Public Views Towards Black Bears and Bear Smart Messaging in a Rural Context

By

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Table of Contents

Abstract

Black bears (*Ursus americanus*) can develop nuisance behaviours such as food conditioning and habituation in response to obtaining attractants on private properties. Black bears that express nuisance behaviours are often destroyed by wildlife management officials due to concerns for public safety. Bear smart programs across North America have been instituted to promote the removal of attractants from private properties in an effort to prevent bears from becoming food conditioned and habituated. Gaining the voluntary compliance of homeowners through the use of effective messaging campaigns is essential for achieving this goal. This study examined the use of positive, negative, and rational messaging strategies with homeowners from rural agricultural, rural residential, and rural recreational areas near Riding Mountain National Park in Manitoba, Canada. In June and July of 2016, 279 Homeowners from randomly selected residences filled out a questionnaire which was developed using the theory of planned behaviour. In this study there were 3 treatment groups and 1 control group. Each treatment group received a different bear smart poster which was examined prior to completing the questionnaire. Results showed that attitude and belief and social norm explained 47.6% of the variation in homeowner intention to remove black bear attractants from properties. The positive and negative posters both failed to elicit emotional responses from participants and messaging in general had no impact on homeowner intention to remove or securely store attractants. The location homeowners were from (rural agricultural, rural residential, or rural recreational areas) was found to affect their attitudes and beliefs toward bears, the influence of social norms, levels of perceived control, and behavioural intention to remove attractants. The majority of participants were found to be positively aligned with bear smart objectives and had removed or

securely stored attractants from their properties in the past to prevent conflict. Positive values held towards black bears and a high degree of pre-existing conformity with bear smart programs is thought to explain why no effect of messaging was found. Results from the theory of planned behaviour suggest that messages aimed at establishing and promoting social norms could increase the effectiveness of campaigns.

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List of Tables

List of Figures

Terminology

Words or phrases frequently used that may reflect discipline-specific terms are interpreted for ease of reference and understanding.

Term or phrase	**Definition**
Adverse conditioning	Learning to associate experiences with negative stimuli (Mazur, 2010)
Anthropogenic	Any influence humans have on the environment
Attitude	An individual's favourable or unfavourable assessment of a subject (Ajzen & Fishbein, 2000)
Attractant	When a bear is attracted to a positive stimulus (e.g., garbage) (Whittaker & Knight, 1998)
Belief	A concept that is accepted to be true or is accepted to exist (Fishbein & Raven, 1962)
Food conditioned	When a bear has learned to associate human presence with sources of food (Smith, Herrero, & DeBruyn, 2005)
Habituation	When a bear tolerates human presence (reduced or absent fear of people) (Whittaker & Knight, 1998)
Homing instinct	A biological characteristic that enables bears to navigate back to their home ranges, even when displaced over long distances (Hristienko & McDonald, 2007)
Intrinsic value	The perceived inherent value of an organism, place, or object
Negative appeal	A message that uses negative spectrum emotions (e.g., sadness or fear)
Negative stimuli	A sensation or experience that is unpleasant (e.g., alarming or harmful) (Mazur, 2010)
Neutral appeal	A message that is devoid of emotion
Nuisance/problem bear	A bear that expresses behaviours deemed undesirable to people (e.g., property damage, aggression, or habituation) (Smith et al., 2005)
Perceived control	The degree of power or influence an individual feels they possess (Ajzen, 2002)
Positive appeal	A message that uses positive spectrum emotions (e.g., happiness or joy)
Positive stimulus	A sensation or experience that is desirable (e.g., comforting or rewarding) (Whittaker & Knight, 1998)
Rural	A geographical area that is inhabited by a low density of people (e.g., countryside) and often lacks access to amenities and services
Social norm	An individual's perception of what is deemed "acceptable" behaviour (Zinn, Manfredo, Vaske, & Wittmann, 1998)
Urban	A geographical area that is inhabited by a high density of people with access to amenities and services

Chapter 1: Background

1.1 Overview

Chapter 1 sets the current context of human and black bear (*Ursus americanus*) conflicts in North America (Section 1.2). This brief introduction to the field of conflicts between humans and wildlife frames the issues that many wildlife managers face when attempting to balance species conservation with the needs of society. Managing wildlife and also accommodating for the broad spectrum of public values held towards wildlife is a complex puzzle that wildlife managers can spend most of their careers piecing together. Trying to understand what motivates the public to voluntarily coexist, or not coexist, with black bears was the basis for this research and the hypotheses presented in Section 1.3. As societal views towards wildlife are ever evolving, it is imperative that wildlife managers are aware of the attitudes of the public in the areas they oversee. Implementing management tools without knowing the orientation of public opinion can result in considerable social and political backlash. While it is acknowledged that wildlife managers are often faced with few actionable tools to address conflicts, respecting social values is an important factor in maintaining public trust. The importance of this research within the context of Manitoba is presented in Section 1.4.

1.2 Introduction

Over the last several decades, black bear populations across North America have been recovering from historically low numbers (Campbell, 2012; Holland, 2015); population declines, and range reductions, witnessed in the early 20th century have been attributed to habitat loss and high levels of exploitation achieved through hunting and trapping activities (Hristienko & McDonald, 2007; Campbell, 2012; Garshelis, Scheick, Doan-Crider, Beecham, & Obbard, 2016). Since the introduction of conservation measures in the 1970s, black bear populations have rebounded and expanded back into much of their historical range across North America (Hristienko & McDonald, 2007). The implementation of conservation measures for this species was made possible due to changes in human attitudes towards bears, and the recovery of suitable habitat (Hristienko & McDonald, 2007). Human settlement and land use, in areas where black bears have experienced population recovery and expansion, has concurrently led to increasing instances of conflict between people and bears (Carlos, Bright, Teel, & Vaske, 2009; Obbard et al., 2014).

Conflicts between people and bears are known to occur when bears develop negatively perceived behaviours of attraction, food conditioning, and habituation (Smith et al., 2005; Barrett, Telesco, Barrett, Widness, & Leone, 2014). Attraction occurs when a positive stimulus, such as food, shelter, or security is found near human settlements, thereby "attracting" bears (Whittaker & Knight, 1998). A food conditioned behaviour is formed after a bear learns to associate human presence with potential sources of food (e.g., accessible garbage, fruit trees, or bird seed) (Smith et al., 2005). Lastly, habituation is the loss of fear associated with human presence (e.g., bear does not retreat when approached) (Whittaker & Knight, 1998). A bear that

expresses these behaviours is often referred to as a “problem bear” or a “nuisance bear” by wildlife managers and the public.

Typical management strategies for dealing with problem bears (e.g., relocation, adverse conditioning, and lethal removal) have proven to be inefficient (Agee & Miller, 2009; Hristienko & McDonald, 2007). Capture and relocation practices often result in bears returning to the original site of removal; this behaviour, which draws bears back to their home territories, even over large geographical distances, is known as “homing instinct” (Hristienko & McDonald, 2007). Problem bears that return to their original area of removal, or travel to different areas occupied by people, typically continue to present a public safety risk (Hristienko & McDonald, 2007). Adverse conditioning (e.g., the shooting of bears with rubber bullets) has been met with mixed results and has not been sufficiently studied for effectiveness (Hristienko & McDonald, 2007; Mazur, 2010). Adverse conditioning is a method by which a bear is provided with a negative stimulus in an attempt to re-instate a natural sense of fear when in the presence of humans (Mazur, 2010). Targeted lethal removal and increased hunting are proving to be controversial options that have led to negative public relations with wildlife managers and agencies (Hristienko & McDonald, 2007; ECO, 2015).

Because there are limited options for dealing with problem bears, preventative methods of conflict reduction have become increasingly popular with wildlife managers, municipalities, and non-profit organizations across North America (Campbell, 2012; Slagle, Zajac, Bruskotter, Wilson, & Prange, 2013; Barrett et al., 2014). Preventative methods include the promotion of “bear smart” or “bear aware” programs that rely on increasing public tolerance for bears and encouraging the voluntary removal of attractants (Campbell, 2012; Lowery, Morse, & Steury,

2012; Slagle et al., 2013; Barrett et al., 2014). This approach is perhaps the least invasive, and potentially the easiest, for wildlife managers to implement. The literature has reflected this transition in management tactics through studies directed towards public attitudes, values, beliefs, and behaviours (e.g., Siemer, Hart, Decker, & Shanahan, 2009; Merkle, Krausman, & Booth, 2011; Campbell, 2012; Lowery et al., 2012; Slagle et al., 2013).

Messaging materials such as posters and pamphlets are the primary methods of knowledge dissemination for bear smart programs; additional strategies include posted signage and online media. Bear smart programming is conducted by a variety of agencies across North America, with governmental and non-governmental organizations being the primary delivery agents. There are currently three main messaging strategies used to promote bear smart behaviours with the public. The three strategies are differentiated by their overriding neutral, negative, or positive appeal. Neutral messaging is designed to be strictly fact-based by suggesting ways in which the public can reduce the likelihood of attracting black bears. Negative and positive appeals take fact-based messaging one step further by incorporating images and language that reflect upon intrinsic values. The incorporation of values in messaging is done to persuade the public to act in a voluntary manner through highlighting the possible consequences of non-compliance. Negative appeals are typically designed to elicit feelings of guilt and/or sadness; positive appeals, in contrast, are typically designed to elicit feelings of enjoyment and/or happiness. The persuasive strength, or relative effectiveness, of each messaging strategy with bear smart programming has not been formally examined. The hypotheses developed and tested in this thesis sought to address which messaging strategies were more, or less, effective with promoting bear smart behaviours.

1.3 Research Hypotheses

Constructs derived from the theory of planned behaviour model developed by Icek Ajzen (1985) were used to develop the main research hypotheses and survey questionnaire. The constructs of the theory of planned behaviour model are: attitude and belief, social norm, perceived control, and behavioural intention (introduced in Chapter 2). As the research intention was to test different types of bear smart messaging with the public, the first hypothesis (H_1) addressed the validity of the messages used in this study. More specifically, it tested if the bear smart messages performed as intended with participants. Three different messages were developed, each designed to elicit a different emotion and have significantly different emotional evaluation scores.

> ***H_1*:** There will be a significant difference in participants' emotional evaluation scores based on the type of bear smart messaging they received.
>
> ***H_0*:** There will be no difference in participants' emotional evaluation scores based on the type of bear smart messaging they received.

The second hypothesis (H_2) addressed the validity of the bear smart message overall. Because the primary intention of bear smart programming is to persuade the public to behave differently (e.g., remove bear attractants), it was expected that participants who received the messaging would hold significantly different behavioural intention scores than those who did not (control group).

***H_2*:** Participants who received bear smart messaging will have significantly different intentions to remove black bear attractants than those who did not receive messaging.

***H_0*:** There will be no difference in participants' intentions to remove bear attractants based on whether they received a bear smart message or not.

Human and black bear conflicts outside of urban areas typically occur in one of three defined areas of anthropogenic land use: rural-agricultural areas, rural-residential areas, and rural-recreational areas. These three areas are defined in Chapter 3 Section 3.2. To investigate the occurrence of on-going conflict, the third hypothesis (H_3) sought to determine if homeowners held different behavioural intentions to remove bear attractants based on the area with which they were associated.

***H_3*:** The area participants are from will significantly affect their behavioural intention to remove bear attractants.

***H_0*:** The area participants are from will have no affect on their behavioural intention to remove bear attractants.

The theory of planned behaviour states that an individual's attitude and beliefs, social norms, and perceived control will inform their behavioural intentions, leading to subsequent behavioural actions (Ajzen, 1985). To further examine the possible effects of area, the last hypothesis (H_4) focused on the constructs informing behavioural intentions.

***H_4*:** The area participants are from will significantly affect their attitude and belief, social norm, and perceived control towards bears and reducing conflict.

***H_0*:** The area participants are from will have no affect on their attitude and belief, social norm, and perceived control towards bears and reducing conflict.

1.4 Importance of Research

Manitoba hosts a diversity of wildlife species that provide both intrinsic and recreational value to Manitobans across the province. Opportunities currently exist to improve black bear conservation in Manitoba through increasing the public's capacity for co-existence and reducing the number of conflicts initiated by people annually. Where human behaviour has continued to contribute towards bears developing nuisance behaviours, the application of bear smart programming has become a very useful management tool. Currently, public education and awareness campaigns are supported and implemented by businesses, non-profit organisations, conservation associations, federal and provincial park services, and Manitoba Sustainable Development (a branch of the provincial government that manages wildlife). These primary agencies who implement bear smart programs often operate on limited funding and staff resources. Finding ways to increase the efficiency of current bear smart programs can allow public outreach programs to have a greater impact. To achieve greater efficiency in bear smart programs, research is required to examine how the public responds to different messaging strategies.

Outcomes of this study have sought to add to the understanding of how messaging affects homeowners' perceptions of black bears and their motivations to voluntarily reduce conflict. Conclusions may be used to generate more informed bear smart messaging campaigns in the future and provide wildlife conflict managers with insights into public attitudes and values towards black bears.

Subsequent publications that may result from this study will supplement the scientific literature in a relatively under-examined area of human and black bear conflict research. Until recently, the literature has been predominantly focused on examining public attitudes and behavioural responses to black bears and various management options (e.g. Pelton, Scott, & Burghardt, 1976; Campbell and Lancaster, 2010; Merkle et al., 2011; Campbell, 2012). Relatively few studies have been conducted on the effectiveness of different messaging strategies with different public groups (e.g. Sagle et al., 2013).

Chapter 2: Literature Review

2.1 Overview

Chapter 2 explores the theoretical frameworks that are thought to play an integral role in the effectiveness of bear smart messaging. Section 2.2 presents the theory of planned behaviour model, which was the primary framework used in the development of this study. A comprehensive overview of social norms and perceived control, two of the three main constructs used in this theory, are discussed in Sections 2.7 and 2.8. Attitude and belief, the third construct, is discussed in Section 2.3.

Like most forms of marketing, bear smart programs can employ different messaging strategies to persuade the public to act in a desired manner. The use of emotion in messaging is presented in Sections 2.3 and 2.5, while the use of non-emotional strategies is discussed in Section 2.4. Section 2.9 introduces the historical and present roots of cultural attitudes towards wildlife in western societies. Pre-existing attitudes towards wildlife, namely black bears for the purpose of this study, provide insights into people's attitudes to bears and why the adoption of bear smart behaviours is necessary. Sections 2.10 and 2.11 review the current black bear management policy within the province of Manitoba. Section 2.12 reviews the black bear management policies in place at Riding Mountain National Park, one of the locations included in the study area.

2.2 Theory of Planned Behaviour

The theory of planned behaviour was developed by Icek Ajzen (1988, 1991). This well received and popular theory has been used extensively within the social science disciplines to explain the behavioural intentions, and actual behaviours, of people since its conception (Ajzen, 2002). This theory, and several similar theories, have been established under the belief that behavioural intentions are the most direct precursor to actual behaviour (Sheeran, 2002). Behavioural intentions themselves can be considered a sliding scale of motivation towards performing a behaviour (Sheeran, 2002). One of the main issues that has continued to plague human behavioural studies is the discrepancy between intention and actual behaviour. Sheeran (2002) performed several meta-analyses, of which one examined people's behavioural intentions to use condoms and go for cancer screening. After results showed that nearly one-half of those who had positive behavioural intentions to use condoms and go for cancer screening failed to act, Sheeran (2002) framed the often-frustrating issue perfectly by commenting that "… 'well-paved with good intentions' is the proverbial road to hell" (7). Sheeran's meta-analysis identified that "…those participants who fail to act upon their positive intentions … are mainly responsible for the intention-behavior gap" (p. 7). Although this intention-behaviour gap has yet to be solved, behavioural intention models, like the theory of planned behaviour, are still the best tools currently available for social scientists to use.

The variables that are used to predict behavioural intention/motivation are often what distinguishes different theories (Sheeran, 2002). The theory of planned behaviour uses attitude and belief, social norm, and perceived behavioural control to predict behavioural intention (Ajzen, 1988; 1991; 2002) (Figure 1). Each of these predictors are described in detail in

subsequent Sections of this literature review. The theory of planned behaviour was chosen due to its applicability to wildlife management issues. There is a continuous need for institutions, such as governments, to track trends in public attitudes and beliefs towards wildlife species. Tracking public attitudes and beliefs helps wildlife managers gauge tolerance towards various management tools and objectives. When humans and wildlife species come into conflict, understanding which human behaviours (social norms) promote or impede coexistence is essential for addressing systemic issues (e.g., the practice of leaving garbage on the curb the night before morning pickup, which thus attracts wildlife). When behavioural change is required to prevent the occurrence of ongoing conflicts, consideration should always be made as to whether the target individuals have the capacity to comply (perceived control).

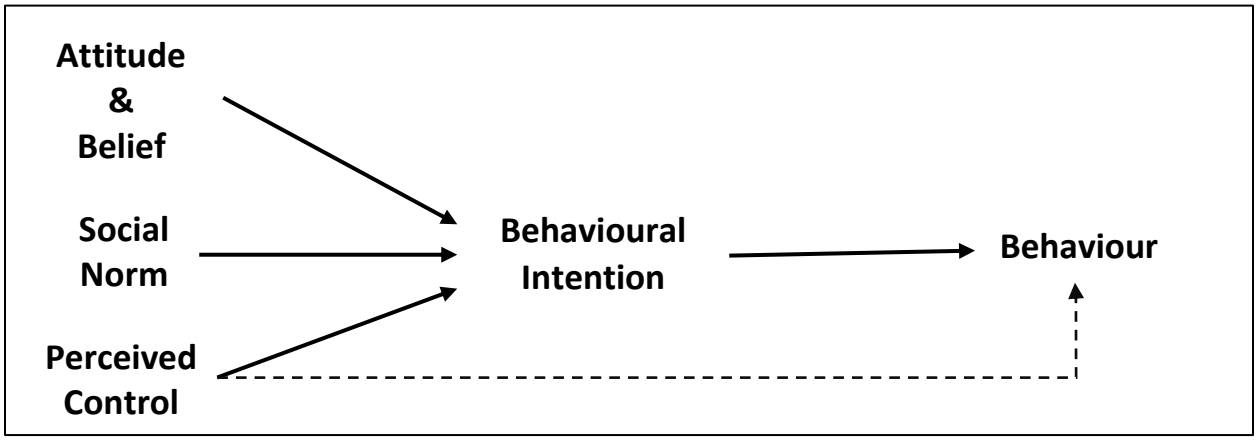

Figure 1: Theory of planned behaviour model developed by Ajzen (1985, 2004), figure by Lynnea Parker.

The theory of planned behaviour has been used frequently, with success, in previous studies relating to environmentally friendly behaviours, such as recycling (e.g. Laudenslager, Holt, & Lofgren, 2004; Mahmud & Osman, 2010; Largo-Wight, Bian, & Lange, 2013; Arı & Yılmaz, 2016; Wan, Shen, & Choi, 2017).

2.3 Discrete Emotions, Attitude, and Behaviour

Attitudes are thought to be derived from two main factors: evaluation and affect (Ajzen & Fishbein, 2000). Evaluation is considered to be an individual's favourable or unfavourable assessment of a subject, while affect is the relative strength of the evaluation (Ajzen & Fishbein, 2000). Belief, in the construct for attitude and belief in the theory of planned behaviour, is defined as a concept that is accepted to be true or is accepted to exist (Fishbein & Raven, 1962). Attitude and belief are measured independently but considered together in the construct.

There is consensus in the literature that emotions play an integral role in the formation of attitudes and therefore influence decision-making and behaviour (Schwarz, 2000; Lau-Gesk & Meyers-Levy, 2009; Angie, Connelly, Waples, & Kligyte, 2011; Shen & Dillard, 2007).How emotions precisely influence attitudes, however, is still unclear (Schwarz, 2000; Van Kleef, Van Doorn, Heerdink, & Koning, 2011; Kang & Cappella, 2008). Shen and Dillard (2007) state that emotional appeals in messages trigger cognitive responses in one of three typical categories: support, rejection, or non-evaluation. These cognitive responses, in turn, are thought to mediate the degree to which a message will influence a person's attitude, therefore presenting a measure for persuasion (Shen and Dillard, 2007). This is further elaborated by the idea that appraisal theory can be used to help bridge the connection between emotional appeals used in messaging, and corresponding cognitive reception and attitude formation (Kang and Cappella, 2008; Lench, Flores, & Bench, 2011). Appraisal theory is the idea that emotions are generated through evaluations (Roseman & Smith, 2001). Attitudes have subsequently been linked to behavioural intention, which is a precursor for actual behaviour (Ajzen, 1985; Webb & Sheeran, 2006).

2.4 Use of Rational and Emotional Appeal in Messaging Campaigns

Literature exploring the use of appeals in message development, and corresponding measures for effectiveness, are predominantly centered in the fields of business marketing and public health. Rational appeals present factual information to generate logical, objective arguments (Holmes & Crocker, 1987; Stafford & Day, 2005; Zhang, Sun, Liu, & Knight., 2014). Emotional appeals, conversely, target specific feelings to elicit emotional responses (Holmes & Crocker, 1987; Cutler & Javalgi, 1993; Zhang et al., 2014). Both rational and emotional appeals in messaging are persuasive in nature and are typically used to generate desired behavioural and attitudinal outcomes (Holmes & Crocker, 1987).

There has been debate in the literature pertaining to the subjective effectiveness of rational versus emotional appeal (e.g., Studts, Ruberg, McGuffin, & Roetzer, 2010; Farrelly et al., 2012). Further, within emotional appeal literature, there are debates concerning how different types of discrete emotions affect persuasion, attitudes, and behaviour (Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996; Kang & Cappella, 2008). Trends in the literature indicate that the effectiveness of appeals are, in general, dependant on several factors, such as: target audience, context, claim strength, and desired attitudinal and behavioural outcomes (Holmes & Crocker, 1987; Grove, Pickett, & LaBand, 1995; Albers-Miller & Stafford, 1999; Stafford & Day, 2005; Zhang et al., 2014). Therefore, it is not appropriate to generalize rational or emotional appeals as being more or less effective over broad contexts; messaging strategies must be specifically tailored and measured against situation-specific objectives.

2.5 Discrete Emotions in Emotional Appeals

Different types of emotions have previously been grouped into valences based on their positive or negative mood attributes (Lerner & Keltner, 2000; Mitchell, Brown, Morris-Villagran, & Villagran, 2001). For example, negative valence emotions include states of sadness, regret, guilt, fear, and anger (Lerner & Keltner, 2000; Lau-Gesk & Meyer-Levy, 2009). Positive valence emotions represent the opposite end of the emotional spectrum: happiness, joy, and pleasure (Kang & Capella, 2008; Angie et al., 2011). It was once assumed that emotions within each valance affected cognitive processes in the same way; however, over the last decade, research into discrete emotions has revealed that same-valence emotions can influence peoples' judgements and decision-making in different ways (Lerner & Kaltner, 2000; Mitchell et al., 2001; Lau-Gesk & Meyers-Levy, 2009; Angie et al., 2011). For instance, Lerner and Kelter (2000) found that same valence emotions of anger and sadness influenced attitudes and choice differently. This difference, in part, may be due to a difference in cognition, where anger has been theorized to elicit heuristic processing as opposed to systematic processing in sadness (Schwarz, 2000; Angie et al., 2011). Heuristic processing can be described as quick decision-making without fully regarding the subject being judged or acted upon (Vohs, Baumeister, & Sage Publications, 2007). When heuristic processing takes place, people will often do what aligns best with their predispositions (biases), or act based on "expert opinion" without examining the issue in detail themselves (Vohs et al., 2007). Systematic processing is the opposite, where a message results in an individual critically examining the issue before deciding to act (Kahlor, Dunwoody, Griffin, Neuwirth, & Giese, 2003). Systematic processing is often the preferred response strategy with

persuasive messaging, as attitudes developed towards the subject persist longer and may influence both short-term and long-term behaviour (Kahlor et al., 2003).

