5-1-2020

Evaluating the Effects of a Brief Acceptance and Commitment Therapy Intervention on Environmentally Sustainable Behavior

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EVALUATING THE EFFECTS OF A BRIEF ACCEPTANCE AND COMMITMENT THERAPY INTERVENTION ON ENVIRONMENTALLY SUSTAINABLE BEHAVIORS

by

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B.S., Southern Illinois University, 2018

A Thesis
Submitted in Partial Fulfillment of the Requirements for the
Master of Science Degree

School of Psychological and Behavioral Sciences
in the Graduate School
Southern Illinois University Carbondale
May 2020

THESIS APPROVAL

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April 9, 2020

AN ABSTRACT OF THE THESIS OF

Anne Sheerin, for the Master of Science degree in Behavior Analysis and Therapy, presented on April 9, 2020, at Southern Illinois University Carbondale.

TITLE: EVALUATING THE EFFECTS OF A BRIEF ACCEPTANCE AND COMMITMENT THERAPY INTERVENTION ON ENVIRONMENTALLY SUSTAINABLE BEHAVIORS

MAJOR PROFESSOR: Dr. Mark R. Dixon

The purpose of the present study was to use the principles of acceptance and commitment therapy (ACT) to increase environmentally sustainable behavior among seven college-aged students. Acceptance and Commitment Therapy involves increasing mindfulness and psychological flexibility. All participants filled out a daily survey that ranked how much they had participated in environmentally sustainable behavior or if they had the opportunity to participate in it at all. Four participants then received three individual, brief ACT sessions with the researcher and three of these participants showed an average of a 20% increase overall in self-reported sustainable behaviors after the brief intervention in both phases, while only one participant had an increase in phase 2 alone at 22.3%. The three participants that did not receive the ACT remained in baseline throughout the study and had minimal changes in responding on the survey. These results suggest that the ACT intervention may have some effect on improvements in sustainable behaviors.

ACKNOWLEDGMENTS

I would like to thank Becky Barron and Jessica Hinman for the help and guidance given to me throughout the thesis process. I could not have completed the paper without their support.

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CHAPTER 1

INTRODUCTION

Environmental Issues

Global warming is the gradual increase in the temperature of the atm atmosphere and the ocean widely predicted to occur due to an increase in the greenhouse effects resulting from pollution (Conway, 2008). According to the National Aeronautics and Space Association's (NASA) Goddard Institute of Space Studies, the global temperature has risen 1.9 degrees Fahrenheit with the past five years being the warmest since 1880 when NASA started keeping records on average global surface temperature (Lessen et al., 2019). This increase in temperature has effects on ecosystems across the planet. The coral reefs across the world have started to lose their color, otherwise known as bleaching, because of the lack of the mutual relationship between it and an alga. When corals become bleached for too long, populations die. This bleaching is also caused by oceanic pollution and overfishing (Hughes et al., 2017). Global warming has affected animals on land too. In a recent study done by Alex Draper at the Georgia Institute of Technology, he has found a change in interactions between predators and their prey because of increased carbon dioxide levels. This has become an issue of population control in certain ecosystems on land and water (Draper & Weissburg, 2019). Even by 1990, global warming had affected ecosystems in the forest areas. It had decreased water availability which decreased the amount of water in the soil, reducing the number of trees that could grow in Eastern North America (Peters, 1990).

Global warming has effects on the natural environment all around, and the increasing amount of greenhouse gases into the atmosphere is to blame. The Intergovernmental Panel on Climate Change (IPCC), which is a part of the United Nations, is made up of 195 scientists from

around the world who conduct research on the factors contributing to climate change in order to inform policy and increase environmentally sustainable actions within countries (IPCC, 2019). In 2014, the IPCC released a report for policy makers titled *Climate Change 2014* (IPCC, 2014*).* In this report the IPCC describes that greenhouse gases including carbon dioxide, methane, fluorinated gases, and nitrous oxide released by actions related to human behaviors are at an all-time high. Greenhouse gas emissions increased on average 1.3% per year from 1970 to 2000 and then on average 2.2% per year from 2000 to 2010 (IPCC, 2014). The greenhouse effect is a phenomena in which the Earth's surface as well as the lowest layer of the Earth's atmosphere increases in temperature when carbon dioxide, methane, nitrous oxide, water vapor and fluorinated gases absorb heat from the sun. This heat is then trapped in the Earth's atmosphere and then heats up the surface of the planet. Though this effect occurs naturally to keep Earth at a safe temperature for carbon-based life, the more of the gases that are present in the atmosphere allows for more heat to be trapped in the atmosphere. The increase in these gases specifically have had a direct impact on the rising of the global temperature (EPA, 2019).

Climate change is a direct result of the increase of global temperature by the greenhouse effect. As said in an earlier paragraph, has a direct negative effect on the planet, weather patterns, and populations of planets, animals, and other organisms (Peters, 1990; Lenssen et al., 2019; Hughes et al., 2017). The effects of climate change can be seen all the way from space. With the assistance of scientists and organizations, The National Aeronautics and Space Association documented and analyzed over time the aerial view of the planet in which ice caps can be shown melting and land becoming drier. This permanent product of global temperature rising initiated a report done by the Intergovernmental Panel on Climate Change entitled *Climate Change and Land* (2019). In this report, the authors discuss that human directly affect 69-76% of the land

needed for human survival (IPCC, 2019). The increase average temperature has impacted the severity and count of extreme weather which affects the ecosystems and food sources that the regular weather supports (Sleeley & Romps, 2014; Rosenzweig, Iglesius, Yang, Epstein & Chivian, 2001). Some of these events include heat waves and droughts. Another effect climate change has had is a shift in climate regions, specifically the hotter zones getting larger and the colder zones getting smaller (Mahlsetin, Daniel & Solomon, 2013). Most of this results in lack of food security, as in less animals and plants to go around. In relations to the colder areas decreasing, the ice in these areas begin to melt and the habitats on the animals who live there decrease (Smith, et al. 2013). Human actions that increase the likelihood of global warming need to be reduced because of the adverse effect it has had on so many other areas of life. It is our job to identify those actions.

Actions that adversely affect the environment

Human behavior in general can have harmful effects on the environment. Littering, which is defined as trash being thrown in an open area, can harm animals who eat it. Even if trash is thrown away, it goes to landfills to sit Since landfills are covered with trash, there are barely any living things to release the oxygen that is required to break down the trash. Driving a car releases greenhouse gasses into the atmosphere. Some of the behaviors that will be assessed in the current study can or have been found to negatively affect the environment include over consumption of animal products, plastic usage, carbon emissions, and water usage. Meat centric meals use nine times the amount of the emissions than a plant-based meal of the same nutritional equivalent. Meat products have 10-20 times the environmental impact than plant-based meals because of the food, water, and space it takes to raise an animal. The emissions from a meat free diet were 18-31% less than the average diet, and vegan diets had 23% less emissions than the average

vegetarian diet. At the same time, a totally plant based diet is not sustainable (Reynolds, Buckley, Weinstein, & Boland, 2017). When vegetables are used to substitute meant, they can have the same adverse environmental impacts. Some meat is important in a diet, but overconsumption of any food product is not sustainable, because of its lifecycle of growing, feeding, and providing water for the substance whether it be for a plant of animal (Reynolds et al., 2017). Just like animal overconsumption, the release of carbon emissions comes from many human behaviors. Almost anything that uses energy leases some sort of carbon emissions. According to the International Energy Agency, the top three sources of carbon emissions come from using coal, oil, and natural gas (IEA, 2012). Coal is used in many power plants that provide energy to power homes and businesses. In 2018, the electric power industry in the United States consumed 637 million tons of coal in power plants (EIA, 2020). Oil and natural gases are used the most by transportation vehicles, airplanes, and other machinery. In 2018, the United States' average consumption of gasoline, which is derived from oil and other natural gases, to fuel cars was 392 million gallons per day. Jet fuel consumption averaged to around 1.7 million barrels a day in the same year. Producing electricity, heating households and other buildings, construction materials and farming equipment averaged at 4.15 million barrels per day of petroleum oil products in 2018 as well (EIA, 2019). Single use products are also a contributor to the destruction of the planets. Single use products are often in the form of plastic, glass or aluminum. Many single use products are made from plastic and almost 12.7 million metric tons of plastic reach the ocean (Lindwall, 2020). When this plastic gets into the ocean or even into our system it can cause harm to human health. The plastic that reaches the water ends up harming the fish and other animals that live there. Ninety percent of birds who live by the ocean and 100 percent of the turtle there were found with plastic in their systems (Neufeld et al., 2016). This causes

