To what extent do you support measures to restore depleted shark populations (such as banning or regulating shark fishing, establishing no-fishing reserves, etc.), effectively increasing the number of	○	○	○	○	○	○	○

sharks in the ocean?” (1)

Q19 After reading the article, how likely are you to…

1=Never (1)

2 (2)

3 (3)

4 (4)

5 (5)

6 (6)

7=Always (7)

Talk positively about great white sharks to others or on social media (1)

Talk positively about great white sharks in general to others or on social media (2)

Follow shark conservation organizations via social media and/or email lists (3)

Access shark information (4)

Write or email government with regard to sharks (5)

Sign a shark conservation petition (6)

Choose sustainably caught seafood (7)

○ Donate money to shark conservation (8)

End of Block: Behavior intention-poststim

Start of Block: demographics

Q1 What is your age?

_____

Q2 What is your sex?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

Q3 Which of the following best represents your ethnic background?

- ○ Asian or Pacific Islander (1)
- ○ Non-Hispanic White (Caucasian) (2)
- ○ African American (3)
- ○ Spanish or Hispanic origin (4)
- ○ Multi-racial or mixed race (5)
- ○ Native American (6)

Q4 What is the highest level of education you have obtained?

- ○ No high school diploma (1)
- ○ High school diploma or GED (2)
- ○ Some college (3)
- ○ Associate's degree (4)
- ○ Bachelor's degree (5)
- ○ Master's degree or professional degree (6)
- ○ Doctoral degree (7)

Q5 Generally speaking, what is your political affiliation?

- ○ Republican (1)
- ○ Democrat (2)
- ○ Independent (3)
- ○ No preference (5)
- ○ Other (4) _____

End of Block: demographics