Discrete emotions have been defined as "…short-lived, intense phenomena that usually have clear cognitive content that is accessible to the person experiencing the emotion" (Angie et al., 2011). Discrete emotional appeals have been used to elicit desired attitudinal and behavioural responses in persuasive messaging (e.g., Roskos-Ewoldsen, Yu, & Rhodes, 2004; Lewis, Watson, & White, 2010). Shen and Dillard (2007) described how discrete emotions elicit particular response functions and associated behavioural tendencies in terms of approach (induced by positive stimuli) and avoidance (induced by negative stimuli). The approach and avoidance classification of discrete emotions is widely recognized and supported (Elliot, 2008; Yan & Dillard, 2010; Stins et al., 2011). Theories relating to these classifications include the reinforcement sensitivity theory developed by Jeffrey Gray (1990) which includes the behavioural approach system and behavioural inhibition system. The approach system is premised on behaviours being positively reinforced through rewards/incentives (Pam, 2013a). Alternatively, the inhibition system is premised on behaviours being negatively reinforced through perceived threats (Pam, 2013b).

Recent literature has begun to further explore the discrepancy that can arise between discrete emotions used in appeals and actual attitudinal and behavioural responses (Kang & Cappella, 2008; Carrera, Munoz, & Caballero, 2010; Rhodes, 2015). Kang and Cappella (2008) speculated that the discrepancies that often exist can be attributed to the lack of empirical analysis and principled methods developed to design, elicit, and measure discrete emotions. Relatively new avenues in emotions research are examining mixed-emotion appeals (Carrera et

al., 2010; Bee & Madrigal, 2013), subconscious influence of emotional appeal (Heath, 2012), and modeling of emotional experience, or *flow*, as defined by Nabi (2015).

2.6 Impact of Social Norms and Normative Beliefs on Attitude

Social norms are broadly defined as "…shared beliefs about the acceptability of an action or situation" (Zinn et al., 1998, 3). Normative beliefs, derived from broader social norms, are concerned with the social acceptability of situation specific events (Zinn et al., 1998). Belief systems, in general, are guided by a combination of fundamental values and situational variables (Zinn et al., 1998). Social norms and normative beliefs play an integral role in influencing a person's attitude towards a stimulus, such as a persuasive message and subsequent behavioural intention (Manfredo, 1992; Zinn et al., 1998; Webb & Sheeran, 2006; Carlos et al., 2009; Holman, Crano, & Niedbala, 2016). As such, message appeals that are more closely aligned with a person's belief system are likely to result in higher message acceptance and reduced attitude ambivalence (Holman et al., 2016). The Elaboration Likelihood Model developed by Petty and Cacioppo (1981) is the most commonly used model for understanding the persuasion processes (Manfredo, 1992). This model suggests that persuasion is achieved by one of two main routes: central and peripheral (Petty & Cacioppo, 1986; O'Keefe, 2013). The central route is defined as "…a person's careful and thoughtful consideration of the true merits of the information presented in support of an advocacy" (Petty & Cacioppo, 1986, p. 125). Alternatively, the second route of persuasion is achieved "…without necessitating scrutiny of the true merits of the information presented" (Petty & Cacioppo, 1986, p. 125). It is thought that peripheral persuasion is the most common route of persuasion as it is triggered by a "simple cue" which does not require critical thought to

take place (Petty & Cacioppo, 1986). This “simple cue” is often considered positive, attractive, or desirable in context (Petty & Cacioppo, 1986).

Holmes and Crocker (1987) outlined four ideal qualities of an effective message as: generating awareness, persuading the undecided, retaining those already positively predisposed, and lastly, convert those who are negatively predisposed. However, the likelihood of a single message being able to attain all four goals is low (Holmes & Crocker, 1987). In line with this argument, recent research into the field of persuasive messaging has contrasted negative valence and positive valence appeals to better understand how message framing can effectively influence audience reception, attitudes, and behaviour in light of predispositions (Lewis et al., 2010; Yan, Dillard, & Shen, 2010).

2.7 Norms and Behaviour

Examination of norms first took place in the 1980s when researchers began trying to understand rational choice (McAdams, 1997). Although the origins of norms are not well understood, the broad understanding is that norms are “…informal social regularities that individuals feel obligated to follow because of an internalized sense of duty…” (MacAdams, 1997, p. 4). Norms are reinforced formally through laws and regulation, or informally through social consequence (MacAdams, 1997; Dequech, 2009; Thomas & Sharp, 2013; Larson & Brumand, 2014). Social norms are not entirely independent of formal rule, as it has been shown that governments have the capacity to manipulate norms (MacAdams, 1997; Dequech, 2009; Nyborg et al., 2016). The implementation of law and regulation can foster new norms, strengthen existing

norms, or impede norms (McAdams, 1997; Nyborg et al., 2016). Recognizing that government institutions have the ability to manipulate or impede norms is important for understanding the role governments play in society (Dequech, 2009). Governments are expected to enact laws and regulations that *reflect* social norms held by the public; as such, the government's ability to manipulate or impede norms may raise ethical questions. For example, could it be considered ethical for a government to impede the development or expression of social norms through formal legislation? This area of research has been largely focused within the fields of law and economics (MacAdams, 1997; Dequech, 2009).

Specific definitions for norms and its components vary in interpretation across the social science disciplines (Reynolds, Subasic, & Tindall, 2015). Reynolds et al (2015) compiled the literature and identified eight types of norms: subjective norm, descriptive norm, injunctive norm, social proof, social norm, personal norm, moral norm, and ingroup norm. These norms describe social influences both perceived and/or reinforced at societal, family, group, and individual levels. For simplicity, the term "family" will be used to reference people who are of importance to an individual; this may also include relevant neighbours, friends, and coworkers. Norms that typically examine broader societal influences include descriptive norm, injunctive norm, and social proof. Descriptive norms are described as "…what is typical or normal. It is what most people do…" (Cialdini, Reno, & Kallren, 1990, p. 1015, cited in Reynolds et al., 2015). Injunctive norms build upon descriptive norms by adding a moral component. This moral component determines if a specific behaviour is acceptable and implies social consequence if it is not (Cialdini et al., 1990, cited in Reynolds et al., 2015). Injunctive norms relate to social proof,

which is the act of examining other peoples' behaviour to determine what is proper or improper conduct (Cialdini, 1984, cited in Reynolds et al., 2015).

Subjective norm is what an individual deems "acceptable behaviour", which is influenced by their perception of other people (Ajzen, 1991). The subjective norm was originally intended to only reflect injunctive norms (Fishbein & Ajzen, 2010). The more current "perceived norm" extends the "subjective norm" to encompass general influences derived from both descriptive and injunctive norms (Fishbein & Ajzen, 2010; Reynolds et al., 2015). The explicit difference between perceived norm and social norm is not clear. Zinn et al. (1998) was previously quoted describing social norms as a shared belief towards what is deemed acceptable behaviour. Because these terms are not independent of each other, they can be misused and hard to interpret when authors do not explicitly define which definition they are referring to. Subjective norm, perceived norm, and social norm can be used to reflect both societal and family influences depending on the question being asked and the scale at which it is examined.

Norms that reflect upon an individual's own identity through belief systems include personal norm, moral norm, and ingroup norm (Reynolds et al., 2015). Personal norm and moral norm are conceptually the same (Parker, Manstead, & Stradling, 1995). Personal/moral norm is described simply as "feelings of moral obligation" (Schwartz & Howard, 1981, p. 191). Ingroup norm reflects a social identity that is fostered and maintained by people who group together based upon shared beliefs and values (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987, cited in Reynolds et al., 2015). Individuals can have their behaviours influenced when they self-identify with specific groups of people (Reynolds et al., 2015). The degree to which individuals align with

a group can also affect the degree to which their behaviours are influenced (White, Smith, Terry, Greenslade, & McKimmie, 2009).

Studies are often only able to examine select norms, which may not accurately reflect the influences of other norm types. If one norm is tested and is not found to contribute towards behavioural intentions, other norms, that were not examined, could contribute. For example, White et al. (2009) found that injunctive norm did not predict an individual's behavioural intention to recycle. This same study also measured for group norm, descriptive norm, and personal norm, which were found to contribute to behavioural intention. On the contrary, Larson & Brumand (2014) found that injunctive norm and descriptive norm were both a significant predictor of behavioural intentions regarding an individual's behavioural intention to implement environmentally friendly lawn care methods and water conservation measures. Where White et al. (2009) found no effect of injunctive norm, Larson & Brumand (2014) did find an effect. White et al. (2009) theorized that "…the subjective norm construct provides only a narrow understanding of social influence" (p. 20). It could be argued that all norm types, individually, are narrow in scope, not just the subjective norm as White et al. (2009) implies. It can also be observed that no construct has been designed to easily measure all the identified types of norms together. Because of this measurement limitation, examining any single norm will provide only a narrow view of the many possible social influences in a given context. Therefore, caution should be taken when using any single norm to broadly explain social influences on behavioural intention. Contradicting results, as shown above, reveal that normative influences are likely behaviour and context specific. There is also insufficient research examining the mediating

effects of cultural and socio-demographics on the degree to which norms are influential (Culiberg & Elgaaied-Gambier, 2015).

The eight social norms, or arguably nine norms with the inclusion of perceived norm, are not entirely exclusive from one another. Because overlap between each norm exists, creating measurements that are discrete has been plagued with theoretical difficulties. This study was only designed to measure social norm, which is currently supported by the theory of planned behaviour (Fishbein & Ajzen, 2010).

2.8 Perceived Control and Behaviour

Obstacles that can inhibit an individual from performing a desired behaviour are commonly referred to as perceived control (Ajzen, 2002). Theoretically, the more control an individual has over their own behaviour, the more likely they will be able to perform that behaviour (Ajzen, 2002). Obstacles that are often thought to inhibit behaviour include: financial means, physical capabilities, time availability, situational control, and knowledge (Ajzen & Madden, 1986; Kraft, Rise, Sutton, & Roysamb, 2005). Perceived control has been regarded as a significant predictor of behavioural intentions within the theory of planned behaviour (Ajzen, 1985, 2002). Literature examining the specific effects of perceived control on behaviour is centered in the field of health sciences. Research specifically examining if perceived control is the most suitable measure for behavioural inhibition, over other options (e.g. self-efficacy), within the theory of planned behaviour is lacking.

Self-efficacy measures the degree to which an individual believes they can perform a behaviour (Bandura, 1977; Wood & Johnson, 2016). Individuals with high levels of self-efficacy have higher motivations for performing behaviours, are more optimistic regarding behavioural outcomes, and are more capable of performing behaviours for longer periods of time (Schwarzer, 1992/2014). Self-efficacy is not independent of perceived control. If an individual has limited control over aspects of a situation, self-efficacy may decrease, and an individual may experience negative psychological impacts (e.g. feelings of helplessness, depression, anxiety, and stress) (Schwarzer, 1992/2014). Feelings of low self-efficacy have been found to be a direct barrier to behavioural action (Schwarzer, 1992/2014). While perceived control focuses on the direct measurement of specific, pre-identified obstacles, self-efficacy is broader in scope by encompassing many additional over-arching factors, such as: interpersonal thoughts, beliefs, and feelings (van Dinther, Dochy, & Segers, 2011).

Ajzen (2002) sought to address the issues of using self-efficacy vs perceived control by noting that his original use of perceived control was not sufficient. He adapted his definition of perceived control to mimic the more popular self-efficacy by stating: "…the term "perceived behavioral control" should be read as "perceived control over performance of a behavior" (p. 668). By slightly changing the definition, perceived control was no longer concerned with directly measuring concrete obstacles as an indicator of "…control over attainment of an outcome" (Ajzen, 2002, p. 668). Rather, perceived control was now a measurement of how an individual perceived an obstacle to impact the degree to which they could perform a behaviour (controllability). Although the new definition of perceived control, in theory, became more reflective of self-efficacy, it is not considered an appropriate substitute. To mitigate this issue,

Ajzen (2002) developed a hierarchical model that showed perceived behavioural control as a construct of both perceived controllability and perceived self-efficacy. He advocated for the measurement of both variables when possible, while also identifying issues with measurement validity (also see Kraft et al., 2005).

Ajzen's motivation for adapting the definition to better reflect self-efficacy was in part due to the power of measuring beliefs (perceptions). Where direct measurements of obstacles could be useful, the incorporation of a belief statement allowed for "…insight into the cognitive foundation underlying perceptions of behavioral control" (Ajzen, 2002, p. 668). Understanding how an individual perceived an obstacle to inhibit their behaviour could be more useful than measuring the obstacle and then subsequently making inferences to how it could inhibit an individual's behaviour.

This study used the adapted definition of perceived control within the theory of planned behaviour. Although there was interest in also measuring perceived self-efficacy, it was beyond the scope of this study to include it and only perceived controllability was accounted for.

2.9 Wildlife Values

Public responses to bear smart messages and associated management actions are largely driven by social norms and an individuals' own belief system (attitudes, values, ideologies, and experiences) towards the subject matter (Whittaker, Vaske, & Manfredo, 2006; Carlos et al., 2009; Manfredo, Teel, & Henry, 2009; Sponarski, Vaske, & Bath, 2015). Public values towards

wildlife in North America have been classified by Manfredo and his research group into two distinct orientations: utilitarian and mutualist (Manfredo et al., 2009).

Utilitarian beliefs and values are reflective of pro-wildlife use and anti-wildlife rights and welfare perspectives (Manfredo et al., 2009). The utilitarian value orientation is thought to be the most widespread orientation in western culture (White, 1967, cited in Catton & Dunlap, 1980; Hand & Van Liere, 1984; Buttel & Humphrey, 2002). The origins of the utilitarian value orientation can be linked to Judeo-Christian religion (Hand & Van Liere, 1984); European culture and colonialism; scientific and technical advances (Catton & Dunlap, 1980); and the rise of capitalism and globalization (Buttel & Humphrey, 2002; Manfredo et al., 2009).

Alternatively, the mutualist value orientation is reflective of beliefs and values that assume equal relationships with animals (e.g., pets and wildlife) and are typically known for being pro-wildlife rights and/or welfare (Jacobs, 2007). Mutualist values are rooted in coexistence and "harmony with nature" (Manfredo et al., 2009, p. 411). This value orientation was thought to have originated from pre-agricultural times when humans had a dependant relationship with the land and its resources (Ingold, 1944). This was because "…in hunter-gather societies, humans perceived themselves in a relationship of mutual responsibilities with one another and with wildlife" (Manfredo et al., 2009, p. 411).

The transition from mutualist to utilitarian values is thought to have occurred post-agriculture (Pratto, 1999). The ability to farm animals "…facilitated humans assuming power over animals, as a way of increasing benefits to humans, and in the process, relegating animals to a group receiving undesirable roles and conditions" (Manfredo et al., 2009, p. 411). This separation led to the belief that humans were distinctly different from animals, and that animals existed for

human use, consumption, and exploitation (Ingold, 1994). While utilitarian values have been the dominant orientation in western European cultures, there has been an observed shift back towards mutualist value in some westernized societies around the globe (Jacobs, 2007).

An explanation for the rise in mutualist value orientations in western culture may be found within the field of animal geography. Animal geography's presence in academic institutions and the literature, as a distinct branch of cultural geography, has been a recent development (Johnston, 2008). Johnston (2008) describes the rise of animal geographies as a "…response to our political and ethical responsibilities to the species who share our plant" (633). The goals of this field can be said to bring animals (often referred to as non-human animals within this literature) back into the spotlight to ensure their physical and emotional needs are visible and equally acknowledged within human societies (Johnston, 2008). Pacini-Ketchabaw & Taylor (2015) likewise propose that humans have an ethical duty to "…rethink our understandings of our responsibilities to the common world we share with other living beings" (p. 47). Pacini-Ketchabaw & Taylor (2015) argue that the impacts of humans on the natural world have largely been driven by the colonial belief that humans are separate from nature. This view has been mirrored by many scholars who wish to see humans acknowledge themselves as a part of nature, and thus having an ethical duty to better represent animals in our societies (e.g., Latimer, 2013; Lorimer, 2015).

Cultural representations of wildlife shape public views and beliefs towards animals (Kalof & Amthor, 2010). Kalof and Amthor (2010) explored the role media has played in positively or negatively shaping public views and beliefs towards different species. It was found that media has often defined different animal species as being "for" or "against" humans, which has been

accomplished by anthropomorphising undesirable or desirable traits. This human-centric practice of classifying good and bad animals has continued to promote a cultural hate or love for certain species (Kalof & Amthor, 2010). The "for" or "against" depictions of animals in media can be associated with the fundamental cultural belief that nature is to be dominated and brought under human control (Ingold, 1994; Loo, 2007). Kalof and Amthor (2010) summarized this very well:

> "Whether considered in urban, rural, or natural areas, problem animals are those that disturb the "proper" boundary between culture and nature" (2).

Changing wildlife value orientations at varying scales have important implications for wildlife managers, where polarized views have made many management tools and decisions controversial (Zinn, Manfredo, & Barro, 2002; Manfredo, Teel, & Bright, 2003; Whittaker et al., 2006; Barunch-Mordo, Breck, Wilson, & Broderick, 2009; Decker et al., 2016; Manfredo, Teel, Sullivan, & Dietsch, 2017). Manfredo et al. (2017) explores the consequences of "cultural backlash" from groups who do not align with changing cultural values towards either wildlife in general, or specific species.

Due to the nature of bear smart programs being premised on co-existence with wildlife and the need for *human* behavioural change, the messaging in this study is deemed to be reflective of the mutualist values.

2.10 Manitoba's Provincial Black Bear Management and Conflict Policy

Black bears are provincially managed under The Wildlife Act as a big game species in Schedule A (2016, c. W130). There is currently no species management plan for black bears in the province. Spring and fall hunts are supported by Manitoba Sustainable Development, which was formerly known as Manitoba Conservation and Water Stewardship (MCWS; name change occurred in 2016). The spring hunting season begins on April 25th and closes between June 12th and 30th (MCWS, 2016). Fall seasons begin on August 29th and close October 9th (MCWS, 2016). The black bear management area covers nearly the entire province except for the southwestern corner (MCWS, 2016). The current bag limit for black bears is one adult individual, without cubs, across the three management zones (MCWS, 2016). Baiting is permitted throughout both spring and fall seasons with limited restrictions to bait type (MCWS, 2015). Baiting is not permitted within 100-meters of Riding Mountain National Park, 200-meters from a road or dwelling, or 500-meters from a cottage subdivision (MCWS, 2015).

Manitoba Sustainable Development's Wildlife and Fisheries Branch (previously known as the Wildlife and Ecosystems Protection Branch) produced both a black bear conflict policy and a related procedures document in 2005 (MCWS, 2005a; 2005b). These documents were designed to standardize how black bear conflicts are resolved across the province. The overriding goals of the provincial policy include: managing conflict while ensuring the future sustainability of bear populations; conflict prevention and public safety initiatives; public education campaigns; training staff to uphold best management practices; and province-wide conflict monitoring (MCWS, 2005a).

The 2005 policy was updated in 2015 to become the Human-Black Bear Conflict Management Policy (MCWS, 2015a). This most recent policy outlines three categories for black bears. Category 1 refers to bears that have not developed negative behaviours of food conditioning or habituation, or attraction. Category 2 refers to bears that have developed negative behaviours relating to food conditioning, habituation, or attraction. Bears in this category may become defensive over food sources but will retreat when approached and will show signs of intimidation when aversive conditioning methods are used. Bears that are aggressive and are not intimidated by aversive conditioning methods are considered Category 3 and must be euthanized humanely (dispatched). Only bears in Category 2 are eligible for translocation.

Under the Human-Black Bear Conflict Management Procedures document (MCWS, 2015b), the non-lethal management of problem bears is encouraged. Strategies that residents can utilize for conflict reduction include: practicing good husbandry skills (e.g., electric fencing and other non-lethal deterrents), investing in bear-proof storage containers, and using aversive conditioning/hazing devices (e.g., bangers, air horn). In addition, the procedures document outlines commitments to provide the public with information relating to bear smart messaging and signage. Bear smart messaging is especially important in rural communities, where under The Wildlife Act Section 46(1), any person may kill a black bear in the act of defending or preserving their property (2016, c. W130). Bears killed under 46(1) must be reported to a conservation officer within ten days (The Wildlife Act, 2016, c. W130).

2.11 Manitoba's Provincial Bear Smart Program

Manitoba's Bear Smart program was initiated in 2006 and aims to reduce the number of black bear conflicts in the province. This is currently being done by increasing public acceptance of black bears and providing public education on bear and human behaviours, with a focus on conflict prevention. Bear Smart messaging material distributed to the public is predominantly fact-based (neutral) and focuses on: black bear identification, natural history and behaviour, how to act around bears, and the removal of attractants (MCWS, 2014). Materials are geared towards both home owners and recreationists (MCWS, 2014).

2.12 Riding Mountain National Park's Black Bear Conflict Policy

Riding Mountain National Park is currently in the process of developing an updated black bear management plan (RMNP, 2014). The update is meant to replace the "Operational Guidelines for Managing Bear/Human Conflicts in Riding Mountain National Park", which was published in 2003 (RMNP, 2003). The 2014 unofficial revision is responsible for addressing all human and black bear interactions within the park boundaries and is summarized in the following paragraphs. Relevant details about locations within the park are covered in Section 3.2.

Black bears within the park are regarded as either exhibiting natural or problematic behaviours. Bears exhibiting natural behaviours are described as a low public safety and conflict risk. These bears will typically avoid people and do not express aggressive behaviours. In contrast, problem bears are regarded as having the potential to cause conflict and may present a public safety risk. These bears are typically not afraid of people (habituated) and express varying levels

of aggressive behaviour. Aggressive behaviours can include: approaching people, bluff charging, and vocalizations. There are three categories for problem bears; category one refers to bears that will tolerate some human presence, do not approach people, and do not express aggression. Category two refers to bears that are highly habituated, may approach people, and may express aggressive vocalizations. Category three refers to bears that are highly habituated, will approach or bluff charge people, and will express aggressive vocalizations. Wildlife conflict officers are responsible for assessing reported interactions between humans and bears to determine which actions, if necessary, are required.

In response to bears that may cause a threat to public safety in the front country (townsite of Wasagaming and campground areas), park officers are required to post warnings for the public, monitor the situation, and possibly trap and relocate bears. In response to bears that actively pose a threat to public safety in the front country, park officers are required to close areas to the public and destroy the bear.

Riding Mountain National Park has developed a series of stringent bear smart policies regarding waste and attractant management. Garbage disposal containers are required to be bear proof and have regular maintenance schedules to ensure overflow does not occur. Townsite residents and visitors are required to abide by waste management protocols which respect this system. Failure to abide by park bylaws may result in park wardens using enforcement measures to gain compliance. Gatekeeper and campground staff are required to provide all visitors entering the park with basic black bear education. This information focuses on safety and proper food/garbage storage practices. In addition to directly providing visitors with information, signage is required to be posted and maintained throughout the park. This management plan

focuses on preventative measures of conflict reduction to minimize the likelihood of bears developing problematic behaviours.