damage to the natural flow of ecosystems. Man made products, like most of single use items, are seemingly unlimited but there are only so many resources available to humans on the planet. Even though the planet is more than 71% water, the fresh water that humans can use makes up around 0.76% of that (USGS, 2020). Water conservation is important because when humans use too much water, it leaves less water to be used for growing crops in seasons of drought, plants and for raising animals (EPA, 2018). To put it broadly, consumer behavior is to be considered as a large factor for a great deal of environmental change. The study of consumer behavior is directly related to behavioral economics. Behavioral economics has to do with predicting and controlling the behavior of a group. Steven Hursh conducted an experiment with monkeys that tested the principles of behavior economics. He found that behavior is affected by the price or response effort it takes to receive a commodity or reinforcer (1978). Behavior analytically speaking, the reason that so many people participate in their behaviors is because of a reduced price or response which increases the motivating operation to exhibit environmentally unsustainable behavior (Brown & Hagen, 2010). The reason people drive their car is to reduce the effort it would take to walk or bike. People use electricity to power their vacuum to reduce the response effort it would usually take to sweep. Using plastic containers is less effort than washing a reusable cup and bringing it with you all the time. These replacements for an easier, more convenient reinforcer are called substitutes in consumer behavior analysis. Substitutes alter the price of the original reinforcer, making the price for the original reinforcer higher than the substitute (Foxall, 2010). The price referring to the effort and the money it costs to be more sustainable is often why green products are more expensive and sustainable behavior is more effortful (Benveniste, 2019).

Behavioral approaches to addressing environmental issues

There are limited studies that have been done to promote environmentally sustainable behaviors through self-report measures, and some on observable behaviors. In 2012, a meta-analysis was published involving interventions implemented on observable behavior that contained studies on increasing sustainable behaviors in communities (Osbaldiston & Schott, 2012). Some studies in particular had to do with the behaviors related to the current study including recycling, gas consumption, electricity usage, and water usage as well. For example, research on sustainability is important in the workplace. Intervention made to reduce the waste of paper can be simple but effective. Brothers and McClannhan conducted a study to increase the pounds of paper recycled by 25 employees in an office setting (1994). The researchers found that when a recycling container was in a central location less paper was recycled. Pounds of paper in the trash reduced to almost zero pounds in multiple settings when a local container and memo was given out to employees. The percentage of paper used that was being recycled went above 80% and in the follow up data reached to near 100% after that (Brothers & McClannahan, 1994). This strategy to reduce waste in the workplace seems to effective.

Car usage is a contributor to the increase of greenhouse gases in the atmosphere (EPA, September 2019). Although the purpose of a particular research study done by Foxx and Schaffer (1981) was to decrease the use of gasoline for a company for financial purposes, a reduction in the use of gasoline means less carbon dioxide, a greenhouse gas, goes into the Earth's atmosphere. This experiment consisted of a multiple baseline across groups with a reversal design. The researchers measured the odometer readings to see how many miles they traveled per day and were also given a "Personal Fuel Conservation Guide." If their mileage was reduced anywhere from 10% to 40% weekly, they would be entered into a lottery that was drawn at the

end of the week. Three more people reduced their mileage in the experimental group than the control group (Foxx & Schaffer, 1981). In terms of reinforcement, this study shows that the lottery became an abolishing operation for using gas and an establish operation for using other modes of transportation. The employees met increased reinforcement with the lottery, along with saving more money on gasoline. This method is often referred to as an incentive program in organizational behavior management. Often to increase productivity in the workplace, employers offer more money based on performance (Oah & Lee, 2011).

Electricity usage is similar in function to the behavior of using gas because electricity comes from a factory that causes atmospheric pollution. Hayes and Cone (1981) aimed at reducing the electricity consumption of residential homes using feedback. They implemented the intervention in the form of monthly feedback. It consisted of a professional letter given to residents that reported a change in consumption from one month to another. It included percent change in dollar amount and kilowatts per hour. A reversal design was used and when intervention was removed, dollar amounts and kilowatts per hour increased back to baseline levels (Hayes & Cone, 1981). The study suggests that when the participants are more aware of the change in consumption, they are more likely to participate in behaviors to induce that change.

Another residential intervention was implemented by Geller, Erickson and Buttram in 1983 implementing an intervention hoping to decrease the amount of water being used by people in the household. They tested a number of combinations in treatment that included education on conservation, feedback on residential consumption per household, and engineering strategies. The engineering strategies was a device that was put on the plumbing of the house to use less water. There were 129 participants in this study that were separated into eight groups, each with two of the three conditions for three months. Significant changes were only found when the

conservation devices were implemented with at least one of the other conditions (Geller, Erickson & Buttram, 1983). This study suggests that water conservation was only found when it was out of the resident's control and controlled by the device. This procedure was probably ineffective because of the heave use of water in the home. Many household appliances use water such as the fridge, shower, dishwasher, clothes washer, and more.

Many of these interventions deal with basic behavior analytic principles that are contingency driven. Many of the consequences of living unsustainably are in the future and are a result of more than just one individual's behavior. Although the consequences are delayed, an individual may be following a rule that they have learned through past experiences in order to live sustainably. For example, someone might turn off the lights every time they leave the house because a parent told them to. But they have no knowledge of what the consequences, such as a decreased electric usage, of the behavior are. To affect behavior that will last without immediate contingencies, an intervention involving verbal rule-following like acceptance and commitment therapy may need to be put in place to increase sustainable behavior in humans.

Acceptance and Commitment Therapy

Acceptance and commitment therapy (ACT), is a tool that focuses on increasing skills to be able to change the relationships and rules that govern an individual's covert behavior (Hayes, 2004). Covert behavior consists of experiences within the skin that an observer cannot see such as internal sensations. These behaviors may consist of private events that involves language such as thoughts and feelings (Zhang et al., 2018). Humans form rules and relationships between words, events, and all stimuli, which sometimes can be helpful and sometimes it can get in the way of moving towards a life worth living (Bond, Hayes, & Barnes-Holmes, 2006). This process of language and learning can be conceptualized behavior analytically through Relational Frame

Theory.

Relational Frame Theory is a behavior analytic approach to human cognition and language (Barnes-Holmes, Hayes, & Roche, 2001), one of its core concepts being arbitrarily applicable relational responding. This type of responding is a skill that lets a human relate multiple stimuli to each other from a past learning history. A word, object, or emotion can come under the contextual cue of a stimulus completely randomly. Arbitrarily applicable relational responding allows human to put stimuli in frames of relation and create rules around these stimuli (Barnes-Holmes, Hayes, & Roche, 2001). Another core concept of Relational Frame theory is rule-governance. Verbal rules are formed from past experiences with the environment around an individual. They can be formed by socially mediated consequences or meeting contingencies that follow behavior (Barnes-Holmes, Hayes, & Roche, 2001). For example, many people do not litter. The rule is if someone litters, they get fined. Many people have not been fined for littering. This rule is socially mediated because the consequence has not been met by the individuals who follow the rule.