Chapter 3: Methods

3.1 Overview

Chapter 3 outlines the development of the research design, its implementation, and methods of data analysis. This study took place near Riding Mountain National Park, which is located 3 hours northwest of Winnipeg in the province of Manitoba, Canada. The designated survey area and the rationale for selecting participants from rural agricultural, rural residential, and rural recreational areas is described in Section 3.2. Each homeowner who agreed to participate in the study was provided with a package containing one questionnaire and one free-entry contest ballot. Participants could have also received one of three different types of bear smart messaging posters. Those who were a part of the control group did not receive a poster. The structure and content of the questionnaire is outlined in Section 3.3 and the creation of the messaging posters is detailed in Section 3.4. Because bear smart programs often assume specific values towards wildlife in their messaging, a bias statement has been included in Section 3.5. The ideal sample size for the study was generated using rationales presented in Section 3.6, while survey implementation methods are described in Section 3.7. As the survey area had a low population density, anticipated low participation rates prompted the inclusion of a free-entry contest which is described in Section 3.8. The post-survey participation rates and the perceived effectiveness of incorporating the free-entry contest are presented in Section 3.9. The project budget and sources of funding have been stated in Section 3.10. The method for presenting basic summary results from the questionnaire is stated in Section 3.11. Section 3.12 provides the justification for which items from the questionnaire were ultimately selected for inclusion in the constructs developed for hypothesis testing. Section 3.13 identifies the statistical tests that were

chosen to answer each of the four hypotheses and the theory of planned behaviour model. Reasons why each test was selected have been provided, along with how each test's assumptions were met. Results are presented in Chapter 4 and were produced using IBM SPSS version 24 and 25, except for the reliability analysis which was conducted using R (R Core Team, 2018).

3.2 Study Area

The study area was located predominantly within the rural municipal area of Harrison Park in the midwestern district of Manitoba (AMM, n.d.) and extended slightly into the rural municipality of Clanwilliam-Erickson. The study area's northern edge followed Riding Mountain National Park's southern border from Wasagaming and Onanole west along HWY 345 (Figure 2). The southern edge of the study area stretched from Erickson west to Elphinstone via HWY 45. Erickson and Ditch Lake reside within the rural municipality of Clanwilliam-Erickson (AMM, n.d.). The core study area was located within townships 18-20 and range roads 18-22, west of the meridian. This area was chosen in consultation with Riding Mountain National Park in order to investigate concerns that communities outside of the National Park were experiencing high rates of conflict with bears.

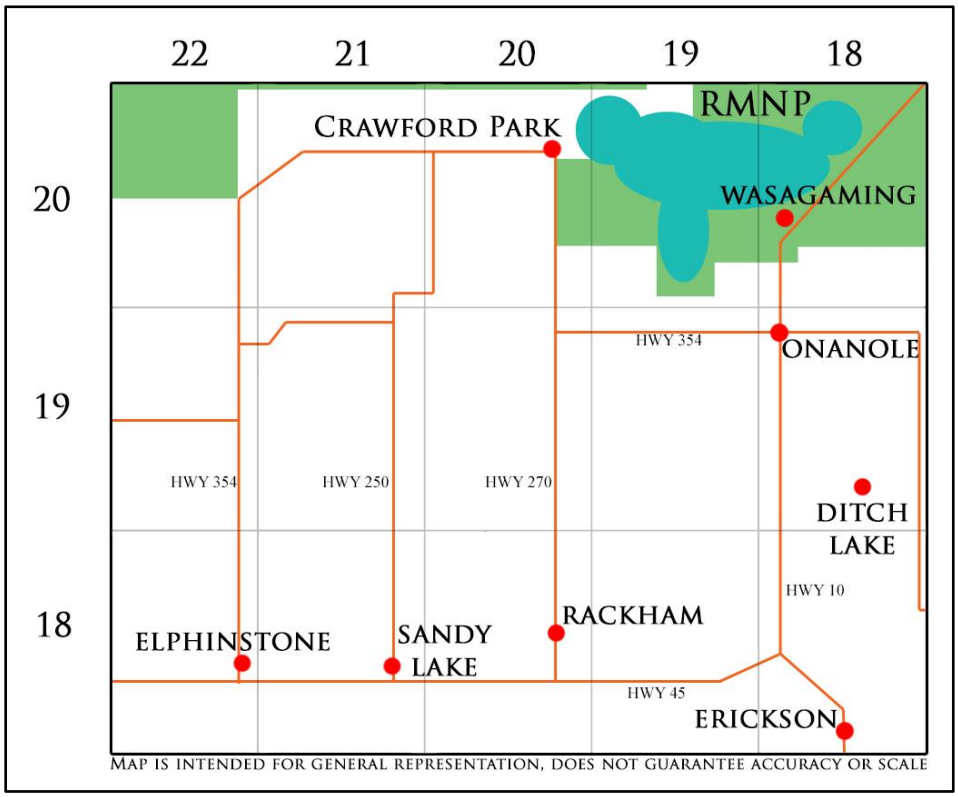

Figure 2: Designated survey area. Map created by Lynnea Parker.

Outside of major cities in Manitoba, residences are typically located within rural agricultural, rural residential (townsite), or rural recreational areas. Manitoba Sustainable Development adopted these area designations to track where human and black bear conflicts in the province were primarily taking place. This was done in recognition that sources of conflict stemming from rural agricultural, rural residential, and rural recreational areas were often different. Manitoba Sustainable Development has classified a residence as a dwelling, such as, but not limited to, a house, trailer, or cottage (MCWS, 2012). Residences located within rural agricultural areas are regarded as typically having no street address and will often use a civic address or Dominion Land Survey description instead (AMM, 2003); this type of residence is generally associated with yard sites next to farms and farmland (MCWS, 2012). Residences

located within rural residential areas include "…a community, town or village which is serviced yearly" (MCWS, 2012, p. 2). Residences located within recreational areas are often seasonal and include campgrounds, cottages, and trailers often associated with lodge countries, parks, and beaches (MCWS, 2012).

The population estimates within the designated survey area were low but still deemed sufficient for obtaining an adequate coverage of residences in rural agricultural, rural residential, and rural recreational areas. Harrison Park had an estimated population of 1,799 in 2015 (MMG, 2015) while Erickson and Ditch Lake (Clanwilliam-Erickson) had a combined population estimate of 487 in 2011 (MMG, 2011). The sampling method is detailed further in Section 3.7.

3.3 Questionnaire Development

The survey questionnaire was created using the theory of planned behaviour (Ajzen, 1985) (first described in Section 2.2). The questionnaire had four main components designed to measure the theory's four core constructs: attitudes (18 questions), subjective norms (7 questions), perceived behavioural control (5 questions), behavioural intention (1 question), and past behaviour (13 questions). In addition to these categories, message evaluation and basic socio-demographic questions were asked (5 questions). Four questions for messaging material evaluation were included to measure the strength of the emotional appeal each message type was designed to elicit. The entire survey consisted of 53 questions and generally took between 10-30 minutes for participants to complete.

The first section of the questionnaire measured personal beliefs and attitudinal judgements across the topics of: attractants, nuisance bear behaviour, bear conservation, and relationship to nature. Social norms and beliefs identified the degree to which the participants' behavioural actions were self-reportedly influenced by the perceived opinions of family and neighbours. Personal belief questions regarding standard management options, and whether they were considered acceptable/unacceptable, were also asked. The perceived behavioural control section sought to identify possible factors that inhibit or facilitate people acting in a bear-smart manner. This was done by formulating questions that assessed: financial security, physical capability, time to perform, concrete knowledge, and self-determination.

In the behavioural intentions section, a dichotomous yes or no question was asked to determine if participants would remove some, or all, bear attractants from their yard that summer. Subsequently, participants were then able to self-identify which common attractants were present on their properties by indicating their willingness to remove or securely store them. The list of attractants was based on the Manitoba Conservation and Water Stewardship (2012) black bear district occurrence report protocol. There was also an option for participants to self-identify any additional attractants that were not included in the chart. To better understand participants' willingness to remove or not remove attractants, one question asked if they had experienced black bear conflict in the past. A second follow-up question asked if they had removed or secured attractants in the past to prevent conflict.

In the demographic section, participants were asked to identify with either having a rural or urban background. Because wildlife value orientations have been previously correlated with an individual's background (higher proportion of utilitarian orientations in rural settings, as

opposed to mutualist orientations in urban settings), this measure was intended to gain insight into participant values (Deruiter & Donnelly, 2002; Manfredo et al., 2003). In addition, participants were asked to identify their gender and age bracket. Age brackets were 18-25 for young adults, 26-60 for middle-age adults, and 61+ for older adults (e.g., used in: Campbell & Lancaster, 2010; Campbell, 2013). Age and gender have been associated with differences in attitudes towards wildlife (Campbell & Lancaster, 2010; Campbell, 2013). Participants could also identify as a member of the Keeseekoowenin First Nation. Lastly, participants were asked to identify with an income bracket: <$10,000, $10-24,999, $25-49,999, $50-74,999, $75-99,999, $100-124,999, >125,000 (Manfredo et al., 2003). Income bracket information was initially intended to provide supplementary information for explaining levels of perceived control.

In the theory of planned behaviour, measures for behavioural intention are used to predict actual behaviour. The discrepancies between behavioural intention and actual behavioural performance has been identified as the hypothetical bias (Ajzen, Brown, & Carvajal, 2004). To reduce instances of hypothetical bias in this study, questions were formulated to consistently reflect real-life in two significant ways:

1. Context of time and place was kept constant throughout the questionnaire to reflect decisions made that summer, at participants' personal property.
2. Word choice was reflective of the real-life situation, and not a hypothetical scenario.

3.4 Messaging Material

Messaging material consisted of one full-page poster uniquely designed for each of the three test groups (Appendix I). To reflect current trends in bear smart messaging campaigns, existing government and non-profit bear smart programs across North America were reviewed during the design phase. Textual and visual information incorporated into the posters was meant to be reflective of current black bear education programs by incorporating similar statements and references to bear behaviour and types of attractants. Human-wildlife conflict managers from Manitoba Sustainable Development were also consulted and provided important feedback on materials during the design process.

Each of the three posters contained pictures of bears. For the rational appeal group there was a picture of a bear depicted in a neutral scene: an adult male bear standing in a forest. Contrasting this, the positive and negative emotional appeal groups contained pictures chosen to elicit a discrete emotional response: sadness vs. happiness. The positive poster had a banner image featuring a sow with two older cubs. The negative poster had a banner image featuring a sow with a young cub. This poster also featured two smaller images; a bear raiding a residential garbage container and a typical bear trap. For the negative appeal poster, the use of graphic negative images was not advised at the time by Manitoba Sustainable Development. The banner images for each poster were used under a licensing agreement with photographer Robert Anderson from FireFlight Photo (Appendix I). In addition, the emotion-based posters each contain pictures of common black bear attractants (garbage, pet food, apples, and bird feeders). The negative poster contained less-appealing images of attractants (e.g., rotting apples on the ground) and the positive poster contained appealing images of attractants (e.g., charismatic dog

holding a food dish). All pictures of attractants were obtained under relevant creative-commons licenses.

Textual information in each poster was different; this was required to elicit the desired appeal and overall message of the poster. The rational poster contained more fact-based text than the emotion-based posters. The positive poster uses the slogan “knock, knock, who’s there? your neighbours!” with a few positive facts about mother bears and their cubs. The negative poster used the slogan “bear families, like this one, may be killed this summer if you leave attractants on your property”. Text for the negative poster highlighted the trapping and killing of bears and cubs.

To ensure both rational and emotional posters elicited the desired appeal, a simple preliminary survey was conducted at the university by recruiting fellow students and staff.

3.5 Bias Statement

It is acknowledged that bear smart programs and associated messages are value-biased. Numerous studies have shown that the general public intrinsically values black bears (e.g., Carlos, et al., 2009; Campbell & Lancaster, 2010; Campbell, 2013). Bear smart programs often utilize this social value in the development of messaging material (e.g., Get Bear Smart Society, n.d.; Ministry of Environment, n.d.). This use of social value is done in an attempt to persuade the public to adopt “bear smart” attitudes and behaviours in order to avoid the killing of black bears. Messages are therefore determined to be biased in favour of non-lethal management options for conflict-reduction and prevention.

3.6 Determining Ideal Sample Size

The anticipated ideal sample size for comparing groups and achieving a high degree of statistical power was determined through a literature search and conducting two different G*Power 3.1.9.2 tests (Faul, Erdfelder, Lang, & Buncher, 2007). This study grouped participants by treatment type and area. Treatment type consisted of three test groups which differed based on the type of message participants may have received (positive, neutral, or negative) and a control group. Participants were also grouped by the type of area they lived in: rural agricultural, rural residential, or rural recreational.

The first a-priori power analysis using G*Power was based on an F statistic for linear multiple regression. Parameter estimates included an effect size of 0.15 (moderate), α error probability of 0.05, power of 0.98, with 4 predictor variables. The predictor variables were representative of attitude and belief, social norm, perceived control, and behavioural intention. G*Power produced an estimated total sample size of 155, which was theoretically ideal for achieving significance and minimizing the risk of type I and type II error. Assumptions of linear multiple regression include: random sampling, independent samples, normal distribution of data, and a linear relationship between variables (Quinn & Keough, 2002).

The second a-priori G*Power test was based on an ANOVA, repeated measures between factors. The chosen effect size was 0.25 (moderate), α error probability of 0.05, power of 0.95, with 12 groups and 4 predictor variables. Correlation between repeated measures was estimated at 0.5. Based on these inputs, the ideal sample size required for an ANOVA test was 264. Each sub-group required a minimum of 22 participants. This sample size was supported by the

literature, where similar studies have used this approximate number of participants while achieving sufficient statistical power (e.g., Ajzen et al., 2004; Slagle et al., 2013; Zhang et al., 2014). Assumptions of the ANOVA statistical analysis include independence of samples, normal distribution, and that groups have similar sample sizes, reflecting variance homogeneity (Quinn & Keough, 2002).

Because participation in this research was completely voluntary and conducted through door-to-door solicitation, the success rate for obtaining completed questionnaires was estimated at 20-40% (Vaske, 2008; Campbell, 2013). In an effort to increase the anticipated response rate, participants who return completed questionnaires were given the option to enter a contest. With this added incentive, response rates were expected to be 40%. Using sample size estimates from the A-priori ANOVA test, combined with the anticipated response rate, an estimated 650 households would have needed to be solicited.

3.7 Sampling Method

Rural agricultural areas were sampled differently than rural residential and rural recreational areas. This was because no estimates were available for the number of households associated with rural agricultural areas. During the data collection phase, it became apparent that most of households in this category would need to be contacted in order to attain the minimum ideal sample size. Road maps were used to keep track of areas surveyed, and nearly all roads with farmhouses were sampled. Houses that were deemed unsafe to approach were

excluded for safety reasons; these included houses with aggressive off-leash dogs, closed gates, and explicit signage not to approach.

Because there were more residences for rural residential and rural recreational areas, streets were randomly selected to be surveyed. All households that were on randomly selected streets, or rural roads, were then solicited. If contact was not made on the first attempt, a maximum of three attempts were made. Each participant was asked a few short questions to ensure they were given a survey corresponding to the right area, as rural recreational and rural residential properties were sometimes intermixed. All participants were given 1 of 4 randomly selected survey packages to complete (control, positive, negative, neutral).

The survey method changed one month into the field season due to the looming threat of a nation-wide postal strike. During the first month of survey efforts, each package contained a pre-paid return envelope that could be mailed back anonymously to a local PO box number. Due to concerns that the survey response rates would drop considerably if the postal strike proceeded over the summer and into the fall, mail-backs were no longer a reliable option. Alternately, homeowners were required to complete the questionnaire at time of contact; if this was not possible, there was a second option of dropping off sealed questionnaires at two locations. The first location was the administration building in Wasagaming, and the second location was the Harrison Park municipal office in Onanole.

3.8 Free-Entry Contest

All randomly selected survey participants who return completed questionnaires had the option of entering a free-entry contest. There were two individual prizes of a $200 prepaid credit

card. Contest ballots were included in the survey package with a separate envelope to ensure questionnaires remained anonymous. The two winning ballots were drawn on October 15th, 2016, and prizes were mailed out in November 2016. No permits or licenses were required under Manitoba's liquor and gaming authority regulations (LGA, 2016) for free entry contests.

3.9 Post-Survey Participation Rate

The target sample size was 264, with 22 participants in each subgroup; survey efforts were successful in obtaining the optimal sample size. In total, 279 surveys were collected with a range of 20 to 26 participants per subgroup (Table 1). Study participation was estimated to be 40% prior to the field season, and expectations were exceeded; of 225 mail back surveys handed out, 136 were received back, resulting in a 60% mail-back response rate. After the change in survey strategy from mail-back to completion at time of contact (in-person), response rates improved further. Of 180 homeowners successfully contacted, 143 agreed to participate in-person, resulting in a 79% response rate. Overall participation rates for both survey methods combined was 69%. The survey contest had an 89% participation rate. The contest was likely beneficial for increasing response rates with mail-back surveys. Due to the positive public response to the study, the contest was not necessary for achieving high participation rates with in-person surveys. There was no test for non-response bias with mail-back surveys and there was no detected non-participation bias for in-person surveys.

Table 1: Obtained sample sizes for test groups, N = 279.

		Area			
		Agricultural	Residential	Recreational	Total:
Test Group	Control	23	24	21	68
	Positive	23	22	22	67
	Negative	20	22	25	67
	Neutral	24	26	27	77
	Total:	90	94	95	279

3.10 Project Budget

The project budget was $6,000; $3,000 provided by Riding Mountain UNESCO World Biosphere Reserve and $3,000 provided by the Berkes Graduate Scholarship in Community-Based Research. In total, it cost $4,342.04 to conduct the research from June to August 2016. A breakdown of expenses is as follows: vehicle gas $839.32, vehicle maintenance $112.37, survey materials $1,382.42, uniform materials $119.38, contest prize and miscellaneous items $538.55, and housing $1,350.00. There was $1,658.00 in left over funds, of which $800 was given back to the Riding Mountain UNESCO World Biosphere Reserve in January 2017.

Riding Mountain National Park supported this research project by providing stipend funding for a two-year period. A Research Manitoba scholarship provided stipend funding for the third year of the project. Additional financial assistance was provided by the Stephen and Alison Philips Bursary in Environmental Studies, Faculty of Graduate Studies Special Awards Fund, and the Alice Chambers-Hyacinth Colomb Assistantship.

3.11 Summary Results

Basic summary results for select items from the questionnaire have been reported as either percentages rounded to the nearest whole number, or as frequencies. Whole numbers were reported for clarity. Summary results from individual questionnaire items will be used to provide both background information and explain results from each hypothesis. Scale data (1-7) was aggregated into 3 groups: disagreed (1-3), neutral or undecided (4), and agreed (5-7). Relative strength of disagreement/agreement is not reported. Appendix VIII contains the mean or frequency responses for questionnaire part 2, 3, 4, and 5, presented by area. All summary results are located in Chapter 4, Section 4.2.

A Kruskal-Wallis H Test was performed for question 29 to determine if annual household incomes were significantly different between rural agricultural, rural residential, and rural recreational areas. Distributions of income scores were not similar across all groups, as assessed by examining box-plots and histograms. Because of this, mean ranks were interpreted instead of median values. All significance values are reported using the asymptotic level. Pairwise comparisons were conducted with a Bonferroni correction based on three comparison groups, with statistical significance accepted at $p < 0.008$.

Generalized Estimating Equations (GEE) were performed with questions 24a, 24b, 24e, 24f, and 24i. In this set of questions participants were asked to indicate if they would remove or securely store different types of black bear attractants. Response categories were “yes, “no”, “not decided”, and “not applicable”. Responses that fell into the category of “yes” or “no” were tested; “yes” was coded as 1 and “no” was coded as 0. The response “yes” was used as an indicator to show that an attractant was deemed acceptable to remove or securely store. A

response of “no” indicated that an attractant was deemed unacceptable to remove or securely store. Because participants were represented more than once in the data, the GEE model was used to account for correlated responses. Three models were conducted, all with respondent ID as the repeated-measures subject variable and willingness to remove or secure attractants as the response variable. In the first model the predictor was attractant type and used the barbeque category as the reference group. In the second model, the predictor attractant type used ripe fruit from trees or shrubs as the reference group. In the third model, the predictor attractant type used fridges and freezers as the reference group. All the models used a binomial probability distribution with a logit link function. In total, there were 659 cases used in each model, representing 231 unique participants. Subgroup sample sizes were as follows: bird feeders (n = 116), fridges and freezers (n = 38), ripe fruit from trees or shrubs (n = 123), garbage (n = 190), and barbeques (n = 192).

The SPSS syntax for the Kruskal-Wallis H Test and GEE models can be found in Appendix II.

3.12 Data Validation

3.12.1 Variables excluded from analysis

Not all questions from the questionnaire were retained for hypothesis testing. There were questions found to be worded incorrectly after receiving participant feedback about the survey. In addition, some questions were found to be irrelevant for the study area. Questions 9a, 9b, 10a, 10b were removed do to ambiguous wording. There was no consistency in how questions 9a and 10a were answered, therefore associated belief statements 9b and 10b were also discarded.

Attitude-based questions 11 and 12 had no associated belief statements and were examined separately in the additional results, Chapter 4, Section 4.2.

Question 24 was a chart that listed 10 different types of attractants, which included an option for "other". After receiving feedback from numerous participants, sub questions 24c, 24d, 24f, 24h were removed. 24c represented "livestock and pets", 24d represented "outdoor pet food", 24f represented "compost", and 24h represented "grain bins and farm feed". Rather than being an attractant, properties with pets, namely dogs, helped to keep bears away from houses. In conjunction, outdoor pet food was not a common practice, nor an issue, as outdoor dogs may have kept nuisance animals away. Rural agricultural residents were in favour of composting and consistently reported not having an issue with bears going after open compost piles. Grain bins and farm feed were not an issue within the study area as steal grain bins are now common practice. There were no reports of black bears going after stored farm feed.

3.12.2 Variables retained for analysis

Reliability analysis: Choice of coefficient

In studies using Likhert scale data, measures of internal consistency (or measurement reliability) are used to verify that questions in the questionnaire were answered consistently (Santos, 1999; Vaske, 2008). Although reliability is closely associated with validity, reliability analysis does not measure validity (Tavakol & Dennick, 2011). Validity itself is the degree to which questions accurately measure what they were originally intended to measure (Tavakol & Dennick, 2011). One of the most popular measurement tools used to determine the reliability of Likhert scale variables has been Cronbach's alpha, or simply "alpha" (Cronbach, 1951; Sijtsma,

2009). In recent literature however, criticism from statisticians regarding the ability of alpha to measure internal consistency has led researchers to find more suitable tests (e.g., Sijtsma, 2009; Peters, 2014; Trizano-Hermosilla & Alvarado, 2016; Vaske, Beaman, & Sponarski, 2017). One of the supported alternatives to alpha includes McDonald's omega (McDonald, 1981, 1999), also known simply as "omega" (Revelle & Zinbarg, 2009; Dunn, Baguley, & Brunsden, 2013; Peters, 2014). Omega is viewed as a superior test because it is not affected by many of the commonly violated assumptions that are associated with alpha (Dunn et al., 2013).

An additional benefit of choosing omega to preform reliability analysis is that the interpretation is comparable to alpha; the same subjective threshold values typically regarded as scale "quality" can be used for omega results. Alpha values between 0.70 and 0.95 are considered acceptable (Tavakol & Dennick, 2011). Tavakol and Dennick state that for alpha, values below 0.70 can indicate "…a low number of questions, poor interrelatedness between items or heterogeneous constructs" (2011).

Following the methods outlined in Dunn et al. (2013), a reliability analysis was performed with hierarchical omega in R version 3.5.1 (R Core Team, 2018) using the statistical package MBESS version 4.4.3 (Kelly, 2018). Hierarchical omega (ω_h) is known to be robust when data is not completely unidimensional, a commonly violated assumption that underlies both alpha and coefficient omega (ω) (Kelly & Pornprasertmanit, 2016; Dunn et al., 2013). There are 13 different interval type options for bootstrapping with MBESS, "mlr" being the default choice (Kelley, 2018). The bias-corrected and accelerated bootstrap confidence interval (bca) interval type was chosen instead, as it is recommended for use with hierarchical omega (Dunn et al., 2013; Kelley, 2018).

The confidence interval was set to 0.95 and the number of simulations was set to B = 10,000. The full command syntax can be found in Appendix III.

A common issue with performing reliability analysis has to do with the constructs being tested in a study (Peters, 2014); constructs such as attitude and belief are comprised of several aggregated questions with different scales. This is done so that a construct can represent and explain variation within a group of closely correlated variables. Reliability analysis requires that like-scales be tested together to ensure unidimensionality (Peters, 2014). Peters (2014) argues that in practice, unidimensional constructs are seldom feasible or practical.

The constructs "attitude and belief" and "social norm" are considered multidimensional as each is comprised of several questions with varying scales (e.g., very unlikely/very likely, definitely will not/definitely will). The construct "perceived control" is effectively considered unidimensional as all the questions used the same scale (strongly disagree/strongly agree). The last construct, "behavioural intention" is comprised of only one question and therefore a reliability test does not need to be performed.

Reliability analysis: Variables included in constructs

Multiple correlations that are too high ($\geq$ 0.9) (Garson, 2015) may indicate that questions are redundant, thereby warranting their removal. In contrast, correlations that are too low can negatively impact the validity and reliability of the construct being tested (Vaske, 2008). Vaske (2008) recommends that variables be considered for removal if correlations are under 0.40, although decisions to remove should not only be based on reliability, but also theoretical grounding. To ensure that enough variables could be retained for analysis and maintain the

validity of the constructs, correlations consistently under 0.2 and over 0.8 were considered for removal.

For attitude and belief, questions that had adequate correlations were 3a, 3b, 4a, and 4b. For social norms and perceived control, all the questions had adequate correlations. Results of the reliability analysis are presented in Chapter 4, Section 4.3.

Transforming variables: Creating constructs

For variables included in the main constructs, missing cases were replaced with the mean value of their representative subgroup. This was done to retain data that was provided by respondents and maximise the number of samples included in the study. All cases were required to have values so that the aggregated questions would not be biased towards lower values due to missing data.

For attitude and belief, 2-part questions were multiplied together to create combined scores. In total, there were 2 combined attitude and belief variables: 3ab and 4ab. These combined variables were then added together to create the construct. For social norm, 2-part questions were also multiplied together to create combined scores. In total, there were 3 variables comprised of: 13 and 14, 15 and 16, and 18 and 19. These combined variables were then added together to create the construct. Perceived control consisted of 5 questions, 20a-20e. These individual variables were added together to create the construct.

Behavioural intention was represented by question 17. A mistake was made in the formation of the original behavioural intention measure, question 23. Instead of being created as a 7-point Likert scale, question 23 was formulated as a dichotomous yes or no answer and

therefore not useable in the intended analyses. Question 17 was a less direct measure of behavioural intention, as it asked if the participant believed *they should remove* attractants, rather than if they *will remove* attractants. This less direct measure for behavioural intention increases the likelihood of hypothetical bias, which was first explained in Section 3.3. As such, there is an increased risk for discrepancy between participants' self-reported behavioural intention and their actual behaviour.

3.13 Data Analysis & Model Fit

3.13.1 Validity testing: One-way ANOVA

Each of the three bear smart messages designed for this study was meant to elicit a different emotional response from participants. To determine if each message performed as intended, a validity check was required to ensure the messages: 1) differed significantly from each other based on participants' self-reported emotional evaluation scores, and 2) the emotional evaluation scores were reflective of their intended appeals. The emotional evaluation score was the first question in the questionnaire. Participants were asked to answer this question after reviewing the bear smart message included in their respective package. The control group did not need to respond to question 1 as they did not receive a poster.

Based on the intended design of each poster, hypothesis 1 states:

H_1: There will be a significant difference in participants' emotional evaluation scores based on the type of bear smart messaging they received.

H_0: There will be no difference in participants' emotional evaluation scores based on the type of bear smart messaging they received.

The emotional evaluation question was originally a 1-7 Likert scale item from happy to sad, with neutral in the middle. This variable was re-coded to -3 to +3 for ease of interpretation. If the null hypothesis was rejected, the positive appeal message would be expected to elicit feelings of happiness, as represented by values ranging between ≥ 1 and ≤ 3. The neutral appeal message would not be expected to elicit an emotional response, which would represented by values ranging between > -1 and < 1. The negative appeal message would be expected to elicit feelings of sadness, as represented by values ranging between ≥ -1 and ≤ -3.

A one-way ANOVA was chosen to test hypothesis 1 due to its suitability with comparing three groups of a categorical, independent variable against a single continuous dependant variable. Each assumption of this test is addressed in detail at the end of this subsection. Model syntax and graphs can be found in Appendix IV.

The main F statistic for the ANOVA test was reported along with the effect size. For ANOVA tests, effect sizes are measured using partial eta squared values that are widely interpreted (e.g., Norouzaian & Plonsky, 2017) as: small = 0.01, medium = 0.06, and large = 0.14 (Cohen, 1988).

Post hoc tests were performed using Fisher's Protected Least Significant Difference (LSD) measure at the 0.05 level. The LSD coefficient was chosen because it is considered robust to unequal sample sizes and reduces the risk of type II errors (Garson, 2015). For this study, controlling for type II errors was deemed to be more important than controlling for type I errors.

In addition, Cardinal & Aitken (2006) and Howell (1997) state that using LSD when comparing three groups is appropriate when the main effect F test is significant (type I error rate is held at 5%). Authors have similarly argued that because the significant mean difference has already been established in higher level F tests, further conservative adjustments are not required (ex: SPSS Inc., 2000; Quinn & Keough, 2002). Tests that adjust significance values for the family-wise error rate are recommended for comparisons with higher numbers of groups to control for increasing type I error rates (Quinn & Keough, 2002).

Testing for assumptions

The research data was collected using methods that ensured there was an independence of observations by soliciting participation from randomly selected properties. Homeowners who were recruited to the study were randomly provided one of four survey packages, with each package representing a different treatment. A homeowner could only participate in the survey once. To test for significant outliers among the groups of the independent variable boxplots were generated based on message evaluation. The boxplots revealed that there were no outliers for each group. To check for normality among the groups of the independent variable, histograms and Q-Q Plots were visually examined in addition to calculating skewness and kurtosis.

Skewness was calculated as:

$$z = \frac{Skewness}{Standard\ Error}$$

Kurtosis was calculated as:

$$z = \frac{Kurtosis}{Standard\ Error}$$

For both skewness and kurtosis, z values within ± 2.58 represent a normal distribution with a statistical significance of 0.01 (Laerd Statistics, n.d.). All three groups had skewness/kurtosis values which resembled normality; Q-Q Plots also resembled normality. The last assumption is the presence of homogeneity of variances. This is checked by running Levene's test of equality of variances in SPSS after the one-way ANOVA model is run. Results of the Levene's test show that the assumption of homogeneity of variance was not violated (p = 0.125). Values below p = 0.05 indicate that equal variances have not been achieved (Laerd Statistics, 2017).

3.13.2 Effect of treatment: Two-way ANOVA

A two-way ANOVA model was chosen to test if bear smart messaging significantly affected participants' behavioural intentions to remove black bear attractants (hypothesis 2). In response to results of the validity testing, a new variable was created and termed "treatment". The categorical treatment variable comprised two groups: messaging and control. The control group was coded as 1 and the messaging group was coded as 2. The messaging group comprised the combined positive appeal, negative appeal, and neutral appeal.

***H_2*:** Participants who received bear smart messaging will have significantly different intentions to remove black bear attractants than those who did not receive messaging.

***H_0*:** There will be no difference in participants' intentions to remove bear attractants based on whether they received a bear smart message or not.

For the null hypothesis, it would be expected that participants who received a bear smart message would hold a higher mean score than participants who had not received a message.

The two-way ANOVA model was chosen because there were two main factors, each with two or more groups. The first main factor was treatment and the second main factor was area. Area was comprised of three groups: rural recreational, rural residential, and rural agricultural. In this model the dependant variable was behavioural intention.

Testing for assumptions

The assumptions of the two-way ANOVA were examined after the model was run. The results are presented in Chapter 4, Section 4.5. Model syntax and tables/figures associated with assumptions can be found in Appendix V.

The residuals were examined for outliers using boxplots for each subgroup in the model. Outliers were identified if they were more than one box-length away, while extreme outliers were identified and flagged if they were more than three box-lengths away. Outliers representing low behavioural intention scores were identified in three of the six subgroups. Extreme outliers representing low behavioural intention scores were identified in two of the six subgroups. Both types of outliers identified for behavioural intention were genuine values and were not the result of data entry or measurement errors. The decision was made to retain both types of outliers in the analysis. Removal of outliers would have resulted in a strong bias towards participants who only reported high intentions to remove bear attractants.

The residuals for behavioural intention were examined for normality among the treatment and area groups; histograms, Q-Q Plots, and skewness/kurtosis values were produced. Histograms showed a negative skew across all 6 subgroups. Q-Q Plots reflected this deviation from normality along with skewness/kurtosis values. To try and improve the normality of the data, a transformation was applied to behavioural intention. A logarithmic transformation was done using: $\log_{10}$(8 - behavioural intention); the 8 represents a value of one added to the highest behavioural intention score, which was 7. This transformation achieved normality of the residuals for 3 of the 6 subgroups. The three subgroups which did not achieve normality were improved. Results of the two-way ANOVA using the transformed dependant variable did not differ in regard to main interaction effects, univariate effects, or pairwise comparisons. Because there was no change in results when using the transformed dependant variable, the untransformed version of behavioural intention was used to allow for easier interpretation of results. Despite minor deviations from normality, the ANOVA test is considered to be robust when distributions are similar among groups and homogeneity of variances is attained (Quinn & Keough, 2002; Schmider, Ziegler, Danay, Beyer, & Buhner, 2010; Garson, 2012; Laerd Statistics, 2015b).

The two-way AVOVA requires that the residuals of the dependant variable be equal across all groups of the independent variables, which is known as homogeneity of variances (Laerd Statistics, 2015b). To test this, the Levene's Test of Equality of Error Variances was run. Results of the Levene's test were not significant ($p = 0.072$) and therefore homogeneity of variances was present. Homogeneity is not achieved when the Levene's test is significant ($p \leq 0.05$).

Because the group sample sizes for treatments were not equal, Type III sum of squares was preferred for significance testing, and the unweighted marginal means were reported. The Type III sum of squares is preferred over Type II sum of squares when sample sizes are not equal (Laerd Statistics, 2015b) and is the default option when running an ANOVA in SPSS.

3.13.3 Effect of area

This section is a continuation of the methods Section 3.13.2 (effect of treatment) and associated results (Chapter 4, Section 4.5). To determine if the area participants were from significantly affected their behavioural intention to remove bear attractants (hypothesis 3), results from the univariate main effect of area were examined. These results were produced when the two-way ANOVA model for hypothesis 2 was run. Results for hypothesis 3 are presented in Chapter 4, Section 4.6.

***H_3*:** The area participants are from will significantly affect their behavioural intention to remove bear attractants.

***H_0*:** The area participants are from will have no affect on their behavioural intention to remove bear attractants.

In the case of the null hypothesis being rejected, participants from recreational areas were expected to have the highest behavioural intention scores, followed subsequently by residential and agricultural areas. In this instance, post hoc tests would be performed using LSD. A rationale for choosing LSD over more conservative post hoc tests was previously addressed in Section 3.13.1. Because the group sample sizes for area were not equal, Type III sum of squares was preferred for significance testing, and the unweighted marginal means were reported.

3.13.4 Effect of area and the theory of planned behaviour

The theory of planned behaviour states that attitude and belief, social norm, and perceived control will inform behavioural intention, leading to behaviour (Ajzen, 1985, 2004). Because area was found to significantly affect participants' behavioural intentions to remove bear attractants, it was expected that area would also affect factors that lead to behavioural intention. Therefore, hypothesis 4 states:

***H_4*:** The area participants are from will significantly affect their attitude and belief, social norm, and perceived control towards bears and reducing conflict.

***H_0*:** The area participants are from will have no affect on their attitude and belief, social norm, and perceived control towards bears and reducing conflict.

Three different models were used to test this hypothesis. For the first model, a robust Welch's ANOVA was run with attitude and belief as the dependant variable. In the second model, a standard one-way ANOVA was run with social norm as the dependant variable. In the last model, a Kruskal-Wallis test was run with perceived control as the dependant variable. The model syntax and all figures/tables associated with assumptions are located in Appendix VI.

Testing for assumptions

Model 1

Histograms for the dependant variable attitude and belief were visually examined for normality and found to be negatively skewed; non-normality was confirmed by assessing Q-Q Plots and calculating skewness/kurtosis values. The shape of the distribution for each group of the dependant variable was the same. While the nonparametric Kruskal-Wallis test is the

preferred choice for violations of normality in parametric tests (Lantz, 2013), it does not perform well in situations where both nonnormality and heteroscedasticity are present (Liu, 2015). The Levene's Test of Equality of Error Variances was used to test for the presence of homogeneity. Results of this test were significant, $p < 0.001$, and therefore homogeneity of variances was not achieved; log and square root transformations were tried in an attempt to correct for heteroscedasticity and were not successful. Because equality of variances could not be achieved, a Welch's ANOVA was chosen (Ekiz & Ekiz, 2012; Grissom & Kim, 2012; Skidmore & Thompson, 2013). The decision was made to continue with this parametric test despite violations of normality because distributions were similarly skewed and sample sizes for each group in the model were large ($n \geq 90$). The ANOVA is known to be robust to deviations of normality when distributions are similar (e.g., Quinn & Keough, 2002; Vaske, 2008; Garson 2012). In addition, the central limit theorem states that "…in large samples (> 30 or 40), the sampling distribution tends to be normal, regardless of the shape of the data" (Ghasemi & Zahediasl, 2012). To increase the robustness of the model, bootstrapping was done with 10,000 iterations. The effect size for Welch's ANOVA was obtained through calculating omega squared (ω^2) (Olejnik, 2010); formula (Skidmore & Thompson, 2013):

$$\omega^2 = \frac{SS_{model} - (k-1) * (MS_{error})}{SS_{total} + MS_{error}}$$

SS_{model} is the sum of squares between groups, SS_{total} is the total sum of squares, MS_{error} is the mean square within groups, and k is the number of groups comprising the independent variable (Garson, 2012). The omega squared coefficient is considered less biased than partial eta squared (Kim, 2016) and is more appropriate to use when there is heterogeneity of variances (Grissom &

Kim, 2012; Skidmore & Thompson, 2013). Omega squared effect sizes are interpreted as small when < 0.6, medium when ≥ 0.6 to ≤ 0.15, and large when > 0.15 (Cohen, 1977, as cited in Garson, 2012). In the result of a significant F test, post hoc tests were performed using Games-Howell for unequal error variances (Garson, 2012).

Low attitude and belief scores were flagged in the data as outliers, as assessed by visually examining box plots. No outliers were removed from the data, as their absence would result in a large bias towards only highly positive scores. The inclusion of the low scores was essential for properly representing the range of range of attitudes and beliefs participants held towards bears.

Model 2

Histograms, Q-Q Plots, and skewness/kurtosis values were examined for normality. Skewness and kurtosis values were mostly acceptable, and histogram and Q-Q Plots were adequate. There were slight deviations for normality present, but this was not perceived to be an issue as the sample sizes were large and distributions similar (Quinn & Keough, 2002). The Levene's Test of Equality of Error Variances was non-significant (p = 0.322) meaning that homogeneity was achieved. No outliers were detected in the data, as assessed visually with box plots. A one-way ANOVA model was conducted. In the case of a significant F test, post hoc tests were generated based on LSD.

Model 3

Histograms, Q-Q Plots, and skewness/kurtosis values were checked for normality. Small to large deviations of normality were observed in the Q-Q Plots and values for skewness/kurtosis. Histograms showed that the data was similarly negatively skewed for each group of the

independent on the dependant variable perceived control. Results from the Levene's Test of Equality of Error Variances was non-significant (p = 0.385) meaning that homogeneity was achieved. Box Plots showed numerous outliers within each group, which were not removed to prevent a bias from occurring in the data. While an argument could continue to be made for using a parametric test, with the reasonings presented in the previous two models, the Kruskal-Wallis test was chosen instead. This non-parametric test does not require normality when homogeneity of variances is present, and it is also not affected by outliers. Because distributions of each group being tested were the same shape, it was the more logical choice to proceed with. In the case of a significant H test, Mann-Whitney U tests were conducted with Bonferroni corrections for multiple comparisons and the adjusted p-values were reported.

3.13.5 Theory of planned behaviour: Standard multiple linear regression

The theory of planned behaviour model was adapted to incorporate area (Figure 3). The inclusion of area in the model was due to the significant effect area had on each of the four main constructs. The strength of the relationship between area and each construct was determined by conducting four different standard multiple linear regression tests. Unstandardized beta (B) coefficients and adjusted R^2 values were used to interpret the relative importance of relationships and effect sizes for the first three models. In the fourth model, the standardized beta (β) coefficient was interpreted because there were variables with different scales were present in the model.

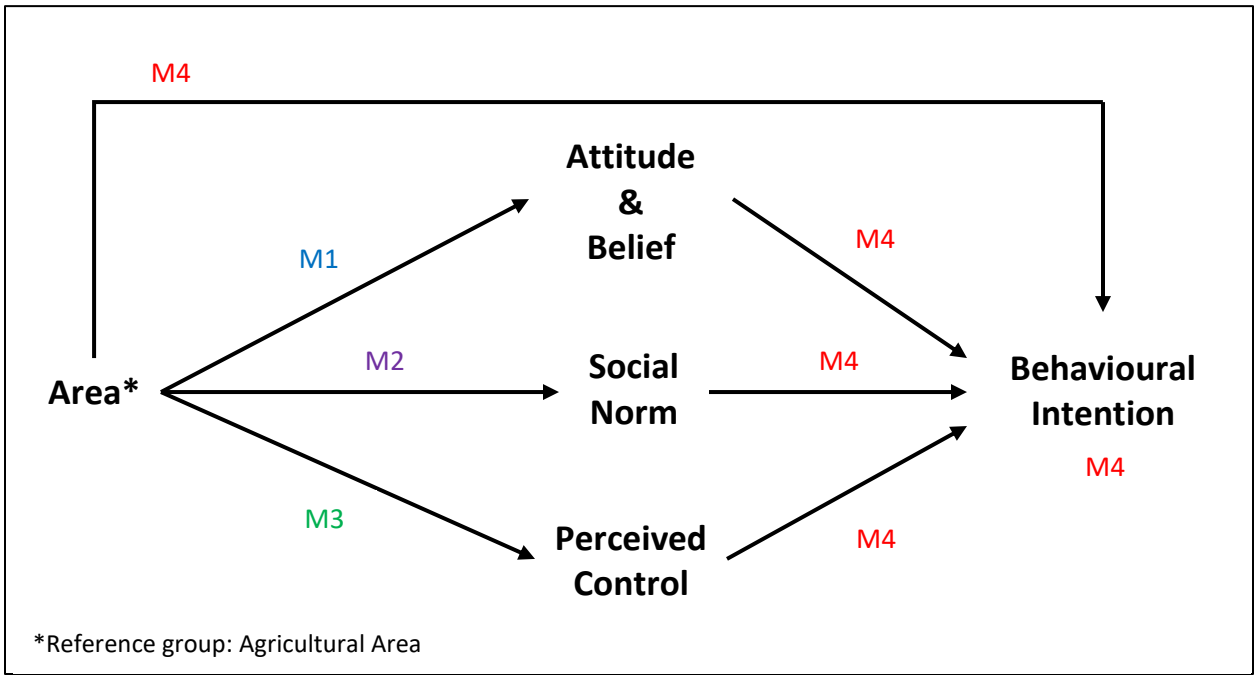

Figure 3: Theory of planned behaviour model developed by Ajzen (1985, 2004), figure and adaptations by Lynnea Parker.

The first model (M1) tested the direct relationship of the independent variable area to the dependant variable attitude and belief. Models two (M2) and three (M3) were conducted in a similar manner as the first, but with social norm (M2) and perceived control (M3) respectively acting as the dependant variable. The fourth model (M4) tested area, attitude and belief, social norm, and perceived control as independent variables and behavioural intention as the dependant variable.

Two dummy variables were created for the categorical variable area. The first dummy variable represented the rural recreational area group and the second dummy variable represented the rural residential area group. No dummy variable was created for the rural agricultural area group as SPSS is programmed to automatically detect it as a control.

Assumptions for each of the four models are addressed in the following subsections and results can be found in Chapter 4, Section 4.8. Model syntax and graphs/tables addressing assumptions for each model are located in Appendix VII.

Testing for assumptions: Standard multiple linear regression

Assumptions of standard multiple linear regression (Laerd Statistics, 2015a):

1. There are two or more independent variables that are either continuous or categorical
2. The dependant variable is continuous
3. Independence of observations (residuals)
4. Linear relationships are present between each independent variable and the dependant variable
5. Homoscedasticity of the residuals is present
6. No multicollinearity among variables
7. No significant outliers
8. Normality of the residuals

Model 1

The categorical variable for area was used to predict the dependant, continuous variable attitude and belief. Independence of observations was controlled for during data collection. The distribution of the dependant was non-normal, as assessed by examining the P-P Plot for the studentized residuals. To address this violation, a rank transformation using normal scores with Blom's proportion estimation formula was applied to attitude and belief. While a normal distribution was not achieved with this transformation, it was improved and retained for analysis. Linear regression models are known to be robust to deviations of normality, and thus the decision

was made to continue using this test (Laerd Statistics, 2015a; Garson, 2014). The presence of linearity and homoscedasticity among the variables collectively was assessed using a scatterplot with studentized residuals plotted against the unstandardized predicted values; both linearity and homoscedasticity were determined to be present. There were no multicollinearity issues, as no correlations were greater than 0.512 and the collinearity statistic had a tolerance value of 0.738; tolerance values $\leq$ 0.1 can indicate multicollinearity issues (Laerd Statistics, 2015a). There was 1 significant outlier (± 3 std) in the data, as assessed by examining the studentized deleted residuals. This outlier was retained in the analysis as it held a marginal leverage value ($\leq$ 0.007) and there was no valid reason to exclude it from the data. Sample size was *n* = 279.

Model 2

The categorical variable for area was used to predict the dependant, continuous variable social norm. There was a normal distribution among the residuals of the dependant variable, as assessed by examining a histogram and P-P Plot. There was linearity and homoscedasticity, as assessed by generating a scatterplot with residuals. There were no multicollinearity issues, as no correlations were greater than 0.512 and the collinearity statistic had a tolerance value of 0.738. There were 2 significant outliers with residuals more than -3 std. These cases were retained in the analysis as their leverage values were marginal (≤ 0.00694) and there was no valid reason to exclude them from the data. Sample size was *n* = 279.

Model 3

The categorical variable for area was used to predict the dependant, continuous variable perceived control. The distribution of the dependant was non-normal, as assessed by examining the P-P Plot for the studentized residuals. To address this violation, a rank transformation using

normal scores with Blom's proportion estimation formula was applied to perceived control. The transformation did improve normality and was retained for analysis. There was linearity and homoscedasticity, as assessed by generating a scatterplot with residuals. There were no multicollinearity issues, as no correlations were greater than 0.514 and the collinearity statistic had a tolerance value of 0.736. There was 1 significant outlier (± 3 std) in the data, as assessed by examining the studentized deleted residuals. This outlier was retained in the analysis as it held a marginal leverage value (≤ 0.007) and there was no valid reason to exclude it from the data. Sample size was n = 277.