Arbitrarily applicable relational responding creates frames of relation between many stimuli while verbal rules create contingencies of covert behavior. Some relations and rules can be helpful, and others can reinforce behaviors of experiential avoidance. Experiential avoidance is escaping from thoughts, emotions, or situations that may cause discomfort (Hayes, Wilson, Gifford, Follete & Strosahl, 1996). Escaping from these sensations can be counterproductive. For example, the quickest way to get to work is down a road that the learner got into a car accident in. Whenever the leaner drives down the road, they experience emotions of anxiety. The learner then starts to avoid that road on the way to work, escaping the feelings of anxiety, but then is 15 minutes late every day. Since the learner values their job, this is not moving them towards their

values of being a productive employee. The ability to accept those uncomfortable anxiety provoking behaviors in order to engage in behaviors in line with their values is called psychological flexibility (Spielger, 2015).One of the main goals of acceptance and commitment therapy is to increase psychological flexibility by six core processes which are contact with the present moment, acceptance, cognitive defusion, detachment from the conceptualized self, committed actions and clear values (Speigler, 2015).

When a person has limited psychological flexibility, they may also have a disconnection from the present moment (Speigler, 2015). Their covert behavior could be focusing on thoughts in the past, the future, or what those experiences make them. Increasing contact with the present moment focuses on what is happening and what behavior can be exhibited in the here and now. Living in the past or future is like living in cartoons, they are not real, if someone were to watch cartoons all day long instead of talking to real people, that would not move them closer to their values. They would experience situations and feelings that had nothing to do with real life (Luoma, Hayes & Walser, 2017). Negative thoughts about the past or the future may lead towards behaviors that are maladaptive. Being grounded in present moment leads to decisions that can move towards making a better situation. For example, when a person has multiple errands to run, they are thinking about what needs to be achieved in the future. Staying the in present moment allows an individual to think of what they can do now to achieve those goals in the future, and how they can do it in a sustainable way. Such as, gathering reusable bags to use for groceries and a coffee mug to drink.

Acceptance of experiences is similar to the present moment. Often, being in the present moment allows an individual the opportunity to participate in behavior that might make them uncomfortable. Escaping from behavioral experiences is experiential avoidance. Allowing

engagement in experiences that provoke feelings of being uncomfortable but doing them anyway to move closer to our values is considered acceptance (Zhang et al., 2018). For example, acceptance may be useful if an individual had thoughts of helplessness and uselessness when it came to sustaining the environment. This person might think that no matter what they do, nothing will change if others do not start being environmentally sustainable as well. In order to be psychologically flexible, the individual will accept that they cannot change the behavior of others and do what they can to promote environmental wellness.

Sometimes, an individual might fixate on behaviors of others and convince themselves they are useless. They may allow this thought to have literal meaning, which may impact the way they interact with the world around them. The individual may participate in maladaptive behavior in relation to sustainability such as using plastics, increased use of electricity, and more. These behaviors tend to be more convenient with less response cost, and also more reinforcing in the moment. When the individual cannot separate the literacy from their thoughts, they are said to be cognitively fused. Cognitive fusion is when humans take their thoughts as literal and believe they are true and factual, rather than just taking them as they are which is language (Hayes et. al., 1999). Cognitive defusion is when a human separates the meaning of the thoughts from themselves (Spiegler, 2015). For example, a person may be fused to the thought that no matter what they do, they cannot stop global warming from happening because there are too many people participating in unsustainable behaviors that require less response effort such as using a disposable cup for coffee. This negative thought allows the participation in unsustainable behavior because the person having this private event believes it is true even though it may not be. Defusing from this thought allows for flexibility to participate in behaviors that lead the speaker towards their value of environmental sustainability. Separating the meaning of the

thought from the words allows humans to move forward and focus on behaviors that are value driven.

An extreme form of cognitive fusion is known as the conceptualized self. When a person is fused to the stories their past, they often use those thoughts to validate behaviors that hold those stories to be true (Speigler, 2015). For example, a person might conceptualize themselves to be someone who hates the environment because they do not recycle all the products they use. They continue to not recycle and validate the behavior by continuing the thought that they are someone who hates the environment. To become more psychologically flexible a person is said to defuse from those thoughts and use the self-as context (Speigler, 2015). Using a model like self- as-context, is described as being a person who has values or things that are important to them. The self-as context is who a person is no matter where they are or who they are with. Who they truly are is the setting context of every event brought forth to them (Hayes et al., 1999).

In using self as context, an individual can commit actions towards their values. Value-driven action are like steps on a ladder that move an individual closer to their values. They are goals along the path to a life worth living. If the steps on the ladder are committed action, then the actual ladder is the values. Values are long-term reinforcing contingencies (Hayes et al., 1999). A person can never achieve a value, it requires continual commitment to goals and actions. For example, if someone values the environment, it takes more than turning off the lights when you leave the room once. Being sustainable to the environment requires constant action such as turning off the water when you are brushing your teeth, using reusable containers, carpooling and more. These are considered committed actions, which can be defined as behaviors that are in line with values that are held by an individual (Hayes, 2004).

All six of these processes working in conjunction with another help increase

psychological flexibility are the core processes of ACT. Acceptance and commitment therapy is often given in individual or group settings. Often, each session focuses on one of the six core processes and how the other tie together.

ACT as an Intervention

ACT has been utilized across a variety of populations to help improve maladaptive behaviors of experiential avoidance and cognitive fusion. For example, ACT has been shown to reduce smoking behaviors with a year of treatment (Gifford et al., 2004). Seventy-six habitual smokers were divided in to two groups, one receiving ACT and the other nicotine replacement treatment and participated in the study for seven weeks. The ACT group received treatment individually and within a group setting. Initially, both groups showed reduction in cigarette smoking. Only the ACT group retained decreased cigarette smoking in the long term (Gifford, et al., 2004). Another study utilized acceptance and commitment therapy to reduce the rehospitalization of patients with schizophrenia (Bach & Hayes, 2002). These patients received four sessions of ACT that focused on diffusion from their private events and acceptance of them as well along with their treatment as usual. The patients that received ACT reported their symptoms more regularly than the control group as well as lowered their rehospitalization rate (Bach & Hayes, 2002). Another study has evaluated the effect ACT had on chronic pain versus traditional cognitive behavior therapy. One hundred and fourteen participants were randomly assigned to the two groups. Each group participated in either an ACT or CBT group session once a week for eight weeks. The ACT group showed higher pain tolerance in a six-month follow up than the CBT group (Wetherell et al., 2011).

ACT has been shown to reduce symptoms and maladaptive behaviors in different contexts. Currently, there is not any ACT literature that looks at increasing sustainable behavior.

In the past there have been behavioral studies that minimal effect in the short term (Osbaldiston & Schott 2012). The contingencies for being sustainable or unsustainable are often years away. Traditional behavior methods are not sufficient. In order for the planet to survive, there needs to be change that will last in the long term-change which is seen in the previous studies involving ACT (Wetherell et al., 2011; Gifford et al., 2004; Bach & Hayes 2002). It is possible, that by addressing the environment, and sustaining the environment within the context of values, ACT may be an appropriate way to address behavior change that commits towards improving the way humans interact with the world around them.

Purpose

The purpose of the current study was to evaluate the impact of a brief ACT intervention on environmentally sustainable behaviors of college students. The current study utilized a behavior rating scale, where the participants assessed how frequently they engaged in certain environmentally sustainable or unsustainable behavior throughout the day. They were asked to reflect on 12 behaviors at the end of the day for five weeks. On the scale they were asked if they did the behavior all the time, some of the time, or not at all. There was also a fourth option to each question that indicated if the opportunity to participate in the behavior occurred, “not applicable”. The intervention focused on the participants’ values and how they related to valuing the environment and committing action to further the health of the planet.

CHAPTER 2

METHODS

Participants

Ten undergraduates and recent graduates of a Midwestern university were recruited for the current study. Seven out of the ten had consistent responding to the researcher and were therefore utilized in the present study. Participants consisted of two males and five females who ranged from 21 - 31 (M = 24). Additional participant demographic information is displayed in Table1. Participants for the current study were recruited via email and personal contacts. Four of the participants went into a brief ACT intervention while the other three participants remained in baseline throughout the study.