Model 4

The transformed variables for attitude and belief and social norm were incorporated as independent variables, along with social norm, and area. The dependant variable was behavioural intention. The distribution of the residuals for the dependant variable resembled normality, and therefore no transformation was required. Linearity and homoscedasticity for relationships among variables were examined with scatterplots using studentized residuals against unstandardized predicted values. Partial regression plots were generated to assess linearity and homoscedasticity between each independent continues variable on the dependant variable. Linearity and homoscedasticity were achieved for all relationships. There were no multicollinearity issues, as no correlations were greater than 0.67 and the collinearity statistic had tolerance values between 0.639 and 0.779. There were 3 significant outliers more than -3 std away from the mean, as assessed by examining the studentized deleted residuals. These outliers were retained in the analysis as they held a marginal leverage values (≤ 0.021) and there

was no valid reason to exclude them from the data. Sample size for each variable in the model was $n = 277$.

Chapter 4: Results

4.1 Overview

Chapter 4 provides results for the summary data, the reliability analysis, each of the hypotheses, and the theory of planned behaviour. Section 4.2 presents summary results from selected questionnaire items to provide supplementary background information for the hypotheses. Section 4.3 presents the results of the reliability analysis, which was a necessary step in the development of the main constructs used for hypothesis testing. Section 4.4 presents the results of hypothesis 1, which tested if the bear smart posters were able to achieve their intended appeal strength. Section 4.5 addresses hypothesis 2, examining if behavioural intentions to remove bear attractants significantly differed based on whether or not participants received a bear smart poster. This section also tested to see if an interaction existed between the area participants were associated with and the potential effects of bear smart messaging on behavioural intentions to remove attractants. Section 4.6 pertains to hypothesis 3, which is a continuation of the previous section. Hypothesis 3 reports the impact area had on participants' behavioural intentions to remove attractants. Section 4.7 presents the results of hypothesis 4, which examined whether attitudes and beliefs towards bears, social influences to behave a certain way, and perceived control to remove bear attractants were affected by the area with which participants were associated. The last section ties the theory of planned behaviour together by presenting how much explained variation was achieved among constructs.

4.2 Public Views Towards Black Bears: Summary Results

Summary results are presented here to provide supplementary information (methods are described in Chapter 3, Section 3.11). Mean or frequency results for questionnaire items have been provided in Appendix VIII.

Demographics

138 participants identified as female and 123 as male (Q27). Participants were mostly middle-aged or older, with 129 homeowners between the ages of 26 and 60 and 134 homeowners aged 61 years or older; only 8 participants identified as young adults between the ages of 18 and 25 (Q28). Those who identified as having a rural upbringing (Q26) represented 87% (n = 84) in rural agricultural area, 75% (n = 85) in rural residential areas, and 44% (n = 87) in rural recreational areas. In rural agricultural areas and rural residential areas, the median income level was $50,000 to $74,999, whereas in rural recreational areas it was $75,000 to $99,999 (Q29, n = 192). Distributions for annual household income were found to be significantly different between area groups, $H(3) = 24.646$, $p < 0.001$. Pairwise comparisons show that rural agricultural (n = 54, mean rank = 74.66) and rural residential (n = 62, mean rank = 86.81) areas did not significantly differ ($p < 0.001$). Participants in rural recreational (n = 76, mean rank = 119.93) areas did have significantly higher incomes than those in rural agricultural areas ($p < 0.001$) and rural residential areas ($p = 0.001$).

Past experience and current intentions

44% (n = 123) of participants indicated that they had experienced conflict with bears in the past, on their own properties while 56% (n = 155) had not experienced conflict (Q21). 78% (n = 214) indicated that they had removed or secured attractants in the past to prevent conflict and

22% (n = 62) had not (Q22). 82% (n = 225) intended to remove or secure attractants to prevent conflict that year and 18% (n = 48) did not (Q23).

Of the 155 participants who had not experienced conflict with bears in the past, 72% (n = 112) had previously removed or secured attractants to prevent conflict from occurring. Of the 123 participants who had experienced conflict with bears in the past, 16% (n = 20) had not previously removed or secured attractants in the past to prevent conflict. Further, those who had experienced conflict and had not previously removed or secured attractants, 9% (n = 11) indicated that they would also not remove or secure attractants that year.

Acceptability for removing or securely storing attractants

Participants were asked to identify which common black bear attractants they would be willing to remove or securely store on their properties (question 24, Figure 4). For garbage, 16% said it was not applicable, 66% would remove or securely store it, 15% would not, and 4% were undecided (n = 245). For bird feeders, 61% of participants said they were not applicable, 26% said they would remove or securely store them, 12% would not, and 2% were undecided (n = 239). For ripe fruit from fruit trees or shrubs (e.g., apple trees), 44% said it was not applicable, 28% said they would remove or securely store ripe fruit, 22% would not, and 6% were undecided (n = 246). For barbeques, 16% said they were not applicable, 44% would remove or securely store them, 34% would not, and 6% were undecided (n = 246). Lastly, for outdoor fridges and freezers, 79% said they were not applicable, 13% said they would remove or securely store, 7% would not, and 1% were undecided (n = 243). Of the 181 of participants who indicated they would remove or secure garbage on their properties, 14% (n = 25) would not remove or secure bird feeders,

26% (n = 47) would not remove/secure ripe fruit from trees or shrubs, and 36% (n = 65) would not remove/secure barbeques.

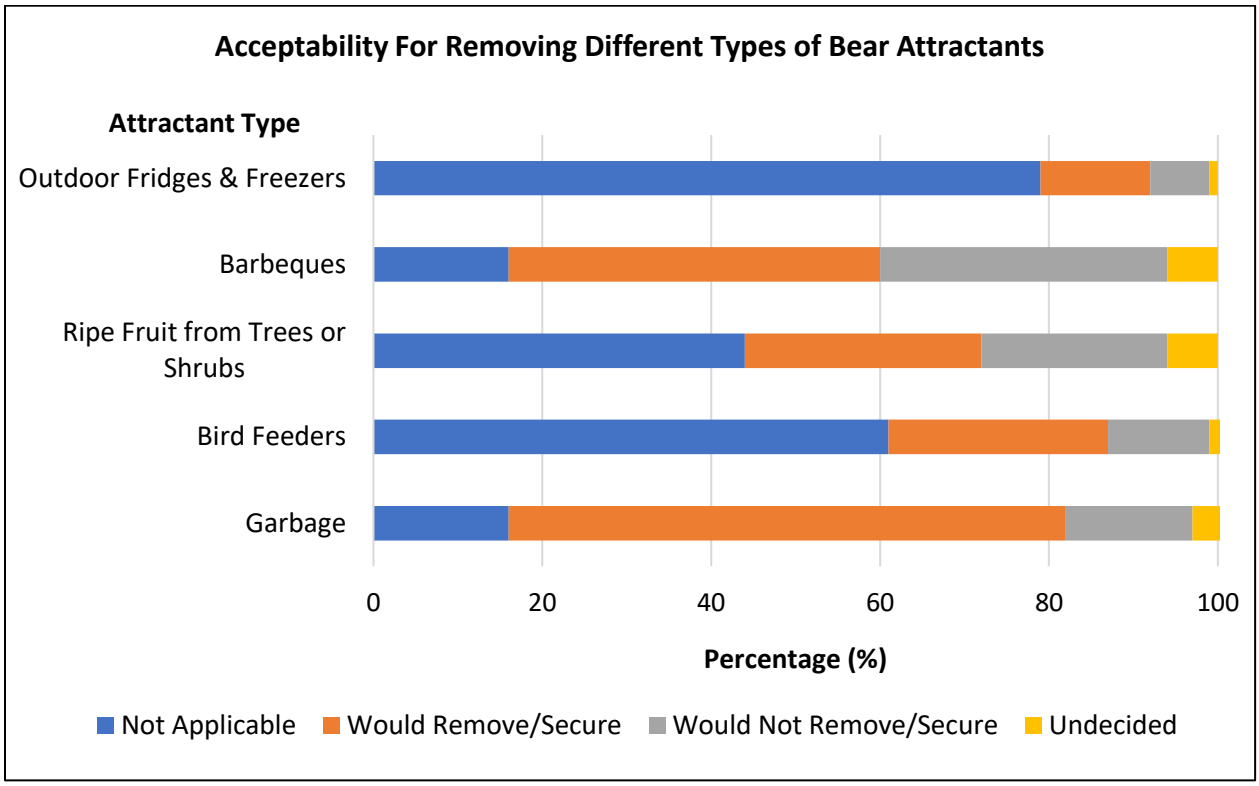

Figure 4: Acceptability scores, in percentages, for removing 5 common types of bear attractants.

The different types of attractant categories were further examined to see if participants were more willing to remove certain types over others. Results showed that homeowners' willingness to remove or securely store attractants did significantly differ by attractant type, Wald $\chi 2 = (4, N = 659) = 77.555$, $p < 0.001$. Parameter estimates from the Generalized Estimating Equations showed that participants were significantly more willing to remove or securely store garbage and bird feeders than they were barbeques, ripe fruit from trees and shrubs, and fridges and freezers (Tables 2, 3, 4). Participants' willingness to remove or securely store attractants such as barbeques, ripe fruit from trees and shrubs, and fridges and freezers did not significantly differ.

Table 2: Differences in homeowner willingness to remove or securely store different types of common black bear attractants in Manitoba, (2016) using barbeques as a reference category.

Attractant Type	B	SE B	CI Lower	CI Upper	Wald χ2	*p*
Intercept	0.251	0.1455	-0.034	0.536	2.984	0.084
Bird Feeders	0.714	0.2504	0.223	1.205	8.126	0.004
Fridges & Freezers	-0.040	0.3492	-0.724	0.644	0.013	0.909
Ripe Fruit from Trees and Shrubs	0.027	0.2130	-0.391	0.444	0.016	0.900
Garbage	2.750	0.3570	2.050	3.450	59.339	< 0.001

B = Beta, SE B = standard error for beta, CI = 95% Wald confidence interval, Wald χ2 = Wald Chi-Square test statistic, *p* = significance value (determined at $p < 0.05$).

Table 3: Differences in homeowner willingness to remove or securely store different types of common black bear attractants in Manitoba, (2016) using ripe fruit from trees and shrubs as a reference category.

Attractant Type	B	SE B	CI Lower	CI Upper	Wald χ2	*p*
Intercept	0.278	0.1821	-0.079	0.635	2.334	0.127
Bird Feeders	0.687	0.2428	0.211	1.163	8.001	0.005
Fridges & Freezers	-0.067	0.3671	-0.786	0.653	0.033	0.855
Barbeques	-0.027	0.2130	-0.444	0.391	0.016	0.900
Garbage	2.723	0.3953	1.948	3.498	47.460	< 0.001

B = Beta, SE B = standard error for beta, CI = 95% Wald confidence interval, Wald χ2 = Wald Chi-Square test statistic, *p* = significance value (determined at $p < 0.05$).

Table 4: Differences in homeowner willingness to remove or securely store different types of common black bear attractants in Manitoba, (2016) using fridges and freezers as a reference category.

Attractant Type	B	SE B	CI Lower	CI Upper	Wald χ2	*p*
Intercept	0.211	0.3263	-0.428	0.851	0.419	0.517
Bird Feeders	0.754	0.3578	0.053	1.455	4.438	0.035
Ripe Fruit from Trees and Shrubs	0.067	0.3671	-0.653	0.786	0.033	0.855
Barbeques	0.040	0.3492	-0.644	0.724	0.013	0.909
Garbage	2.790	0.3759	2.053	3.527	55.098	< 0.001

B = Beta, SE B = standard error for beta, CI = 95% Wald confidence interval, Wald χ2 = Wald Chi-Square test statistic, *p* = significance value (determined at $p < 0.05$).

Attitudes and beliefs and social norms for removing or securing attractants

When participants were asked if removing or securing known attractants from their properties would reduce conflict with bears (Q3a), 93% agreed, 3% disagreed, and 4% were uncertain (n = 277). Further, when asked if it would improve black bear conservation (Q4a), 85% agreed, 5% disagreed, and 9% were uncertain (n = 276). When asked if it would prevent bears from becoming habituated and food conditioned (Q5a), 69% agreed, 26% disagreed, and 5% were uncertain (n = 277). 90% of participants believed that they had a personal responsibility to ensure that bears did not develop nuisance behaviours on their property (Q18), while only 6% disagreed and 5% were uncertain (n = 279). Similarly, 87% believed their neighbours had the same personal responsibility (Q19), while 4% did not, and 8% were uncertain (n = 279).

Perceived control to remove or secure black bear attractants

Questions were asked to assess possible inhibiting factors that homeowners might have had in removing or securing attractants. 76% of participants felt that they had the financial means to remove or secure attractants (Q20a), while 8% did not and 16% were uncertain (n = 278). When asked if they were physically capable (Q20b), 85% agreed, 5% disagreed, and 10% were uncertain (n = 277). When asked if they had the time, 82% agreed, 6% disagreed, and 12% were uncertain (n = 277). When asked if removing or securing attractants was their decision to make, 76% agreed, 13% disagreed, and 12% were uncertain (n = 278). Lastly, when asked if they knew how to remove or securely store attractants 92% agreed, 2% disagreed, and 6% were uncertain (n = 278).

Attitudes and beliefs towards black bears and conflict management methods

96% of participants believed that living in proximity to Riding Mountain National Park increased their contact with nature and wildlife (Q8a), while only 2% disagreed and 3% were uncertain (n = 279). In turn, 91% believed that their contact with nature and wildlife was good (Q8b), while only 1% thought it was bad and 8% were neutral (n = 277). When specifically asked if participants enjoyed seeing black bears (Q11), 89% agreed, 6% disagreed, and 5% were uncertain (n = 279). To follow up with question 11, participants were asked if they were afraid of black bears (Q12) and 62% indicated that they were afraid, while 29% were not afraid, and 9% were undecided (n = 278).

To assess public perceptions towards typical conflict management methods, participants were asked if they believed nuisance black bears were killed (Q6a). 71% did believe that nuisance bears were killed, 19% thought that they were not killed, and 11% were uncertain (n = 275). In turn, 45% thought that killing nuisance black bears was bad (Q6b), while 28% it was good, and 27% held neutral opinions (n = 274). When asked if black bears in residential areas should be trapped and relocated (Q7a), 75% of participants were supportive, 13% were unsupportive, and 12% were neutral (n = 276). When asked if habituated and/or food conditioned bears in their neighbourhood were a public safety concern (Q9a), 71% agreed, 15% disagreed, and 14% were uncertain (n = 278). Alternatively, when asked if bears exhibiting natural behaviours, and were not a nuisance, were a public safety concern (Q10a), 16% agreed, 70% disagreed, and 14% were uncertain (n = 275).

4.3 Reliability Analysis: Hierarchical Omega

Using methods described in Chapter 3, Section 3.12.2, reliability analysis results are reported for each construct. For hierarchical omega, coefficient scores above 0.8 are considered ideal for achieving internal-consistency among scale items included in a construct (Webb, Shavelson, & Haertel, 2006; Schumacker, 2010); Scores between 0.7 and 0.8 are considered sufficient for exploratory research (Schumacker, 2010). Attitude and belief, social norm, and perceived control had acceptable reliability scores (Table 5).

Table 5: Reliability scores for scale items included in the theory of planned behaviour constructs.

Construct	ω_h	SE	CI Lower[1]	CI Upper[1]
Attitudes and Beliefs	0.709	0.048	0.596	0.788
Social Norms	0.811	0.033	0.757	0.854
Perceived Control	0.806	0.029	0.744	0.857

[1] 95% confidence interval; ω_h =hierarchical omega coefficient

4.4 Validity Testing: One-way ANOVA

Using methods described in Chapter 3, Section 3.13.1, results of the one-way ANOVA test showed that hypothesis 1 was supported; there was a statistically significant difference in participants' emotional evaluation scores based on the type of bear smart message they received, $F(2, 201) = 3.701$, $p = 0.026$, partial $\eta 2 = 0.036$. The impact of messaging appeals on participants' emotional evaluation scores was small (Figure 5). Participants in the negative appeal group (M = 0.266, SD = 1.586) had a lower emotional evaluation score than those from the neutral appeal group (M = 0.757, SD = 1.237), a significant mean difference of -0.491, 95% CI [-0.950, -0.033], $p = 0.036$. Participants in the negative appeal group also had a lower emotional

evaluation score than those from the positive appeal group (M = 0.879, SD = 1.259), a significant mean difference of -0.613, 95% CI [0.142, 1.085], p = 0.011. There was no significant difference between the emotional evaluation scores of the positive appeal group and the neutral appeal group based on a mean difference of 0.122, 95% CI [-0.333, 0.577], p = 0.597.

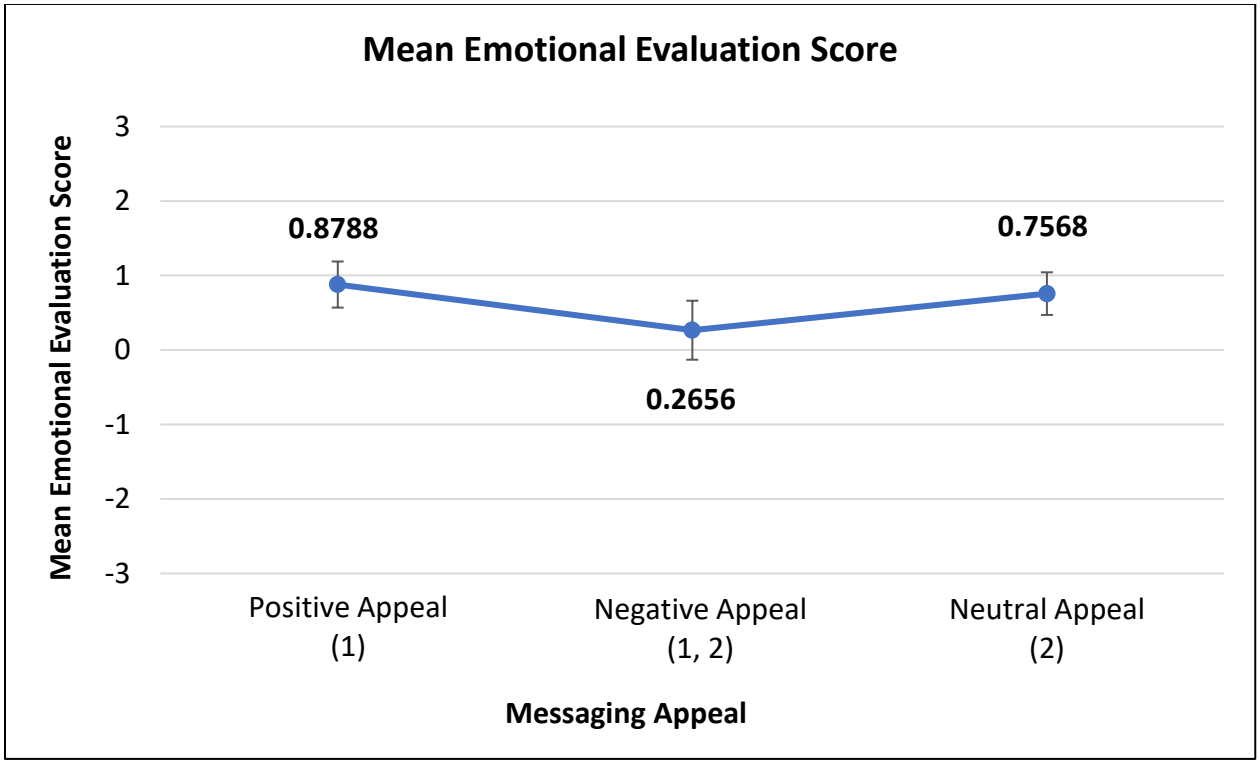

Figure 5: Mean emotional evaluation scores for each bear smart poster, including 95% confidence intervals. Significant group differences (p < 0.05) have the same label number.

The mean scores for each group fell within one point of neutrality. Despite significant mean differences being detected, the positive and negative posters did not elicit their intended emotional appeal strengths. While the null hypothesis was initially rejected, the small effect size between groups and the neutral reception of each bear smart messaging poster warranted their amalgamation into one group called “treatment” for subsequent hypothesis testing.

4.5 Effect of Treatment: Two-way ANOVA

Hypothesis 2 was tested using methods outlined in Chapter 3, Section 3.13.2. Results for the subjects between-effects test showed no significant interaction between area and treatment, $F(2, 273) = 0.995$, $p = 0.371$, partial $\eta 2 = 0.007$ (Figure 6, Table 6), and no main effect of treatment on behavioural intention, $F(1, 273) = 0.932$, $p = 0.335$, partial $\eta 2 = 0.003$ (Figure 7, Table 7). As there was no significant difference between the control group and the treatment group on participants' behavioural intentions to remove bear attractants, hypothesis 2 was not supported. The main effect of area pertains to hypothesis 3 and will be reported in the following section.

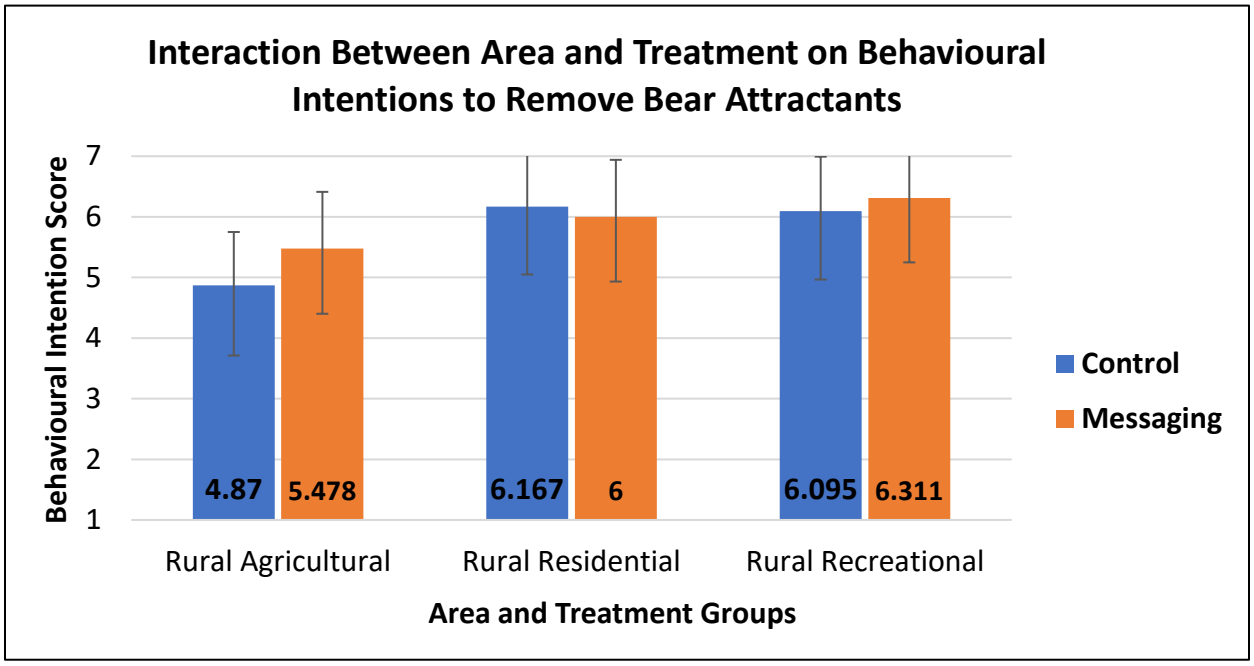

Figure 6: Mean behavioural intention scores for the interaction between area and treatment groups, including 95% confidence intervals.