Materials and Settings

The materials for the current study included a daily self-report survey and ACT activities. The survey consisted of one fill in the black question that asked their unique code and twelve multiple choice questions, displayed in appendix A, which was completed by participants on their smart phones on Google forms. The ACT worksheets consisted of a bullseye divided into four sectors (Harris, 2018) and another worksheet that displayed a mountain in which the participant could name with sections indicating tasks and obstacles (Hinman, 2018). These are displayed in appendix B. For these activities, pens and pencils were provided to the participants. Each evening, the participants were sent the self-report survey via email or text message that they were to complete by the end of the day, in their current location. When the participants completed the ACT intervention sessions, they met with the researchers in an on-campus library room. ACT sessions were scheduled based on the availability of the participants given on google forms and the researcher

Design and Measures

The current study employed a multiple baseline across participants design to evaluate the effects of three brief ACT intervention sessions on daily environmentally sustainable behaviors. The dependent variable was changes in environmentally sustainable behavior. Pro-environmental behaviors or environmentally sustainable behaviors reduce the damaging effect on the planet than an otherwise more convenient option (Osbaldiston & Schott 2012). Environmentally sustainable behavior was measured using participant self-report surveys which were completed by participants in the evening on a daily basis. When completing the daily survey, participants were asked to input their randomized participant code before answering the questions. The self-report survey consisted of twelve, rating scale questions which asked participants to rate whether or not they had engaged in the behavior during the day. For each question, participants were to indicate if they had engaged in the behavior, "2 - Yes, all of the time", "1 - Sometimes", "0 - No, not at all", or "Not Applicable". Questions answered with, "Not Applicable" were excluded from the total number of possible points the participant could earn overall and the question did no influence participant score. Six of the questions asked about environmentally sustainable behaviors which were "I purposely bought products with limited packaging", "I recycled the paper/glass/plastics I used today", "I shut off my computer when I was not using it", "I turned off the water while I was brushing my teeth", "I brought my own shopping bags to the grocery store", and "I used reusable containers for my food and beverage". The other six questions asked about environmentally unsustainable behaviors included "I ate food that was not ethically or locally sourced", " I left the lights on after I left my apartment/house", "I drank a beverage out of disposable container", "I took a shower longer than 10 minutes", "I drove a car by myself to campus", and "I kept my electronics plugged in when they were not being used". These

questions were based on questions from the Personal Environmental Sustainability Behavior Quiz on published by *Psychology Today* (Burn, 2015). Questions about sustainable behaviors were scored two points for yes, one point for sometimes, and zero points for no. Scores were reversed for questions targeting unsustainable behavior meaning zero points would be given to yes, one point for sometimes, and two points for a no answer. Daily self-report surveys were scored by adding up the score. The next step was adding up the number of questions answered minus the number of questions marked "not applicable" and multiplying that by two. The score would be divided by that number and multiplied by one hundred. This would result in their score of environmental sustainability that day.

Procedure

General procedure

Participants were prompted twice every evening to fill out the daily survey that targeted sustainable and unsustainable behavior. The next day, the data was calculated and graphed individually by the researcher. Once data was identified as stable by visual inspection for the first participant, the researcher contacted the participant by email to meet on a certain time and date based on their availability. The next participant with stable data was picked when the previous participant had stable data within the intervention phase. This continued until four participants were entered into intervention. Each ACT intervention started with an overview of the six components of ACT and a values-based activity, and the final two focused on both values and committed action. After the three ACT interventions, participants were asked so to continue filling out the survey until the conclusion of the study.

Participant identification

After participants agreed to participate in the current study by signing a consent form,

they were asked by the researcher to create a unique identification number that they would be using throughout the course of the study. The unique identification number consisted of a random four-digit number followed by the last letter of their last name and the last letter of their last name. This number was entered on their daily survey every day.

Baseline

All participants began the study in the baseline condition. During this condition, participants filled out the sustainable behavior self-report daily. Participants transitioned from baseline to the acceptance and commitment therapy intervention condition when they had shown stable responding in their baseline data and when one other participant who had already begun intervention showed stable responding in their intervention data.

Intervention Phase 1

Once data was determined to be stable, the participant was sent an availability form by the researcher to set times to meet for three separate session of ACT, that lasted no more than 30 minutes. Each session occurred every two to three business days. The session consisted of a one-on-one interaction of the primary researcher and the participant. All activities were based on identifying, working towards, and finding solutions that brought them closer to their values related to environmental sustainability.

Session One: Bullseye Activity

The first session started out with an overview of each process of ACT. The researcher gave a brief definition of each process and along with a metaphor. If the participant had any questions involving ACT, the primary researcher would answer them. The researcher then explained to the participant that over the next three sessions they would be focusing on values. This values activity involved identifying values and how close the participant was currently

living towards those values. This activity was modified from the original bullseye activity from The Happiness Trap: How to Stop Struggling and Start Living: A Guide to ACT written by Russ Harris in 2008. The participant was rhetorically asked what is important to them, what do they want their life to stand for, what kind of qualities do they want to cultivate as a person, and how do they want to be in their relationships with others. Next, the researcher went further in depth into the meaning of values. Then, the participant was asked to speak about the questions rhetorically asked in the beginning of the session. The researcher went further to explain that values were on-going and not the same as goals. Goals can be achieved whereas values involved continued action. A metaphor about heading west was given that stated that a man can be heading west all his life, but he will never reach west. Heading west is something you do rather than achieve. An example about being a good partner was described as continually acting respectful and caring towards the other person is required if they value being a good partner. The participant was then asked to identify three of their values to the researcher. Based on those values, the researcher related them back to the importance of the environment by explaining much of what we love in life cannot happen if the Earth cannot support life. Their fourth value was considered to be environmental wellness. The participant put each of the four values in a quadrant on the bullseye. For each value, the put an arrow to mark how "on target" they were to be living their values. The farther the arrow was from the bullseye, the father they were from living towards their values. After that, they were asked to reflect on how they were living towards their values, and to take it into consideration in the following days. The researcher kept the worksheet to refer to in following sessions. The participant could take a picture to remind themselves throughout the following days.

Session Two: 80th Birthday Activity

The beginning of the session involved the researcher asking the participant about the six components of ACT. When the participant gave vocal verbal definitions, the researcher would give corrective feedback if necessary. The researcher then asked the participant to name the four values they identified in the previous session. If the participant did not remember, the researcher referred back to the bullseye worksheet from session one. The participant was asked to close their eyes and think about what the researcher was saying to them. The individual was asked to imagine that they were at their 80th birthday party, how much time has passed between their college years and that point in time. They were then asked if they were happy with the way they were living their life, if they were doing what makes them happy, and if they were living towards their values. These questions were discussed. The participant was then asked if they would want to change the way they were living their life to further the health of themselves and the planet. Their answer was discussed. The researcher then asked the participant what they think the planet would look like if everyone including themselves continued with unsustainable behavior and what they could change in their daily behavior. A final statement was then made by the researcher about how it is important to be in the present moment with their actions and to be mindful on the impact they have on the rest of their life through their daily behavior.

Session Three: Values Mountain Activity

This final session started with the researcher asking the participant to give definitions of the six processes of ACT. They were given corrective feedback followed by a metaphor describing the process. After that, the participant was asked what the values were that they were working on the past few days. Then the researcher asked if they had been living more towards the value of sustaining the environment and asked them how they had been. These answers given

by the participant were discussed with the researcher. The researcher then stated that actions or goals that are committed towards values are sometimes small daily tasks and some take years to get to. The researcher compared a value to a mountain, the base being all the small, daily tasks and the higher they go up the mountain the harder and longer the tasks tend to be. The participant was given the Values Mountain worksheet and instructed to name the mountain in regard to something of environmental wellness and values (e.g., Sustainability Mountain). First, the participants were asked to focus on three to five tasks on the daily survey they could focus on improving. The researcher and the participant then discussed obstacles and solutions to these tasks. The next step was to write down and talk about goals higher on the middle of the mountain, as weekly or monthly tasks. Obstacles were written down and solutions were then discussed. The final tip of the mountain was filled out with long term goals that might take years to complete, which then obstacles and solutions were discussed. The researcher then asked the participant to focus on the three to four tasks for now, and work on the longer-term goals when they can.