Table 6: Mean estimates for the interaction between the groups of treatment and area based on behavioural intention scores.

Treatment Group	Area Group	Mean*	Std. Error	95% Confidence Interval	
				Lower	Upper
Control	Rural Agricultural	4.870	0.339	4.203	5.536
	Rural Residential	6.167	0.332	5.514	6.819
	Rural Recreational	6.095	0.354	5.397	6.793
Treatment	Rural Agricultural	5.478	0.198	5.087	5.868
	Rural Residential	6.000	0.194	5.618	6.382
	Rural Recreational	6.311	0.189	5.939	6.683

*Estimated marginal means

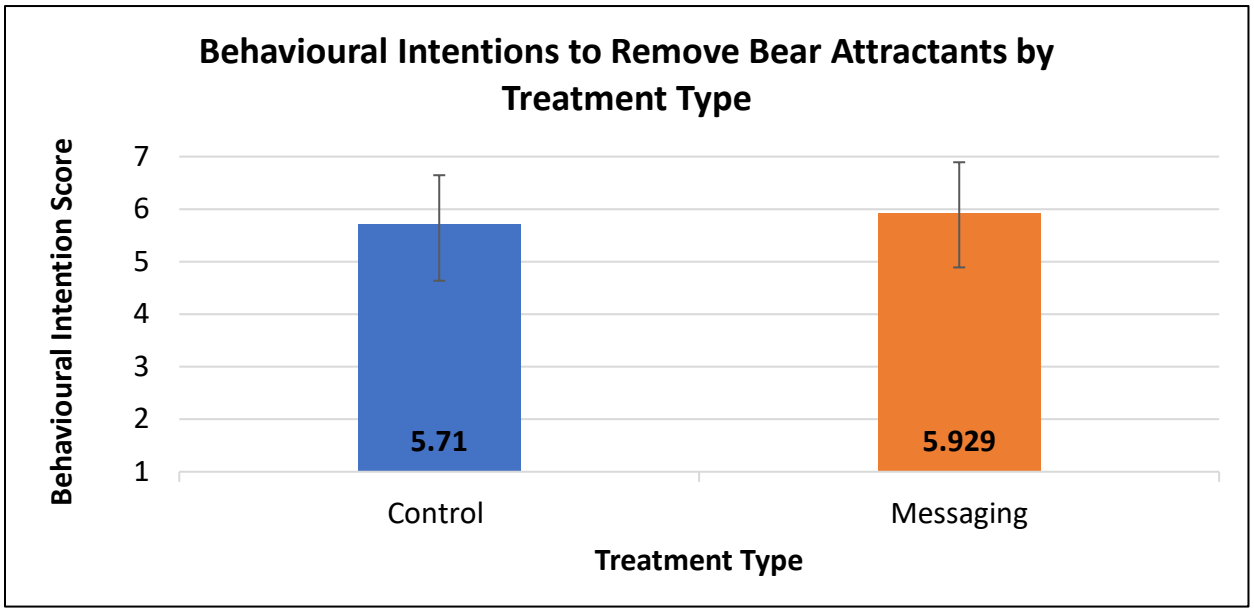

Figure 7: Mean behavioural intention scores to remove black bear attractants for treatment and no treatment (control) groups, including 95% confidence intervals.

Table 7: Mean estimates for treatment and no treatment (control) based on behavioural intention scores.

Construct	Group	Mean*	Std. Error	95% Confidence Interval	
				Lower	Upper
Treatment	Control	5.710	0.197	5.322	6.099
	Messaging	5.929	0.112	5.709	6.150

*Estimated marginal means

4.6 Effect of Area

The results presented in this section are a continuation of the two-way ANOVA model which was conducted for hypothesis 2 (Chapter 3, method Section 3.13.2 and Chapter 4, result Section 4.5). The univariate effects of area are reported for hypothesis 3. Methods specific to this hypothesis can be located in Chapter 3, Section 3.13.3.

Area was found to have a significant small-medium effect on participants' behavioural intention to remove bear attractants, $F(2, 273) = 8.181$, $p < 0.001$, partial $\eta 2 = 0.057$. Reporting pairwise comparisons, the estimated marginal mean score for behavioural intention in rural recreational areas (M = 6.203, *SE* = 0.201) was higher than in rural agricultural areas (M = 5.174, *SE* = 0.196), a significant mean difference of 1.029, 95% CI [0.477, 1.582], $p < 0.001$ (Figure 8). The score for behavioural intention in rural residential areas (M = 6.083, *SE* = 0.192) was also higher than in rural agricultural areas, a significant mean difference of 0.910, 95% CI [0.369, 1.450], $p = 0.001$. There was no significant difference in behavioural intention score between rural recreational and rural residential areas, 0.120, 95% CI [-0.427, 0.667], $p = 0.667$. As participants' behavioural intentions were found to significantly differ based on the area they were from, hypothesis 3 was supported.

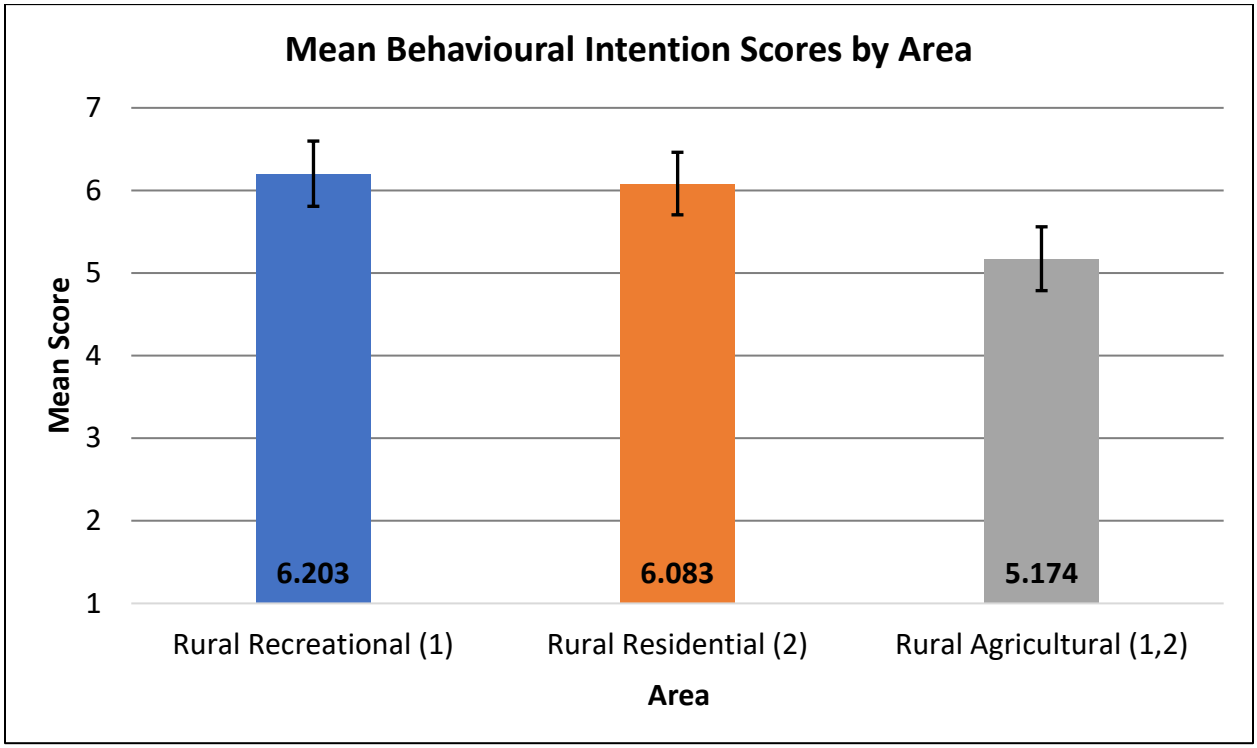

Figure 8: Mean behavioural intention scores to remove black bear attractants by area, including 95% confidence intervals. Significant group differences ($p < 0.05$) have the same label number. Scale is 1 (strongly disagree) to 7 (strongly agree).

4.7 Effect of Area and the Theory of Planned Behaviour

Hypothesis 4 was tested using methods outlined in Chapter 3, Section 3.13.4.

Model 1: Independent Variable: Area, Dependant: Attitude and Belief

The Robust Tests of Equality of Means produced results for Welch's ANOVA. The main F test showed that the area did have a significant effect on participants' attitudes and beliefs toward black bears, *Welch's* $F(2, 160.805) = 16.325$, $p < 0.001$. Area explained 7.9% of the explained variation in attitude and belief, a medium effect size, which was calculated as:

$$\omega^2 = \frac{10461.630 - (3-1) * (403.560)}{121844.304 + 403.560} = \frac{9654.51}{122247.864} = 0.079$$

Post hoc tests revealed that participants from rural recreational areas (M = 92.244, SD = 11.549) had significantly more positive attitude and belief scores than participants from rural residential areas (M = 83.877, SD = 22.702), a mean difference of 8.366, 95% CI [2.149, 14.584], $p = 0.005$ (Figure 9). Participants from rural recreational areas also held higher attitude and belief scores than those from rural agricultural areas (M = 77.250, SD = 23.918), a mean difference of 14.994, 95% CI [8.387, 21.600], $p < 0.001$. There was no significant mean difference in attitudes and beliefs towards black bears between rural residential and rural agricultural areas, 6.627, 95% CI [-1.504, 14.759], $p = 0.134$.

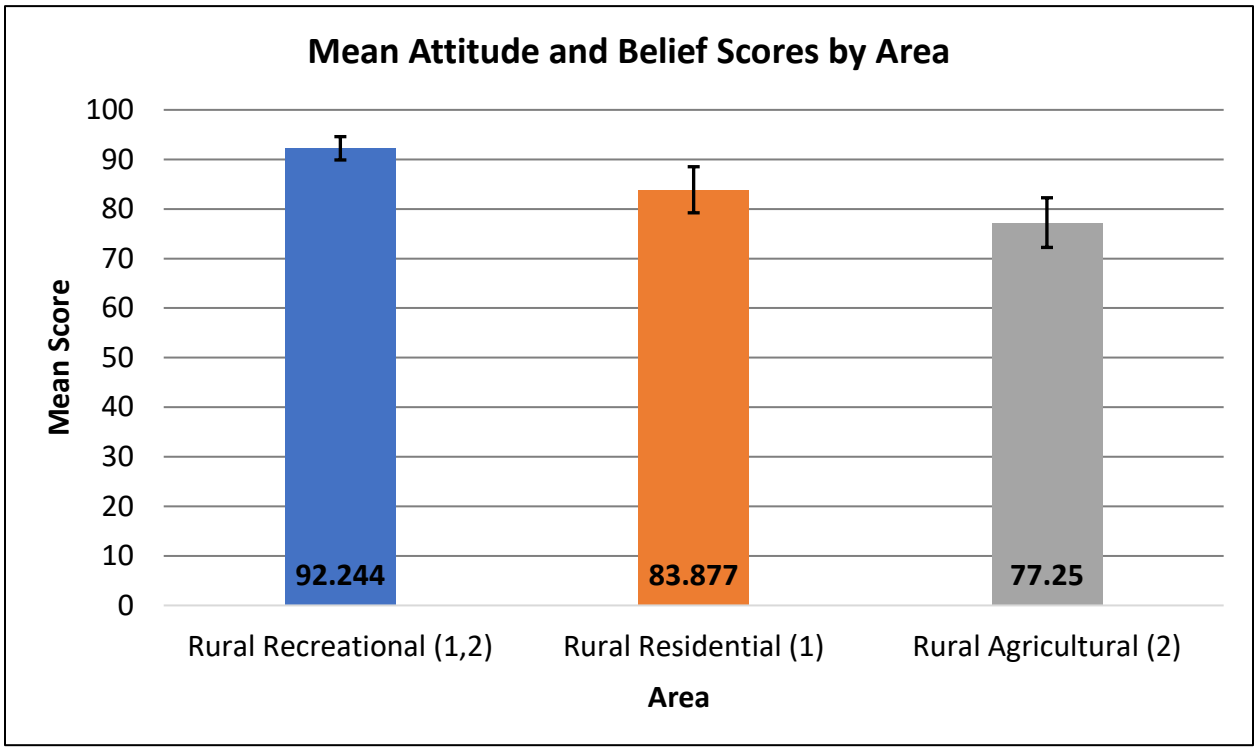

Figure 9: Mean scores for attitude and belief by area, including 95% confidence intervals. Significant mean differences ($p < 0.05$) have the same label number. Minimum score = 9, maximum score = 98.

Model 2: Independent Variable: Area, Dependant: Social Norm

Area had a significant, medium effect size on social norm, explaining 8.9% of the variation, $F(2, 276) = 13.548$, $p < 0.001$, partial $\eta 2 = 0.089$. Post hoc tests revealed that participants from rural recreational areas (M = 108.966, SD = 34.363) held higher mean scores for social norm than those from rural residential areas (M = 98.723, SD = 35.096), a mean difference of 10.242, 95% CI [0.5430, 19.9418], $p = 0.039$ (Figure 10). Participants from rural recreational areas also held higher mean scores than those from rural agricultural areas (M = 83.172, SD = 31.633), a mean difference of 25.793, 95% CI [15.986, 35.601], $p < 0.001$. Participants from rural residential areas also held higher mean scores than those from rural agricultural areas, a mean difference of 15.551, 95% CI [5.719, 25.384], $p = 0.002$.

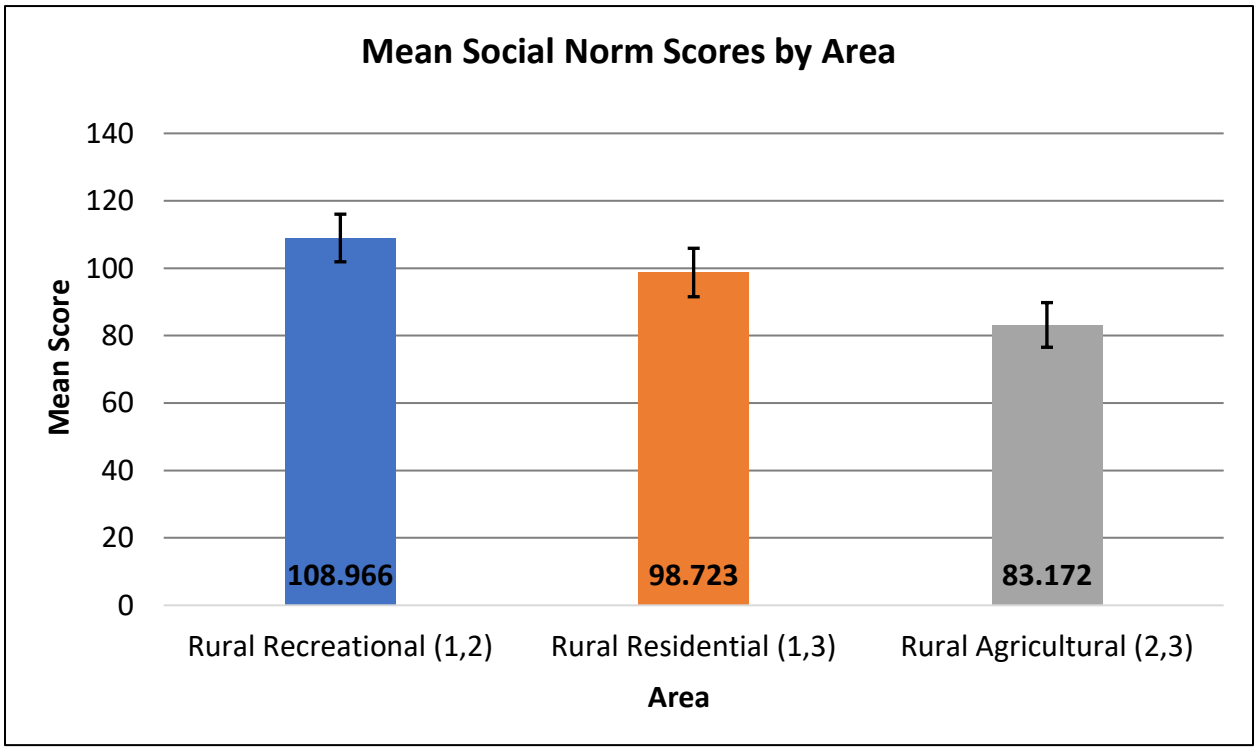

Figure 10: Mean scores for social norm by area, including 95% confidence intervals. Significant mean differences ($p < 0.05$) have the same label number. Minimum score = 4, maximum score = 147.

Model 3: Independent Variable: Area, Dependant: Perceived Control

Area was found to have a significant effect on the amount of perceived control homeowners felt they had over removing or securing black bear attractants on their own properties, H(2) = 12.928, p = 0.002. Post hoc tests revealed a significant difference in scores for perceived control between rural agricultural areas (Mdn = 29.00) and rural residential areas (Mdn = 32.00) (p = 0.030) (Figure 11). There was also a significant difference in scores between rural agricultural areas and rural recreational areas (Mdn = 33.00) (p = 0.002). There was no difference in scores for perceived control between rural residential areas and rural recreational areas (p = 1.00).

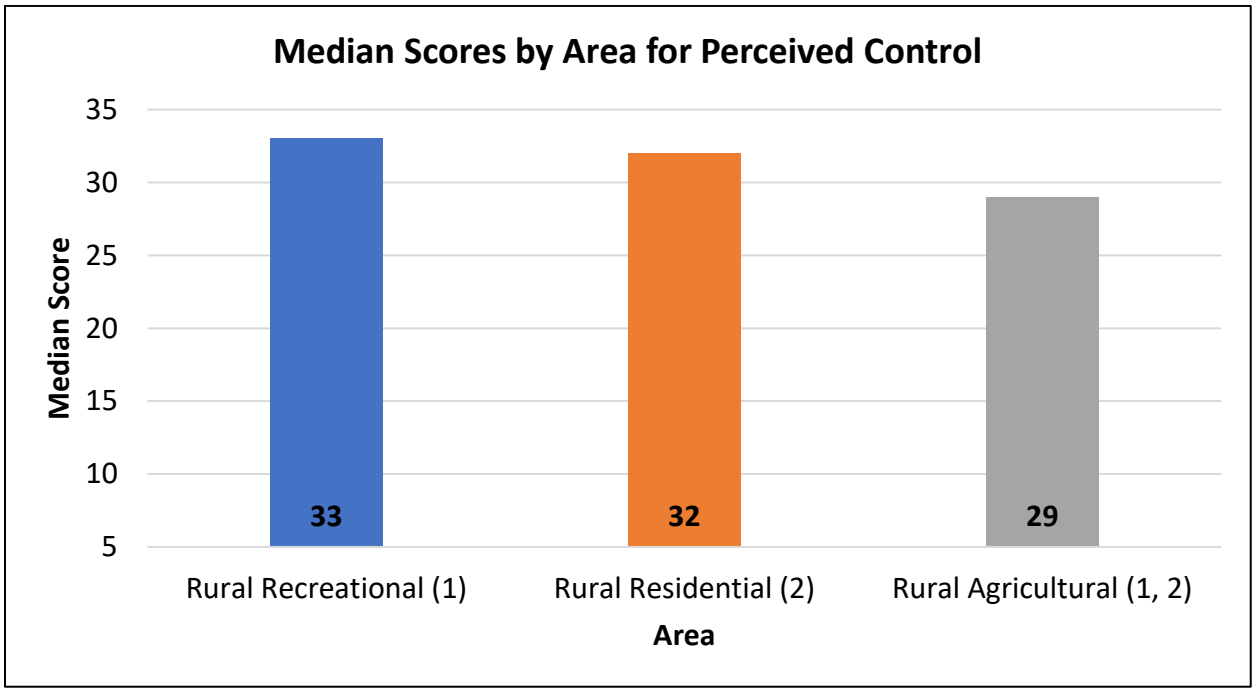

Figure 11: Median scores for perceived control by area. Significant median differences (p < 0.05) have the same label number. Minimum score = 5, maximum score = 35.

Hypothesis 4 was supported as significant effects of area were found for attitude and belief (Model 1), social norm (Model 2), and perceived control (Model 3).

4.8 Theory of Planned Behaviour: Standard Multiple Regression

A series of four multiple linear regression tests were performed in SPSS 24 using methods described in Chapter 3, Section 3.13.5.

Model 1: The area participants were associated with significantly predicted 8.4% of the attitudes and beliefs participants held towards black bears and reducing conflict, $F(2, 276) = 13.745$, $p < 0.001$, Adj. $R^2 = 0.084$ (Table 8).

Table 8: Multiple linear regression results showing the relationship between area groups and homeowner attitudes and beliefs towards black bears.

Variable	B	SE B	β	t	p
Constant	-0.366	0.083		-4.403	< 0.001
Residential Area	0.276	0.116	0.159	2.378	0.018
Recreational Area	0.607	0.116	0.350	5.231	< 0.001

B = unstandardized beta, SE B = standard error for the unstandardized beta, β = standardized beta, t = test statistic, p = probability value.

Model 2: The area participants were associated with significantly predicted 8.3% of the social normative influence participants felt from family and neighbours to remove black bear attractants, $F(2, 276) = 13.548$, $p < 0.001$, Adj. $R^2 = 0.083$ (Table 9).

Table 9: Multiple linear regression results showing the relationship between area groups and the social normative influences homeowners felt from family and neighbours to remove black bear attractants.

Variable	B	SE B	β	t	p
Constant	83.172	3.570		23.298	< 0.001
Residential Area	15.551	4.995	0.208	3.114	0.002
Recreational Area	25.793	4.982	0.346	5.178	< 0.001

B = unstandardized beta, SE B = standard error for the unstandardized beta, β = standardized beta, t = test statistic, p = probability value.

Model 3: The area participants were associated with significantly predicted 3.4% of the perceived control participants felt they had over removing or securely storing bear attractants on their own property, $F(2, 274) = 5.870$, $p = 0.003$, Adj. $R^2 = 0.034$ (Table 10).

Table 10: Multiple linear regression results showing the relationship between area groups and the level of perceived control homeowners felt they had towards removing and/or securing black bear attractants.

Variable	B	SE B	β	t	p
Constant	-0.296	0.093		-3.180	0.002
Residential Area	0.315	0.130	0.167	2.419	0.016
Recreational Area	0.431	0.130	0.229	3.325	0.001

B = unstandardized beta, SE B = standard error for the unstandardized beta, β = standardized beta, t = test statistic, p = probability value.

Model 4: When all variables were included in the model, two predictors explained 47.6% of the variation in behavioural intentions to remove bear attractants, $F(5, 271) = 49.190$, $p < 0.001$, Adj. $R^2 = 0.476$. Social norms explained most of the variation in behavioural intention, followed by attitude and belief. Area and perceived control did not significantly predict behavioural intention to remove attractants when all other independent variables in the model were controlled for (Table 11, Figure 12).

Table 11: Standard multiple linear regression results showing the relationship between predictor variables included in the theory of planned behaviour (Ajzen, 1985, 2004) and the dependant variable behavioural intention when area is also included as a predictor variable.

Variable	B	SE B	β	*t*	*p*
Constant	3.198	0.261		12.263	< 0.001
Residential Area	0.171	0.185	0.049	0.926	0.355
Recreational Area	-0.010	0.193	-0.003	-0.054	0.957
Perceived Control	0.081	0.093	0.043	0.868	0.386
Attitude and Belief	0.341	0.102	0.168	3.358	0.001
Social Norm	0.027	0.002	0.580	11.127	< 0.001

Notes: B = unstandardized beta, SE B = standard error for the unstandardized beta, β = standardized beta, *t* = test statistic, *p* = probability value.