Intervention Phase 2

At the end of the third session, participants were asked to choose three to five behaviors from the survey that they could focus on targeting in their daily life. When three to five chosen behaviors were picked by the participant to focus on, the researcher began assessing changes in these behaviors specifically in addition to overall behaviors that were asked about in the surveys. The scores for chosen behaviors consisted of the points earned each day by each question on the behavior they chose, divided by the total points that could be earned times 100.

CHAPTER 3

RESULTS

The current study utilized a multiple baseline design with two phase changes. The independent variable being three ACT sessions and the dependent variable being a change in a daily behavior checklist on environmentally sustainable behavior. Results of the study can be seen in Figure 1 and Figure 2.

Participant 1

The average score in baseline for participant 1 was *M*=41.7% (range, 18.8-68.1%). When moving to treatment, their average score decreased to *M*=36% (range, 40-77.3%) across all sustainable behaviors on the checklist. The percent non-overlapping data (PND) was calculated at 16.7% with *p*=.405, indicating a no effect. These results indicate that the intervention may have not effective been in improving environmentally sustainable behaviors using a brief ACT intervention for this participant. In the second phase of intervention, participant 1 decided to focus on purposefully buying products with limited packaging, taking a shower for less than 10 minutes, turning off the water when they brushed their teeth, and bringing reusable shopping bags to the grocery store. When assessing the four behaviors the participant chose to work on, participant 1's average score in baseline on those four behaviors was *M*=29% (range, 0-75%), and increased to *M*=51.3% (range, 0-100%) during treatment. These results indicate that phase two of the intervention may have been effective in improving environmentally sustainable behaviors when specifically pinpointing specific items to commit to improving on. The percent non-overlapping data (PND) was calculated at 12.5% with *p*=.2337, which does not suggest a strong effect.

Participant 2

The average score in baseline for participant 2 was *M*=52.4% (range, 40.9-65%). When moving to treatment, their average score increased to *M*=65.69% (range, 40.9-83.3%) across all sustainable behaviors on the checklist. The percent non-overlapping data (PND) was calculated at 54.17% with *p*=.0013, indicating a strong effect size. These results indicate that the intervention may have been effective in improving environmentally sustainable behaviors using a brief ACT intervention. Participant 2 chose to focus on unplugging their electronics when they were not being used, carpooling or riding a bike to campus, taking a shower for less than 10 minutes, and eating food that was ethically or locally sourced in phase 2 of intervention. When assessing the four behaviors they chose to work on, participant 2's average score in baseline on those four behaviors was *M*=20% (range, 0-50%), and increased to *M*=54% (range, 25-83.3%) during treatment. These results indicate that the intervention may have been effective in improving environmentally sustainable behaviors when specifically pinpointing specific items to commit to improving on. The percent non-overlapping data (PND) was calculated at 35.29% with *p*=.0057, indicating a moderate effect size.

Participant 3

The average score in baseline for participant 3 was *M*=43.4% (range, 31.8-65%). When moving to treatment, their average score increased to *M*=70.1% (range, 50-90%) across all sustainable behaviors on the checklist. The percent non-overlapping data (PND) was calculated at 57.89% with *p*=.0001, indicating a strong effect size. These results indicate that the intervention was successful in improving overall environmentally sustainable behaviors using a brief ACT intervention. In phase 2 of intervention, participant 3 chose to focus on walking or carpooling to campus, eating food that was locally or ethically sourced, and using reusable

container to store leftovers. When assessing three behaviors they chose to work on, participant 3's average score in baseline on those three behaviors was *M*=39.6% (range, 16.7-83.3%), and increased to *M*=76.2% (range, 50-100%) during treatment. These results indicate that the intervention may have been effective in improving environmentally sustainable behaviors when specifically pinpointing specific items to commit to improving on. The percent non-overlapping data (PND) was calculated at 28.57% with *p*=.0236, indicating a moderate effect size.

Participant 4

The average score in baseline for participant 4 was *M*=50% (range, 36.4-72.7%). When moving to treatment, their average score increased to *M*=59.8% (range, 37.5-75%) across all sustainable behaviors on the checklist. The percent non-overlapping data (PND) was calculated at 11.76% with *p*=.1755, indicating an insignificant effect. In the second phase of intervention, participant 4 chose to focus on buying products with limited packaging, unplugging electronics when they were not being used, eating locally or ethically sourced food, and using reusable containers When assessing four behaviors they chose to work on, participant 4's average score in baseline on those three behaviors was *M*=38.4% (range, 25-66.7%), and increased to *M*=55% (range, 37.5-75%) during treatment. These results indicate that the intervention may have been effective in improving environmentally sustainable behaviors when specifically pinpointing specific items to commit to improving on. The percent non-overlapping data (PND) was calculated at 12.5% with *p*=.1473, indicating an insignificant effect.

Participants 5

Participant 5 stayed in baseline throughout the study because of high scores on the daily behavior check. The average score on environmentally sustainable behavior was 77.34% (range 54.2-90%). This data indicates that self-report itself has minimal effects on increasing

environmentally sustainable behavior

Participant 6

Participant 6 stayed in baseline thought the duration of the study with a mid-level of percent points earned on the daily behavior check. The average score on environmentally sustainable behavior was 60.5% (range: 40-78.6%). This data indicates that self-report has minimal effects on increasing environmentally sustainable behavior.

Participant 7

Participant 7 remained in baseline throughout the duration of the study with a variable level of percent points earned on the daily behavior check. The average score on environmentally sustainable behavior was 62.77% (range: 41.7-83.3%). This data suggests that self-reporting may have short term, rather than long term effects on increasing environmentally sustainable behavior. This is because of the high variability of data.

CHAPTER 4

DISCUSSION

Data Analysis

The results of the present study suggest that a brief ACT intervention may have some effect in promoting sustainable behavior. Participants 1 and 4 showed insignificant results in the first phase change but participant 4 showed improvement in phase 2. Participants 2 and 3 showed significant increases in both phases of intervention. Participants 5, 6 and 7 showed consistent responding throughout the study which shows that self-reporting on sustainable and unsustainable behaviors alone had no effects on the frequency of environmentally sustainable behavior.

Throughout the ACT sessions participants became more mindful of their experiences and how their actions affected the world around us. Specifically, participant 1 asked for more information about why some behaviors were harmful to the environment. Participant 2 told the researcher that he had gained a lot from their experience with ACT, stating that they had never been asked about what they value. Participant 2 said that he applied the core process of present moment when deciding what behaviors to engage in. Participant 3 also expressed their use of present moment, stating that the use of this core process helped them engage in behaviors that would help towards environmental sustainability in busy times.

The current study is consistent with previous literature that has found success in behavior change following an ACT intervention (Bach & Hayes, 2002; Gifford, 2004; Wetherhall et al., 2011). Currently, there is limited research on the impact of behavioral interventions that target sustainable behaviors for promoting environmental health, and none that utilize ACT.

Previous literature reviewed on sustainable behavior has targeted single behaviors with

multiple interventions and showed effect. Fox and Schaeffer targeted reduced car usage for employees in a workplace by implementing a lottery system (1981). Although this method worked with employees, it is quite intrusive and involves extra money that a company does not have. Based on the results of the present study, an ACT intervention may be a less expensive potential intervention option than a lottery system intervention to reduce behaviors such as car usage. Reduction in electricity consumption was intervened on in the current study as well as the study done by Hayes and Cone (1981) in a residential area by providing feedback through professional letters in the mail. Although the Hayes and Cone (1981) study showed reduced electricity usage, the current study may provide an option that achieves a similar effect. This could be done by teaching communities ACT lessons, addressing values of a community, and working on committed actions as a group. An ACT intervention would also reduce the amount of paper or time that is spent on letter writing. In a study by Brothers and colleagues (1994), recycling of pounds of office paper was increased by moving the locations of the recycling bins closer to the employees. Although this is a simple and effective way to increase recycling of paper, it still requires effort for the company to strategically place bins and requires the participants to continue to follow through long-term. Based on the success of the current study, ACT may provide more increased recycling that may be more cost effective for the company, since they had to buy individual bins for the employees to use. Additionally, an ACT intervention may provide for more generalization outside of an office setting. Finally, Geller and colleagues (1983) focused on reducing the use of water in residential areas and tested this with eight different interventions. The only part of the intervention that decreased water usage was fixing the pipes so they physically could not use the water. An intervention that simply blocks the behavior from occurring does not provide as potentially sustainable of an option as an ACT

intervention may provide.

Limitations and Future Research

Research concerning self-report measures of environmental sustainability has not been done. In the past, much research has been done observable events with permanent such as how much gas is actually being used by a household (Hayes & Cone, 1981). Previous research focuses on one behavior that results in one permanent product that had multiple steps of intervention. The current study focuses on multiple behaviors which could have been a confound, since there were many things that the participants needed to focus on. As convenient as self-reporting is, there can be reactivity. Reactivity is when the behavioral data is affected because the participant is aware of the researcher's purpose for collecting the data (Cooper et al., 2014). Because of this phenomenon, some consider self-reporting to be an intervention. Another possible limitation was the participants consistency filling out the survey. Even with multiple prompts twice a day, most participants did not fill out the survey daily. This could be a limitation because of the missing data.

Other limitations arrive with the questions in the survey. Some of the questions may have been confusing to some participants. There was one participant who lacked knowledge of the concept of locally and ethically sourced food. Future research could give more information about this topic to participants before the survey for accurate responding to questions. Regarding this same question, many participants did not change in their consumption in ethically and locally sourced food. In the area that the study was conducted, this type of food consumption can become expensive for a college student because of the lack of availability. On average, ethically obtained and produced food is more expensive because of demand. In the town that the study was conducted, there was only one natural food store and a farmer's market that happens once a

week on Saturday morning where local food is sold. These factors make it hard to participate in this sustainable behavior.

Another one of the questions asked “I drove to campus by myself” could be a confound. The researchers assumed since the participants were students, they would either be driving to campus with someone or by themselves. This could be a confound because of the answer “not applicable” to the question. If the participant rode their bike or walked to class, they could have marked “not applicable” or “no, not at all”. This would have affected how their score was calculated, since “not applicable” denoted the question taken out of the score entirely and an answer of “no, not at all” would give the participant two point towards their total score.

A recent confound to this study is the coronavirus disease. The first case of COVID-19 was seen in the United States in January. Since then, there have been 938 cases of the virus, 29 of which resulted in death. It has been reported in 38 states as well as the District of Columbia (National Center for Immunization and Respiratory Diseases, 2020). The recent spread of the disease to the United States has caused a mass panic. A popular beverage company, Starbucks Coffee, had recently stopped accepting reusable cups. They still offered the discount the person usually receives when bringing their own cup. Other companies in the area had also stopped accepting reusable cups because of the scare. This could affect daily behavior survey scores of the participants if they often purchased coffee or a beverage from one of these locations. Recycling behavior could also be hard to do in the area. There is only one recycling center in the town here the study was conducted. The recycling center requires products be separated and things can only be dropped off there. A pickup service must be paid for. This is also an issue because landlords have to offer this service, many of which do not.

Regarding Acceptance and Commitment Therapy, a limitation could be the lack of

willingness from the participant. Participants 1 through 4 did not mention environmental sustainability when asked to identify their top four values in the first ACT session. This could mean that they do not truly value the environment. Committing action or behaviors towards a value an individual does not find reinforcing, behavior change is less likely to be seen.

The current study also utilized three brief ACT sessions, and future research may implore using a large number and longer sessions. The participants in the current study only had three sessions within the course of three weeks, while past research has had more over more weeks (Wetherell et al., 2011; Gifford et al., 2004; Bach & Hayes 2002). The increased sessions might be beneficial in order for the participant to make the relation between their current values and the value of environmental sustainability. If that is not possible, finding participants that already value the environment who want to increase their sustainable behavior might be beneficial as well.

Conclusion

Environmentally sustainable behavior is important to keep the place that human beings live inhabitable for everyone, as well as plants and animals. Without the planet and the resources, it provides, people cannot continue to commit actions towards the other values they hold. Everything on the planet is connected, and all values can be connected back to environmental sustainability. If an individual values family, their family requires the environment to be sustained. If one values education, they cannot learn without the planet to learn on. If a person values health, the Earth needs to stay healthy as well. The present study provides preliminary evidence that Act may help towards improving individual behaviors.

EXHIBITS

Table1: The table above shows the gender, age, ethnicity, household composition, annual income and year in college reported by the participant.

Participant #	Gender	Age	Ethnicity	Household Composition	Annual Income	Year in College
1	Female	21	Black or African American	Single	$0 - $5000	Senior
2	Male	23	Hispanic or Latino	Single	$0 - $5000	Recent Graduate
3	Female	21	Black or African American	Single	$5001 - $15,000	Senior
4	Female	26	White	Single	$30,001 - $60,000	Recent Graduate
5	Female	26	White	Married	$30,001 - $60,000	Freshman
6	Male	31	White	Single	$30,001 - $60,000	Junior
7	Female	21	White	Single	$0 - $5000	Senior