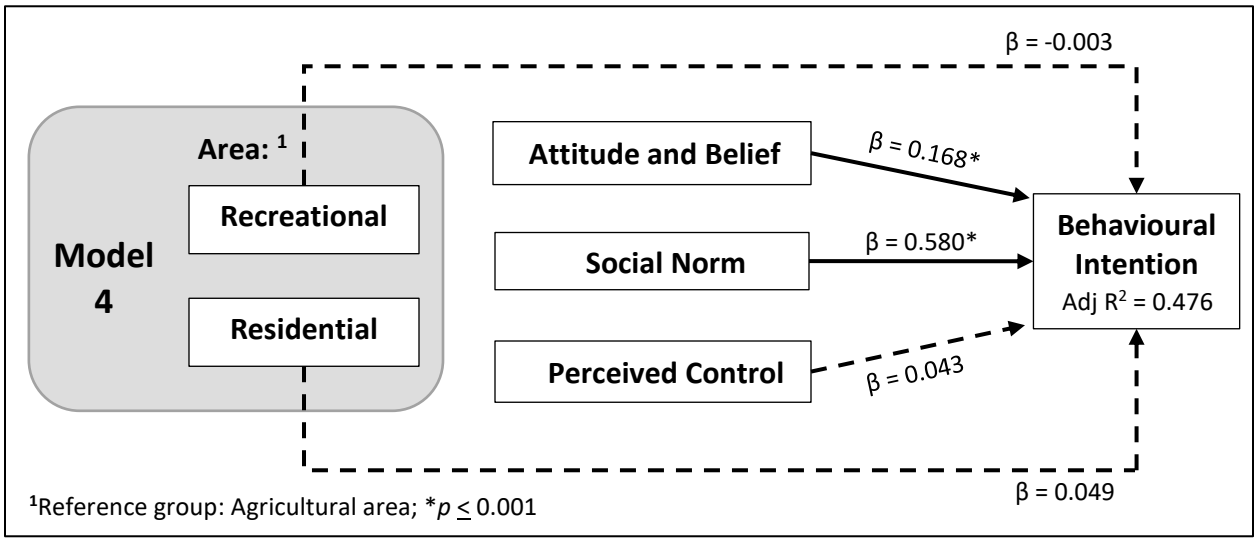

Figure 12: The relationship between predictor variables included in the theory of planned behaviour (Ajzen, 1985, 2004) and the dependant variable behavioural intention when area is also included as a predictor variable. Figure and theory of planned behaviour model adaptations by Lynnea Parker. β = Standardized coefficient beta. Solid line = significant relationship ($p < 0.015$), broken line = non-significant relationship ($p > 0.05$).

Chapter 5: Discussion

5.1 Overview

Chapter 5 is a discussion of the main research results which were presented in the previous chapter. In Section 5.2, the summary data is first discussed to provide a background on participant demographics and overall perceptions of black bears and bear smart programming. The discussion of the summary data is meant to provide readers with an understanding of the attitudes and beliefs, social norms, perceived control, and behavioural intentions of participants before discussing results of the main research findings. Section 5.3 pertains to the results of hypothesis 1 and 2, examining the use of bear smart messaging with homeowners in the study. The discussion regarding the validity of the bear smart messages (hypothesis 1) explains why participants could have perceived the positive and negative appeal posters as neutral. Possible reasons for why bear smart messaging, in general, was not found to affect participants' behavioural intention to remove or secure bear attractants (hypothesis 2) is explored. Section 5.4 pertains to the results of hypothesis 3 and 4, addressing the effects of area on participant attitudes and beliefs, social norms, perceived control, and behavioural intention to remove or securely store attractants. Section 5.5 provides an assessment of the theory of planned behaviour model. The constructs that significantly contributed to the model are discussed, as are the potential reasons why some constructs were not found to contribute. Limitations of the study are specified in Section 5.6 along with how each limitation may have affected the scope and outcomes of the research. The limitations section also includes ways that future researchers can avoid some of the drawbacks that were encountered. The conclusion is presented in the final

chapter and summarizes the main research outcomes and states recommendations for future research, bear smart programs, and addressing conflict within the study region.

5.2 Public Views Towards Black Bears

There was a good ratio of females and males who participated in the study, minimizing the potential for gender-biased results. Authors have previously found that attitudes towards wildlife and the acceptability of management practices can differ based on sex (e.g., Agee & Miller, 2009; Campbell & Lancaster, 2010; Campbell, 2013) and age (Campbell, 2013). The age class distribution was skewed towards older generations, with only 8 participants belonging to the young adult category. This was not entirely unexpected, as the average age of first-time home buyers in Canada in 2016 was 36 years old (Brookes, 2017). As this study pertained solely to homeowners and not the wider population, the lack of representation for young adults is not thought to impact results. The annual median household income was higher in rural recreational areas than in rural agricultural and rural residential areas. Income levels were expected to differ between participants who lived year-round in rural areas as opposed to those who only visited seasonally for recreational purposes. It was speculated that those who owned recreational properties would need to have higher annual incomes in order to afford them. This expectation was also derived from the fact that rural/urban income disparities are present across Canada, including Manitoba (Singh, 2002). Those with an urban upbringing were the majority in rural recreational areas as opposed to a rural upbringing being the majority in both rural agricultural and rural residential areas.

Summary results regarding attitudes and beliefs toward black bears and conflict management options indicate that homeowners are aligned with values portrayed by bear smart programs. Participants recognized that habituated and food conditioned bears were a public safety concern and were supportive of changing human behaviour to reduce or prevent conflict. Participants were found to intrinsically value bears and there was a low social acceptance for killing nuisance bears. This result is in line with the literature, where studies have shown that as intrinsic values towards wildlife increase, the acceptability of using lethal control methods tends to decline (Manfredo et al., 2009).

The majority of homeowners in this study had previously removed attractants to prevent conflict with bears, even if they had never directly experienced issues with bears. This suggests that most homeowners had engaged in bear smart behaviours before this study took place. Further, the majority of participants also indicated that they would remove attractants that summer. When examined at a narrower scale, the willingness of homeowners to remove or secure specific types of attractants was variable. Attractants such as garbage and bird feeders were considered to be more socially acceptable to address than ripe fruit, barbeques, and outdoor fridges and freezers. Within the study area, unsecured garbage and ripe fruit from fruit trees and gardens are some of the primary attractants initiating conflict between homeowners and black bears (MBSD, 2017).

A reason why garbage was considered to be an acceptable attractant to store, while ripe fruit was not, is thought to relate to perceived risk. The two main components of risk are 1) the likelihood of a negative event occurring and 2) the severity of the negative event when it does occur (Pligt, 1998). A damaged shed and strewn waste across a homeowner's yard from a bear

obtaining garbage may be easier to recognize as a negative event than apples disappearing from a tree. Low levels of perceived risk regarding ripe fruit may lead some homeowners to feel less obligated to maintain their trees and gardens; the presence of ripe fruit however can still draw bears into communities and generate public safety concerns (MBSD, 2017). For barbeques, the perceived risk may be low because food is not generally left on the grill after cooking; the potential smell factor and food residues associated with barbeques might not be taken into consideration. Low levels of perceived risk, combined with little to no prior negative experiences with black bears, may generate little incentive to change behaviour with some homeowners.

In 2009, Siemer et al. published a study titled "Factors that influence concern about human-black bear interactions in residential settings". In their study, Siemer et al. found that "…value orientations and personal experience related to black bear presence contribute[d] more toward concern and sensitivity to bear interactions than exposure to print media about bears." (2009, p. 11). This statement suggests that a homeowner's behavioural intention is largely driven by direct personal experiences with bears rather than the potential influences of bear smart messaging. Results of this study have alternatively shown that many homeowners had removed or secured attractants without needing to experience prior conflict with bears. It is plausible that public awareness has indeed been successful with increasing risk perception and encouraging the voluntary removal of attractants with some homeowners, but not for all. For those who cannot be persuaded by messaging, directly experiencing conflict might be an unfortunate but necessary prerequisite for changing behaviour.

Despite variability in homeowner willingness to remove or securely store specific attractants, most participants held high self-efficacy scores; they thought that removing or

securing attractants would prevent conflict and would improve black bear conservation. Evidence for the establishment of social norms in favour of bear smart behaviours was strong, as almost all participants not only believed they had a personal responsibility to prevent conflict, but that their neighbours did as well. Measures for perceived control showed that participants felt confident that they knew how to remove attractants and also had the resources to do so.

5.3 Bear Smart Messaging

Validity of the bear smart messaging appeals

When the three types of bear smart posters were used with homeowners near Riding Mountain National Park, the positive and negative appeals did not perform as intended. Results showed that the mean scores for all groups were within one point of neutrality in the positive direction. This result was not ideal, as the positive appeal was supposed to elicit strong feelings of happiness and the negative appeal to elicit strong feelings of sadness. Despite the neutral reception of each poster, significant mean differences were detected. The negative appeal was half a point lower than the neutral appeal, and just over half a point lower than the positive appeal. This demonstrates that the negative appeal was perceived as being slightly more neutral than both the neutral appeal and positive appeal. The minimal effect sizes between the groups warranted their amalgamation into one treatment group in subsequent hypothesis testing. No conclusions could be drawn about the potential impacts of emotion on factors influencing homeowners to act in a bear smart manner.

The lack of emotional elicitation in the positive appeal and negative appeal is thought to be a result of weak visuals that were used to frame the message and associated text. It is well understood that images play an integral role in eliciting emotion and enhancing the effects of messages (e.g., Dillard & Nabi, 2006; Joffe, 2008; Lang & Yegiyan, 2008; Geise & Baden, 2015; Powell, Boomgaarden, De Swert, & de Vreese, 2015). Visuals have been proven to significantly increase a viewer's sense of engagement, concern, and emotional connection to a subject matter when compared against text-only messages (Joffe, 2008). Attempting to elicit emotion using only text is considered to be much more difficult, as it often requires the audience to have a high level of pre-existing knowledge about the subject (Powell et al., 2015). Without this prior knowledge, textual messages often do not resonate as well (Powell et al., 2015) and an emotional response may not be triggered. On the contrary, it has been found that prior knowledge is not necessary for eliciting emotion when images are used to frame a message (Powell et al., 2015).

The images used in the negative appeal did not depict any graphic content (e.g., bears that have been shot) and when isolated from the text, could be regarded as neutral or even pleasant. Similarly, when the images incorporated into the positive appeal were considered without any associated text, they could also be considered neutral or pleasant. The use of emotive text, which was provided to give the images emotional value, was either not sufficient or did not work. A potential reason is offered by Geise and Baden (2015), who speculated that when image and textual elements conflict, they will compete for attention and reduce the effectiveness of the overall message.

Another consideration to be made is the mediating effect of an individual's pre-existing attitudes and prior experiences on message reception. Joffe (2018) points out that "[i]ndividuals

positioned in different groups are likely to have differential responses to the same visuals, which may depend on factors such as their empathy with the victim" (p. 217). The issue of differential responses is also applicable to textual components. The ability of the negative appeal to elicit feelings of sadness was premised on the fact that participants would perceive bears being killed as a negative event. While it is likely that not all participants viewed the killing of bears to be something negative, differential responses are not believed to be the main reason the negative appeal was perceived as neutral. This is because respondents consistently reported highly positive views towards bears, bear conservation, and were generally opposed to lethal control methods. The positive appeal may not have elicited feelings of happiness due to a combination of pre-existing, highly positive attitudes towards bears and a weak message claim strength.

Many agencies tasked with developing and implementing bear smart messaging programs have limitations on how graphic or sensational visual and textual components of messages can be. While the incorporation of graphic or sensational visuals to frame a message may achieve a stronger emotional response from the public, agencies may not find this method to be appropriate. The posters used in this study were designed to reflect current practice by incorporating messaging components that were deemed to be acceptable by Manitoba Sustainable Development. As such, the neutral responses to the positive and negative appeal posters may indicate that there is no practical difference between the use of emotional and rational messaging strategies with the public.

Effect of treatment on behavioural intentions to remove attractants

As this study was initiated in an attempt to address a high level of perceived conflict between bears and homeowners outside of Riding Mountain National Park, it was expected that messaging would have an impact on homeowners' behavioural intention to remove attractants. Prior to the survey, it was theorized that perceived levels of ongoing conflict could be explained by three main factors: 1) high influxes of seasonal homeowners who may lack specific knowledge about bears, 2) the absence of municipal programing to provide education on how to avoid conflict with bears, and 3) the absence of municipal bylaws and strong provincial regulation to enforce the removal of attractants contributing towards ongoing conflict; these are well-known factors underpinning many situations where human and black bear conflict is prevalent across Canada (Davis, Wellwood, Ciarniello, 2002). Because these assumptions were held, the finding that homeowner behavioural intention was not affected by bear smart messaging was unexpected. No effect of messaging was found with homeowners in rural agricultural, rural residential, or rural recreational areas. Two potential insights into why bear smart messaging may have had no impact can be found in the summary results. The first insight was that some of the pre-study assumptions regarding homeowners were found to be false. Rather than participants being uneducated about living with black bears, homeowners were observed to highly value them and knew how to resolve conflict with bears on their own properties. The second insight is that the majority of participants had previously removed or secured attractants to prevent conflict. The potential effect size for persuading homeowners to change their behaviour was small, as most participants had already conformed to bear smart practices before the study took place. While this outcome undoubtedly impacted the study's ability to test the effectiveness of

bear smart messaging, it was ultimately a positive result to find that homeowners who did not align with bear smart values and objectives were a minority.

Persuasive messaging has four fundamental goals, as outlined by Holmes & Crocker (1987): persuasive messaging "a) creates awareness among the unaware, b) creates preferences among the undecided, c) provides reinforcement among those positively predisposed, and d) provides conversion among those negatively predisposed" (p. 27). While reinforcing a positive bias toward the subject is generally good for marketing, the primary focus is arguably to convert those who are unaware and/or negatively predisposed. Converting the unconverted is especially important for bear smart programs, as it can only take a small number of uncompliant individuals to potentially promote nuisance bear activity within a community. Participant predispositions suggest that the bear smart posters failed to influence behavioural intention because participants were already positively aligned with the message. The potential effect size for persuading those who were not aligned was small, presenting both theoretical and measurement difficulties. The outliers in this study may represent a small percentage of the population that cannot be voluntarily persuaded to adopt bear smart behaviours.

Ideally, this study would have been conducted with a population which had received limited prior exposure to bear smart programming and had a history of conflict with bears. The assumption that the study population near Riding Mountain National Park was uneducated about bears and bear attractants proved to be false. Messaging provided by the national park, provincial conservation officers, and private agencies is thought to explain homeowners' pre-existing attitudes, past behaviour, and behavioural intention.

5.4 Effect of Area

Effect of area on homeowner attitude and belief, social norm, perceived control, and behavioural intention

Results showed that homeowner intention to remove or secure black bear attractants differed significantly based on the area they were associated with. Participants from rural recreational and rural residential areas held significantly higher intentions than those from rural agricultural areas. This result was validated by the fact that attitude and belief, social norm, and perceived control, which inform behavioural intention (Ajzen, 1991), were also affected by area. A similar pattern was observed with participants from rural recreational areas and rural residential areas holding more positive scores than those from rural agricultural areas across all three predictive constructs.

The finding that participants' attitude and belief, social norm, perceived control, and behavioural intention regarding black bears significantly differed based on the area they were associated with is in line with previous research that has examined urban and rural differences in environmental concern (e.g., Tremblay & Dunlap, 1978; Lowe & Pinhey, 1982; Smith & Krannich, 2000; Berenguer, Corraliza, & Martin, 2006; Herberlein & Ericsson, 2006; Huddart-Kennedy, Beckley, McFarlane, & Nadeau, 2009). It was expected, and confirmed, that more participants would identify as having a rural upbringing in rural agricultural and rural residential areas, while those who identified as having an urban upbringing would be higher in rural recreational areas. Past literature has tended to describe the urban/rural divide as a consequence of cultural, economic, educational, and environmental differences (Huddart-Kennedy et al., 2009). This divide has generally characterized rural groups as possessing utilitarian values (Jones,

Fly, Talley, & Cordell, 2003) and urban groups holding mutualist values (Manfredo et al., 2009). The direction of the relationships among the three areas studied was consistent with this characterization of urban/rural divide: rural recreational areas consistently held the highest scores in favour of bear smart programming, followed by rural residential areas, and lastly rural agricultural areas. An interesting finding however, was that the expected divide between area groups was narrower than anticipated; those participants who held strong utilitarian views represented a minority in the areas with the highest proportions of participants with rural upbringings.

Social scientists have been documenting the narrowing, or complete disappearance, of the urban/rural divide in some areas of North America for over the past 30 years (e.g., Tremblay & Dunlap, 1978; Freudenburg, 1991; Jones et al., 2003; Huddart-Kennedy et al., 2009; Minato, Curtis, & Allen, 2010). Three primary factors thought to contribute to these changes include: 1) broad effects of mass media (Tremblay & Dunlap, 1978; Freudenburg, 1991), 2) immigration of urbanites into rural areas (Smith & Krannich, 2000), and 3) rural areas reduced dependency on natural resource extraction (Jones et al., 2003). Staying within the scope of this study, it is plausible that bear smart messaging (and other pro-environmental influences) disseminating from Riding Mountain National Park and other sources, in combination with increasing immigration of urban residents and visitors, has gradually shifted values towards bears. This is premised on the assumption that rural residents held more utilitarian values prior to the introduction of bear smart programing. To address the third factor, there are few known resource-extractive activities that occur in the region outside of a small number of guide outfitting businesses; farming and ranching, which are prominent south of the national park, are

not considered to be resource-extractive industries (Jones et al., 2003). As this study only pertained to black bears, it is not known to what extent observed values, for those of urban or rural upbringing, may extend toward other wildlife species and environmental concerns. A substantial effort has been put into media campaigns locally, provincially, and nationally to promote increased tolerance and co-existence with black bears, arguably more so for this species than any other. It is for this reason that black bears may represent a special case where rural and urban values have become more closely aligned.

Results for social norm suggest that maintaining properties in a bear smart manner has become an established norm in rural recreational and rural residential areas. These two groups were significantly different from one other, however, the difference in mean scores was small. This intuitively makes sense as homeowners who lived in rural residential areas year-round were often intermixed with those who only lived in the area seasonally for recreational purposes. While they represent distinct groups, their close proximity leads to shared norms. The successful establishment of pro-environmental norms is important, as "…newcomers to a community are likely to be influenced by existing norms even when their values might suggest otherwise" (Minato, Curtis, & Allen, 2012, p. 874).

Homeowners in the rural agricultural group were influenced by social norms the least. The capacity for informal norms to be effectively used to establish and promote bear smart behaviours is dependant on the strength to which segments of the public align with the values being portrayed (group identification) (Reynolds et al., 2015) and subsequent conformity to the perceived influences of that group (White et al., 2009; Hogg, 2016). The degree to which social norms influenced homeowners in agricultural areas is thought to be best explained by differences

in conformity, as attitudes and beliefs appeared to be in alignment with bear smart objectives. Social norms relating to bear smart behaviours have not been well established in rural agricultural areas as homeowners did not tend to think their neighbours or family expected them to act in any particular manner. In addition, regardless of what their neighbours or family may have thought, homeowners had weak motivations to conform. The reduced effectiveness of social norms in rural agricultural areas could potentially be explained by the rural rights and privileges homeowners expect to hold when living outside of conventional townsites and away from neighbours.

Levels of perceived control were high across all three area groups, albeit lower in agricultural areas, for removing or securing bear attractants. Differences in peoples' perceptions of perceived control is often context dependant and does not tend to rely on specific character traits (Jewell & Kidwell, 2005). People may feel capable of performing a behaviour, even with the presence of obstacles, if that behaviour is important to the individual (Bandura, 1991, 1997). Jewell and Kidwell (2005) point out that motivations are a key factor in forming levels of perceived control. People who have intentions to perform a behaviour, but are not highly motivated to do so, will often fail to act even without the presence of limitations (Bandura, 1991). For this reason, lower perceived control scores in rural agricultural areas are thought to be reflective of lower motivations. Low motivations to address attractants closely relates to low levels of perceived risk, which was discussed in Section 5.2.

5.5 Theory of Planned Behaviour

Theory of planned behaviour was an effective model for predicting homeowners' behavioural intentions to act in a bear smart manner. The constructs of attitude and belief and social norm contributed 47.6% of the explained variation in behavioural intention. Area and perceived control were not found to predict behavioural intention. The explained variation that was detected with area in the first three linear regression models was accounted for by social norm and attitude and belief in the last model when all variables were included. Area being a non-significant predictor in the final model was an ideal result, as area itself was a variable assigned to group participants based on shared characteristics and was not meant to directly predict behavioural intention. Once attitude and belief and social norm were controlled for, there was no additional explained variation between area and behavioural intention.

The measure for attitude and belief contributed a small amount towards behavioural intention, suggesting that when the public holds positive attitudes and beliefs towards bears, intentions are mostly influenced by social norm. In 2007, Campbell (2012) conducted a study on bear smart programming near Grand Beach and Victoria Beach in Manitoba and observed similar results. The theory of planned behaviour, also used in his study, showed that social norm contributed the most toward explained variation in behavioural intention followed by attitude and belief (Campbell, 2012). Homeowners in Campbell's study were also reported to have held positive attitudes and beliefs towards bears and were generally supportive of bear smart programming (2012).

Outcomes from the theory of planned behaviour have provided additional clarity as to why behavioural intention significantly differed, or did not differ, across area groups. Behavioural

intention in rural residential and rural recreational areas did not differ mostly because they were influenced by similar norms. While significant differences between these two groups existed for attitude and belief, it was not a strong determinant of behavioural intention. The significant difference in behavioural intention between rural agricultural areas and both the rural residential and rural recreational areas was mostly due to difference in social norm influence; those from rural agricultural areas were generally less affected.

Aside from the main results of the theory of planned behaviour, it is also speculated that motivations and perceived risk to remove or securely store attractants likely played an undetected role in the formation of behavioural intention. The construct for perceived control in the theory of planned behaviour does not incorporate direct measures for motivation or perceived risk, and as such, these factors could not be included in the model. Despite this apparent weakness, there is good evidence to suggest that behavioural intentions in this study were also mediated by factors such as past experience, past behaviour, and perceived level of importance to remove different kinds of attractants.

5.6 Limitations of the Study

Study population

This research was developed under the assumptions that homeowners within the study area were largely uneducated about black bears and how to prevent conflict. This assumption proved to be false for the majority of participants; scores from the questionnaire showed high levels of awareness and education about black bears. These faulty assumptions did impact the

study's ability to detect potential effects of bear smart messaging with homeowners. In hindsight, this assumption could have been validated or dismissed by speaking with local conservation officers in the Neepawa and Shoal Lake Districts during the design phase. While changing the study area would not have been an option, the research focus may have shifted, or alternative methods may have been developed to control for pre-existing values and bear smart knowledge.

Messaging materials

The emotional elicitation strength of the positive and negative appeal posters was not strong enough to sufficiently test the hypothesis of whether or not the use of emotion in bear smart messages could increase effectiveness. The bear smart messaging posters used in this study were developed in consultation with the Furbearer and Human-Wildlife Conflict Management Unit at Manitoba Sustainable Development. Based on what was deemed acceptable practice, graphic images were not permitted for use in the negative appeal poster. As such, results reflect currently acceptable standards for bear smart messaging in Manitoba.