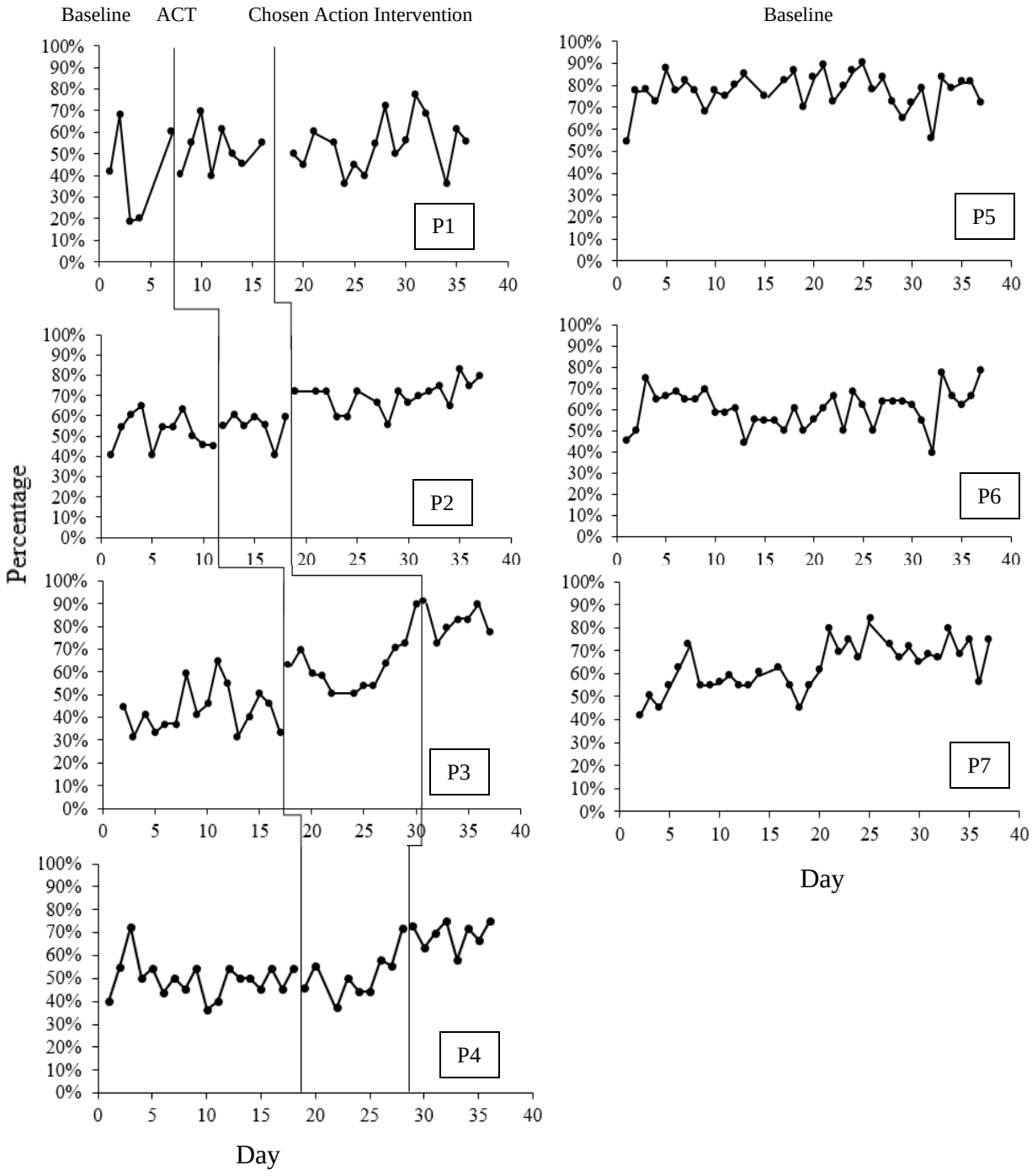

Figure1: The y axis shows the percentage of points possible to earn for the day over the total points earned of all behaviors reported in phase 1 of intervention. The x axis is the day.

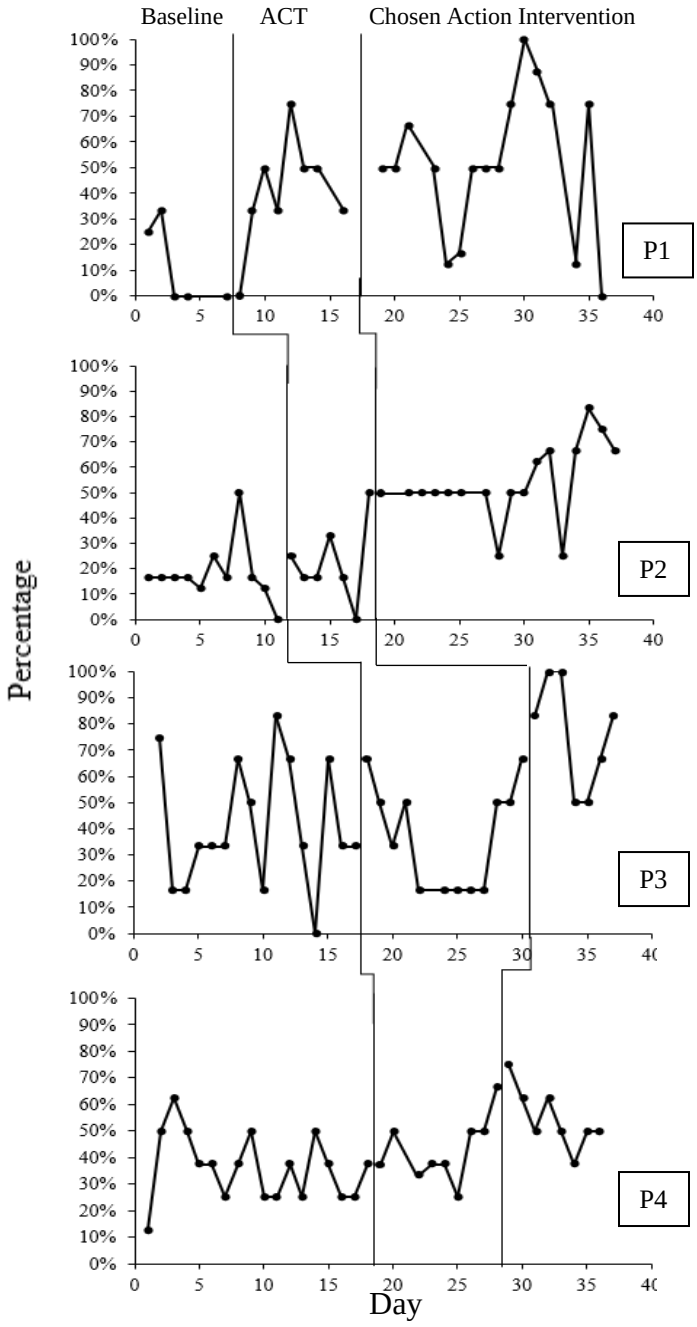

Figure2: The y axis shows the percentage of points possible to earn for the day over the total points earned from the chosen actions selected by each participant in phase 2 of intervention. The x axis is the day

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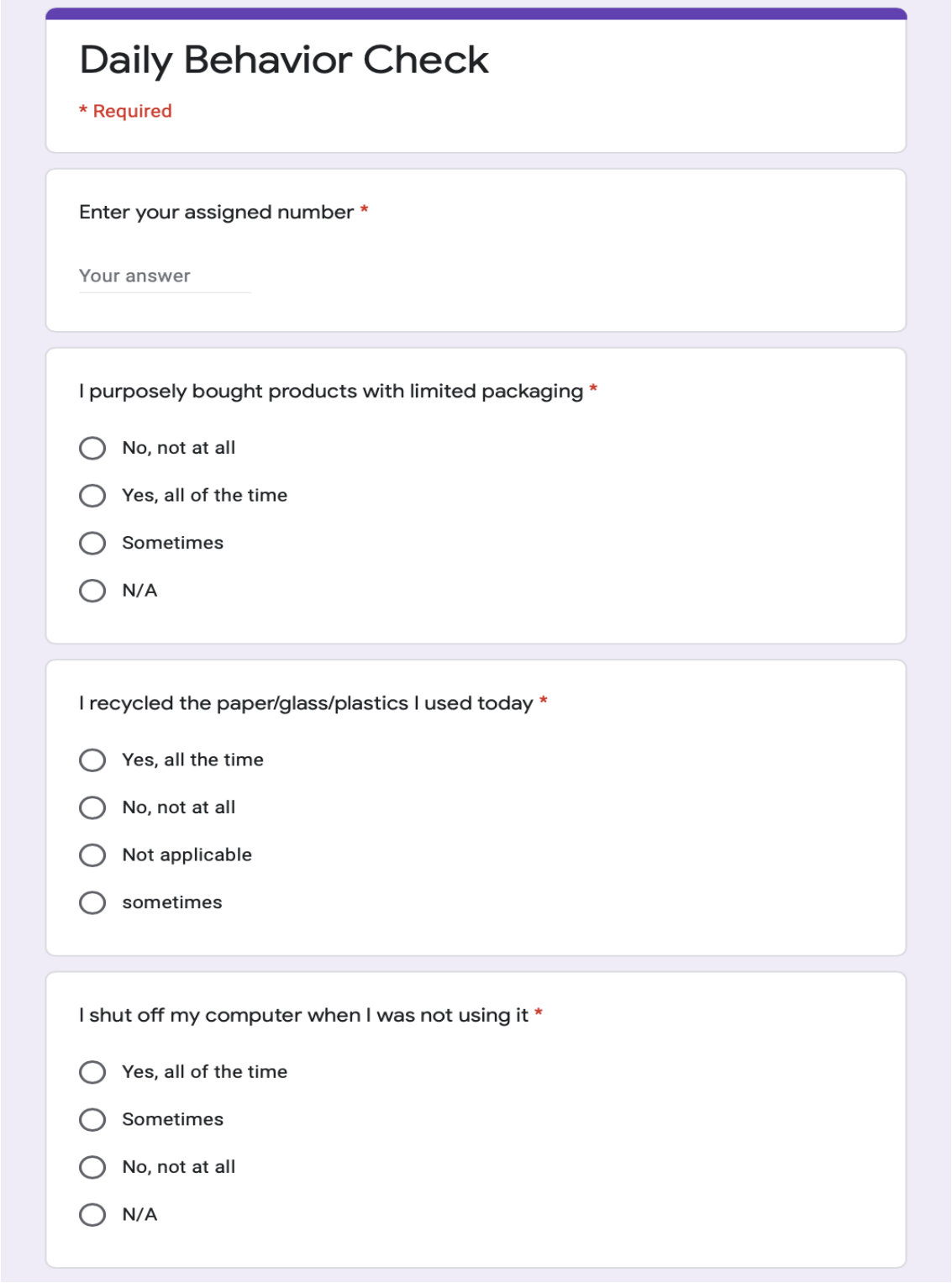
APPENDIX A

DAILY BEHAVIOR CHECK



Daily Behavior Check

* Required

Enter your assigned number *

Your answer

I purposely bought products with limited packaging *

- No, not at all
- Yes, all of the time
- Sometimes
- N/A

I recycled the paper/glass/plastics I used today *

- Yes, all the time
- No, not at all
- Not applicable
- sometimes

I shut off my computer when I was not using it *

- Yes, all of the time
- Sometimes
- No, not at all
- N/A

I kept my electronics plugged in when they were not being used *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ Not applicable

I drove a car by myself to campus *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

I took a shower longer than 10 minutes *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

I drank a beverage out of a disposable container *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

I turned off the water while I was brushing my teeth *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

I left the lights on after I left my apartment/house *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

I brought my own shopping bags to the grocery store *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

I ate food that was not ethically or locally sourced *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

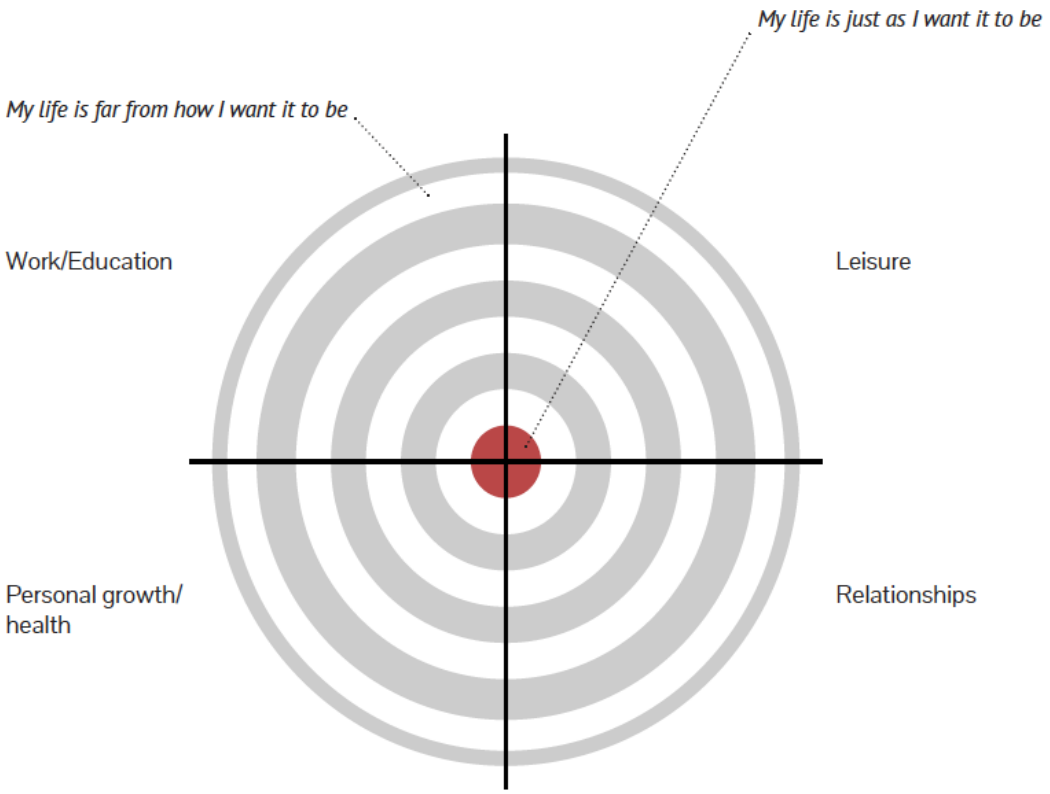
I used reusable containers for my food and beverage *

- ◯ Yes, all of the time
- ◯ Sometimes
- ◯ No, not at all
- ◯ N/A

Submit

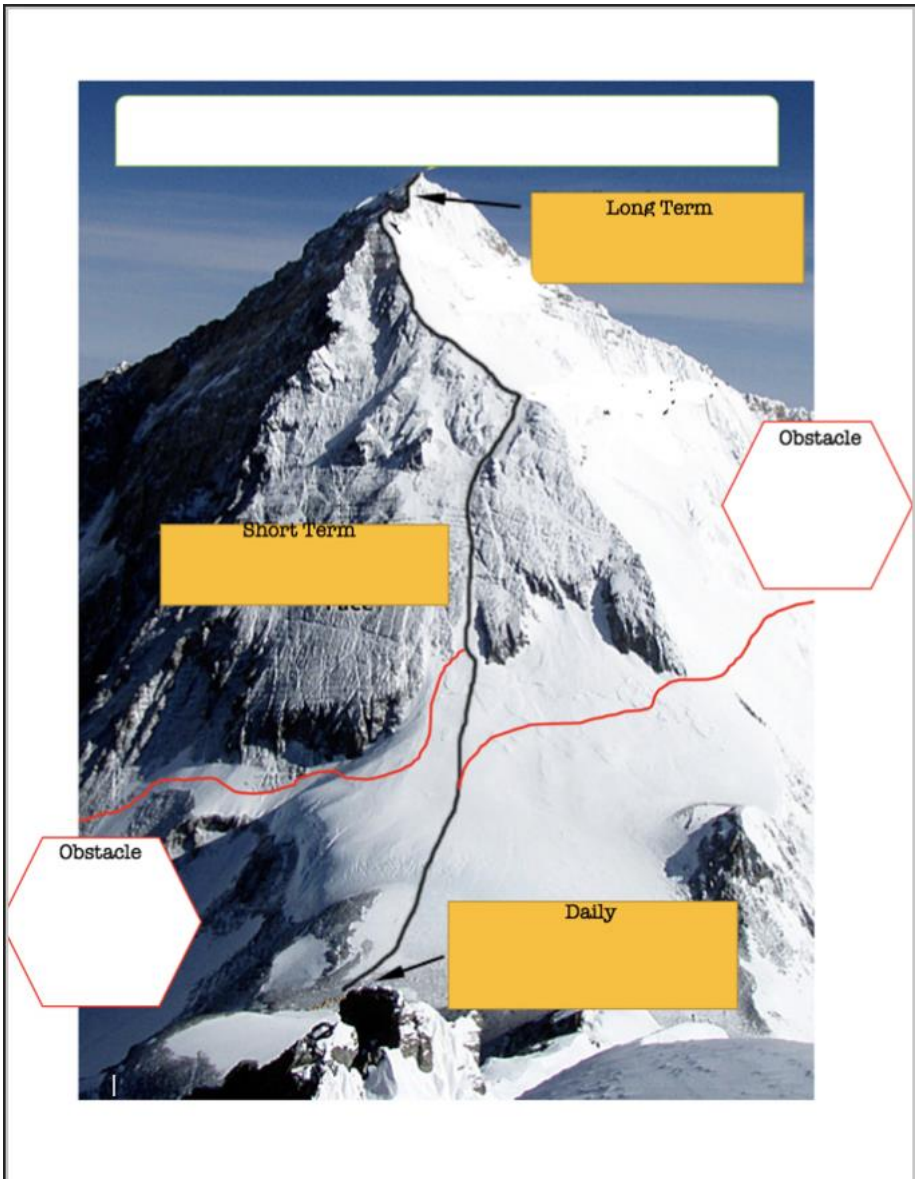
APPENDIX B

BULLSEYE WORKSHEET



APPENDIX C

MOUNTAIN WORKSHEET



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Bachelor of Science, Behavior Analysis and Therapy, May 2018

Thesis Paper Title:
Evaluating the Effects of a Brief Acceptance and Commitment Therapy Intervention on Environmentally Sustainable Behaviors

Major Professor: Dr. Mark R. Dixon