Questionnaire development

During the survey implementation phase of the study, issues with some of the questions were identified. Issues were identified through written feedback provided by participants in response to specific items, or by watching participants fill out the questionnaire. The first issue was with question #1, which asked participants to report how the bear smart message included in their package made them feel. When filling in the answer, some participants chose to report how the study being conducted made them feel, rather than how the actual message contents made them feel. For instance, a participant completed and handed back a questionnaire while the researcher was present, remarking that although the message content made them feel sad,

they were happy that the research was being conducted. This same participant self-reported that the bear smart message made them feel happy rather than indicating they felt sad in response to the material. This misinterpretation of the question had not been anticipated and likely had a small impact on the validity of the measure. It is recommended that a rationale, or simple statement of importance, be provided to discourage people from reporting on feelings which are not directly in response to the question being asked.

In part two of the questionnaire there was an oversight with how the direction of the scale were displayed. All the questions except for 5a and 6a had the highest score (7) on the left, with the lowest score (1) on the right. Questions 5a and 6a did not follow this pattern and some participants did not notice the change in scale direction. This did cause these two measures to have reduced reliability. Summary results for these two questions were still reported because the overall measures were still considered to be meaningful. It is recommended that scales remain in the same direction for all items in a given section to control for this type of measurement error.

For the theory of planned behaviour, the original measure for behavioural intention in the questionnaire had been a dichotomous yes or no response question. During the data analysis phase, it was realized that the dichotomous scale did not meet the assumptions of the tests that were to be used. Question 17 from part 3 of the questionnaire was used as a substitute for the original behavioural intention score (question 23). Question 17 was very similar, except that it did not incorporate a control for hypothetical bias.

Potential measurement issues for the perceived control construct may explain why it was not a significant predictor of behavioural intention in this study. Current methods for measuring

perceived control are often vague, and, in many regards, lack specific context and applicability to the subject. When conducting in-person surveys, it was apparent that some participants did not immediately understand how the indicated inhibitor (financial cost, physical capability, time availability, control, and knowledge) related to performing bear smart behaviours. This uncertainty likely weakened the validity of the construct. To address this concern, future studies should attempt to place inhibitors in specific contexts to reduce ambiguity. For example, one might state: "I have the financial means to purchase a bear-proof shed for garbage storage". Another example addressing physical capability: "I am physically capable of removing ripe fruit from fruit trees on my property". This question could be followed by, "I have the tools required to safely remove ripe fruit from fruit trees on my property." These questions would use a measurement scale of "strongly agree" to "strongly disagree". Participants should also be given a "not applicable" option, as context-specific questions may not always be relevant. Additionally, adding a time component to each question would further strengthen the construct's predictive ability by reducing hypothetical bias. A secondary method for addressing potential measurement issues with perceived control would be to conduct qualitative interviews. The qualitative approach to understanding behavioural inhibitions is a powerful tool for identifying new insights into complex problems (as opposed to using a limited number of pre-determined inhibitions used in standard questionnaires).

Lastly, it was identified during the data analysis and interpretation phase that there had been no option provided for participants to indicate if they had no attractants present on their properties. Because of this, the measure for behavioural intention may have been impacted. Those who had no attractants on their properties may have reported that they had no intentions

to remove or secure them simply because they didn't have any. Homeowners who had no attractants should have been treated differently than those who did for the purpose of this study.

6.0 Conclusions & Recommendations

6.1 Conclusions

Results of this study showed that homeowners near Riding Mountain National Park held strong positive values towards black bears and supported measures that would promote coexistence between people and bears. Public education disseminated from sources such as the national park, provincial conservation officers, private community boards, and non-profit organizations are thought to have contributed towards the formation of positive values and social norms associated with bear smart objectives. While the majority of participants aligned with bear smart program goals, the degree to which individuals were willing to change their behaviour was dependant on the type of attractant in question. This observed discrepancy between support for the program and reduced willingness to conform behaviourally suggests that public awareness campaigns targeting specific types of attractants (e.g., ripe fruit trees and barbeques) may be helpful. It is suspected that homeowners who would not remove certain attractants (e.g., barbeques) perceived them as a low risk for attracting bears or causing property damage. The use of non-voluntary methods may be required in circumstances where ongoing conflict has resulted from homeowners not heeding education efforts to remove or securely store attractants.

In conjunction with public awareness messaging, a strategy for addressing the issue of ripe fruit from trees and shrubs could be the establishment of a local fruit sharing program. Fruit sharing programs typically operate by property owners listing trees that members of the public can harvest from. Fruit sharing programs in Manitoba currently operate in Winnipeg, Steinbach, Brandon, Portage la Prairie, Morden, Gimli, and Neepawa (Fruit Share, 2014). While these

existing programs operate under a business model (Fruit Share), they could also be independently designed as a community-driven, non-profit initiative. The business Fruit Share (n.d.), which currently operates in cities across Canada requires a small annual membership fee for both tree owners and tree pickers. Members gain access to the business's website, which is a hub for prospective fruit pickers to communicate with tree owners in their area. A fruit sharing program would continue to allow homeowners to have apple trees while benefiting members of the community who wish to utilize the resource, for as long as demand exists.

The ability of a bear smart messaging campaign to successfully motivate homeowners to remove or secure attractants hinges on its powers of persuasion. This study sought to find out if different messaging strategies with the public were more, or less, effective with promoting bear smart behaviours. Of the three messaging appeals designed to address this overarching research question, two of them did not preform as intended; the positive and negative emotional appeal posters failed to elicit an emotional response with homeowners. As such, this study was unable to address if messaging strategies based on emotional appeal could be more effective than those based on a rational appeal. The approach of using text to provide images with emotive value was not thought to be an effective method for eliciting emotional responses to the material. In the future, studies choosing to use visuals to frame a message should use images that, in isolation from text, evoke a strong emotional response. However, because current practice does place limitations on how emotionally evocative visual components of a bear smart message can be, there may be no practical difference between the use of emotional and rational messaging strategies with the public.

The use of bear smart messaging, in general, was not found to affect homeowners' behavioural intention to remove or secure bear attractants. This result has been attributed to the high levels of existing awareness regarding black bears that was observed with participants. Outcomes suggest that bear smart messaging strategies may not be sufficient to convince all homeowners of the risks associated with different types of attractants, or to alter their behaviour even when risks are acknowledged. Researchers attempting to re-examine the effects of bear smart messaging may have better results with a study population that has had minimal prior-exposure to bear smart initiatives.

While no effect of messaging was found, homeowners' attitudes and beliefs, social norms, perceived control, and behavioural intention were found to significantly differ by area. Differences associated with area are thought to reflect potential cultural, economic, educational, and environmental differences between rural and urban groups (Huddart-Kennedy et al., 2009). This result has implications for those in charge of instituting bear smart programs as strategies tailored towards the values or needs of specific groups may prove beneficial. The theory of planned behaviour model showed that social norms were the single most important factor contributing towards homeowners' behavioural intentions to remove or securely store black bear attractants. The construct for attitude and belief was only found to contribute a small amount. By considering both the results of area and the theory of planned behaviour together, there is evidence to suggest that campaigns should focus on establishing and promoting social norms associated with bear smart behaviours in rural residential and rural recreational areas. Because homeowners from rural agricultural areas were less affected by social norms, messaging focused on this factor may not be as effective. These results also imply that messaging that

focuses solely on changing attitudes and beliefs towards bears may not be as useful as messages that incorporate social normative influences. Further, tailoring messaging strategies towards specific groups may prove beneficial as factors influencing intentions may differ between sub-populations. Within the study area, raising levels of perceived risk for ripe fruit from trees and shrubs and barbeques using social norms may increase compliance in an otherwise bear-aware community.

6.2 Key Outcomes of Research

1. Homeowners generally supported measures to coexist with black bears and believed removing or securing attractants would prevent conflict
2. Homeowners felt that they themselves, and their neighbours, had a personal responsibility to prevent bears from developing nuisance behaviours on their properties
3. Financial wellbeing, time availability, physical capability, power to make decisions, and knowledge of attractants were not found to inhibit homeowners from acting in a bear-smart manner
4. There was more support for non-lethal management options (e.g., prevention and/or capture and relocation) than lethal management options (destroying nuisance bears)
5. Willingness to change behaviour differed by attractant type (e.g., garbage, bird feeders, barbeques)
6. The negative and positive bear smart posters failed to elicit emotional responses with homeowners

7. Because many agencies have limitations on how emotionally evocative their bear smart messaging content can be, there may be no practical difference between the use of emotional and rational messaging strategies with homeowners
8. The bear smart messaging posters used in this study did not affect homeowners' behavioural intentions to remove bear attractants
9. Homeowners in rural recreational and rural residential areas had higher intentions to remove black bear attractants than homeowners in rural agricultural areas
10. Homeowners from rural recreational areas held the most positive attitudes and beliefs towards bears, followed by homeowners from rural residential and rural agricultural areas
11. Social norms were the most influential with homeowners in rural recreational areas, followed subsequently by rural residential and rural agricultural areas
12. Homeowners from rural recreational and rural residential areas held higher levels of perceived control than homeowners from rural agricultural areas
13. Social norm and attitude and belief were found to contribute towards homeowners' behavioural intentions to remove or securely store attractants
14. Perceived control and the area homeowners were from did not contribute towards homeowners' behavioural intentions to remove or securely store attractants

6.3 Recommendations

1. Local agencies tasked with implementing bear smart programs should seek to increase public awareness for the specific types of attractants that were found to have lower levels of social acceptance to remove or securely store
2. Local agencies tasked with implementing bear smart programs should consider the practicality of establishing a fruit-sharing program to reduce black bear conflict associated with ripe fruit from fruit trees and gardens
3. Bear smart programs should consider using social norms in their messaging when attempting to raise levels of voluntary compliance with homeowners
4. Bear smart programs should consider using messaging strategies that are tailored towards the values and needs of specific groups of people as it may increase overall message acceptance
5. Future research should attempt to re-examine the potential impacts of emotional messaging versus rational messaging in regard to bear smart programming
6. Future research should include measures for motivation and perceived risk when examining behavioural intentions to remove or secure different types of attractants
7. Researchers should attempt to control for the prior exposure that participants may have to bear smart programs when conducting studies on the effectiveness of messaging
8. Future research near Riding Mountain National Park should examine if urban and rural values toward wildlife species, other than black bear, have become closely aligned. It

may be the case that urban and rural values, as observed in this study, have become closely aligned for black bear but not for other species.

6.4 Concluding Statement

It would seem as though a significant amount of outreach has been conducted with the public to disseminate bear smart information and promote pro-environmental values and social norms. The majority of homeowners from rural agricultural, rural residential, and rural recreational areas all held positive views towards black bears and were supportive of measures for coexistence. Bear smart education disseminated from public and private agencies such as Riding Mountain National Park, Friends of Riding Mountain, Riding Mountain UNESCO World Biosphere Reverse, Manitoba Sustainable Development, and Grey Owl Estates are thought to have contributed toward this positive outcome. Current levels of observed public support for black bears should make it easier for local organizations and institutions to introduce programs that seek to further reduce human and black bear conflict through preventative measures.

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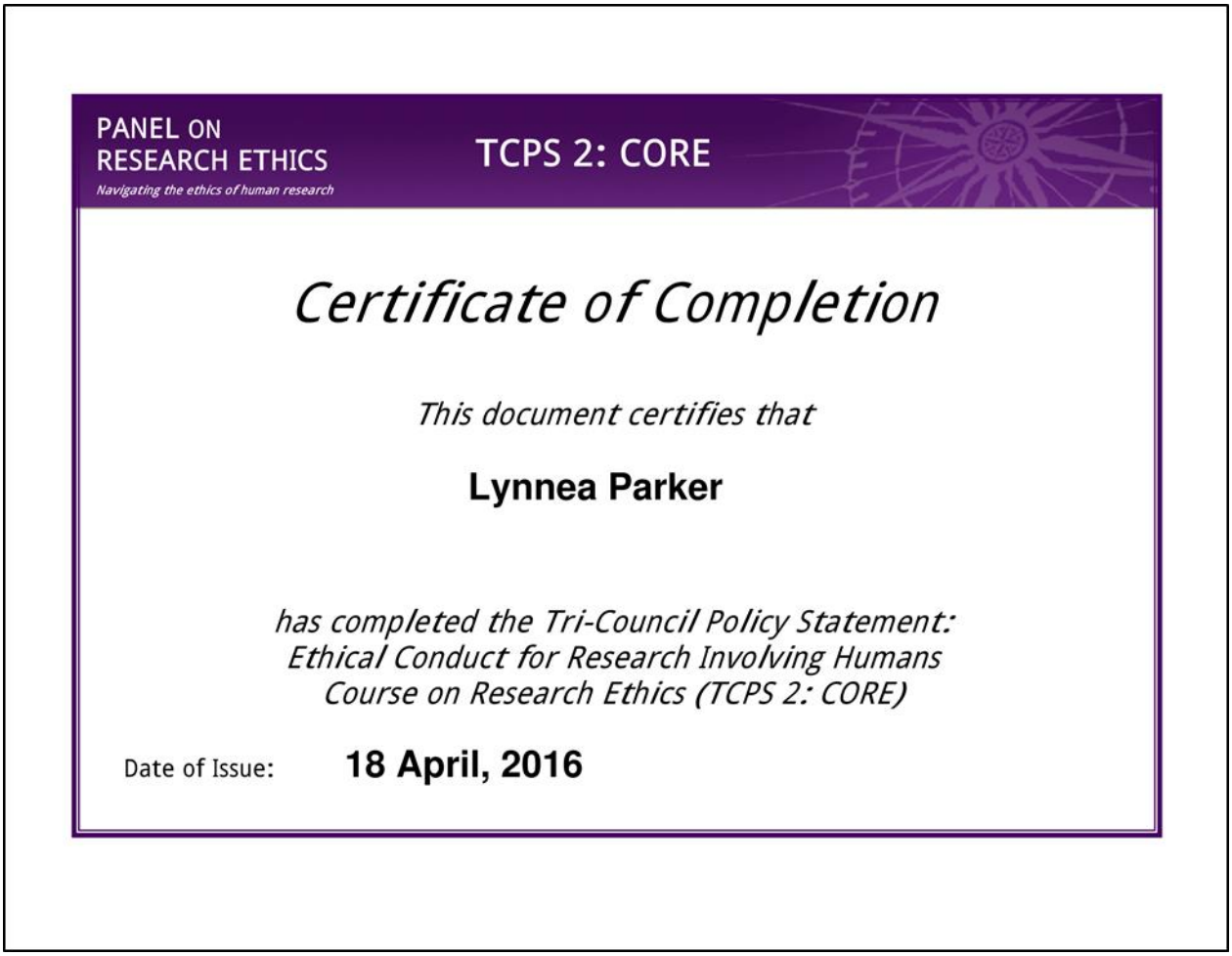
Appendix I - Research Instruments



PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Lynnea Parker

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: **18 April, 2016**

TCPS 2: CORE Certificate of Completion

UNIVERSITY OF MANITOBA | Research Ethics and Compliance
Office of the Vice-President (Research and International)

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Canada R3T 2N2
Phone +204-474-7122
Fax +204-269-7173

APPROVAL CERTIFICATE

June 9, 2016

TO: **Lynnea Parker** **(Supervisor: Michael Campbell)**
Principal Investigator

FROM: **Lorna Guse, Chair**
Joint-Faculty Research Ethics Board (JFREB)

Re: **Protocol #J2016:044 (HS19717)**
"Public attitudes and intentions in response to bear smart messaging strategies"

Please be advised that your above-referenced protocol has received human ethics approval by the **Joint-Faculty Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). **This approval is valid for one year only and will expire on June 9, 2017.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- **If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: http://umanitoba.ca/research/ors/mrt-faq.html#pr0)**

- **if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.**

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans.*

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html) **in order to be in compliance with Tri-Council Guidelines.**

umanitoba.ca/research

Research Ethics Approval

Survey Cover Letter

Study Title: Public attitudes and intentions in response to bear smart messaging strategies

Principle Investigator: Lynnea Parker, Masters Student
[redacted] ParkerL5@myumanitoba.ca

Co-Investigator: Dr. Michael Campbell, Advisor
[redacted] Michael.Campbell@umanitoba.ca

Sponsor: The University of Manitoba in association with Riding Mountain National Park, Manitoba Conservation, Riding Mountain UNESCO World Biosphere Reserve, and Keeseekoowenin First Nation.

Project Description:

In response to human-black bear conflicts in Manitoba, this study was developed to better understand, and potentially enhance the effectiveness of current bear smart programs. Human-black bear conflicts occur most often when human-based attractants (food, shelter, or security) are present on properties in rural and urban areas. Bear smart programs seek to reduce conflict through public education and marketing campaigns aimed at persuading home owners to remove attractants from their properties. Effective marketing campaigns are therefore essential to the success of provincial bear smart programs. The examination of different bear smart messaging strategies and their proposed effectiveness is an under developed area of the literature. This study seeks to address this by testing different types of bear smart messaging strategies with rural residents in the municipalities of Harrison Park and Clanwilliam-Erickson, by Riding Mountain National Park.

Contest:

If you choose to participate in this bear smart research project, you may also enter a free-entry contest. The prize is one of two, $200 pre-paid VISA cards. The contest will be drawn on October 15th 2016. Please return the contest entry ballot in the sealed ballot envelope with your questionnaire in the return envelope. Only the winners of the contest will be contacted.

Package Contents:

This survey package includes:

- one survey questionnaire
- one contest entry ballot, and a sealable ballot envelope
- one return envelope with paid postage

This package may or may not include:

- one bear smart messaging poster

Location and Time Requirement:

This research package may be completed at any location and time of your choosing. Completed surveys may be mailed back using the pre-paid envelope included in the package. The expected time to complete the survey is 10-15 minutes. This survey is completely voluntary, and you are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence.

Please have the questionnaire and contest entry ballot returned by October 1st 2015.

Survey Cover Letter (page 1 of 2)

Confidentiality:

All responses to the questionnaire will be anonymous and confidential. Completed questionnaires and contest entry ballots will be stored in a secure location at the principle investigators residence. After completion of the contest, all entry ballots will be destroyed. Anonymous data collected from the survey will be kept in electronic format, while hard copies of the questionnaires will be destroyed after the completion of the study. Contest entry ballots will not be associated with questionnaires to ensure both confidentiality and anonymity of answers provided in the survey. The University of Manitoba may look at my research records to see that the research is being done in a safe and proper way.

Dissemination:

Data collected from this survey will be published in Lynnea Parker's master's thesis on Myspace at the University of Manitoba. In addition, scholarly articles will be subsequently published using data obtained through this research. Results of the study will be submitted in reports to Riding Mountain National Park (funding agency), Riding Mountain UNESCO World Biosphere Reserve (funding agency), and Manitoba Conservation and Water Stewardship Branch (supporting agency). When information is presented in any public forum, including conferences and presentations, it will be aggregated (lists, tables, maps) and will not be linked to any individual.

At the conclusion of this study, a local newspaper article will be published to inform residents on the results, and how to obtain more information. Any participant may also contact Lynnea Parker (Principle Researcher) to inquire about the progress and results of the study.

Risks and Benefits:

There are no anticipated risks involved with participating in this research study. The survey is completely anonymous and confidential. Answers provided in the questionnaire cannot be used for any incriminating purposes.

Benefits of this study will include an increased awareness of rural residents and recreational users to human-black bear conflicts. In addition, residents may learn how to avoid and resolve conflicts on their properties. This study seeks to create a safer living environment for both people and bears.

Consent:

You are under no obligation to participate and you may stop at any time. Returning the questionnaire in the enclosed self-addressed stamped with or without the contest entry ballot will imply your consent to participate in this research project. It would be very helpful to have your completed questionnaire returned to me by October 1st 2016.

This research has been approved by the Joint-Faculty Research Ethics Board (protocol #J2016:044). If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at 204-474-7122, or e-mail humanethics@umanitoba.ca

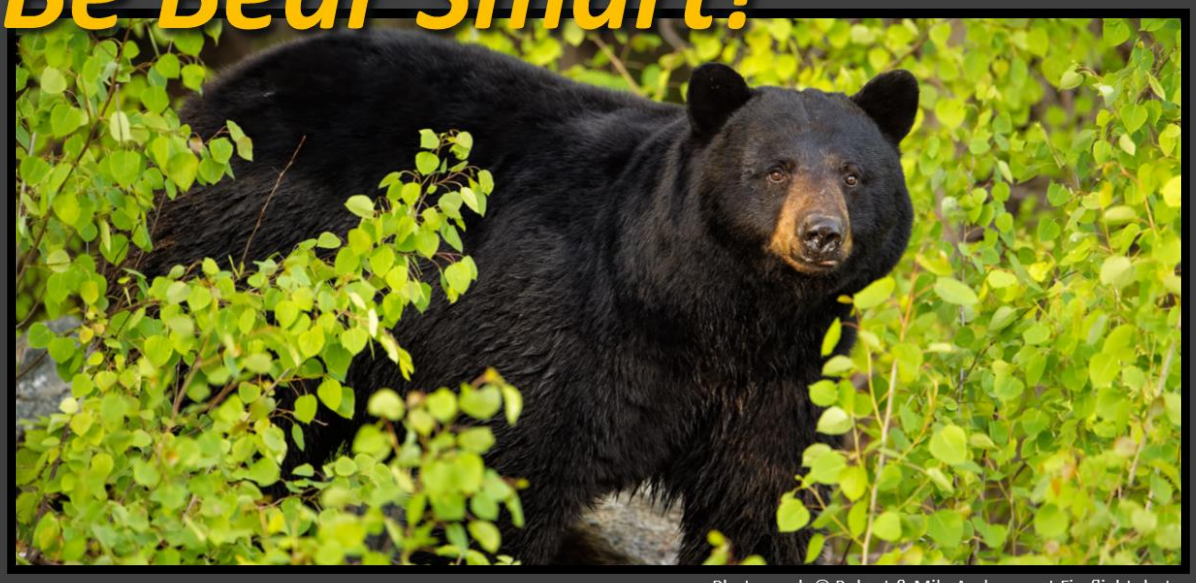
Thank you for being an important part of this research project

UNIVERSITY OF MANITOBA

Natural Resources Institute CHFEER,
University of Manitoba Winnipeg
Manitoba Canada

Survey cover letter (page 2 of 2)

Be Bear Smart!



Photograph © Robert & Mila Anderson at Fireflightphoto

Removing attractants from your property will prevent conflict

Common Attractants:

- Unsecured household garbage
- Outdoor BBQ's, fridges and freezers
- Strong odors which are organic or synthetic
- Outdoor pet food and livestock feed
- Unpicked fruit trees and berry bushes
- Bird feeders and bird seed

What You Can Do:

- Secure all garbage and compost in bear proof containers or sheds
- Never store fridges and freezers outside
- Clean BBQ's after use to remove odors
- Feed pets inside
- Pick fruit trees and collect fallen fruit
- Install electric fences around livestock feed, orchards, gardens, and beehives
- Remove bird feeders from April to October

Understanding Black Bears:

- They are omnivores, meaning they have a natural diet of vegetation, berries, and meat
- Cubs stay with their mother for two years
- Most bears avoid people, and attacks are very rare
- Bears lose their fear of people after they learn to associate humans with sources of food

Help People and Bears Coexist

Bear smart poster, neutral appeal.

Bear smart poster, positive appeal

Bear smart poster, negative appeal

Robert Andersen
FireFlight Photo
186 main St
Littleton NH, 03561
PH 603 502 3801

4/4/2016

FireFlight Photo Client Agreement

To Whom It May Concern:

Lynnea Parker has purchased high-resolution digital files from FireFlight Photo. Lynnea Parker is hereby granted permission by FIREFLIGHT PHOTO to include the images in her bear safety poster and may print a quantity of up to 1000 posters. The three images Lynnea Parker has permission to use for this purpose are NHBBC076, NHBBC088, NHBB126 and permission does not extend to any other purpose than this safety poster.

This permission applies worldwide. Bearer agrees that he/she may not use any FIREFLIGHT PHOTO images for commercial or editorial purposes other than agreed to above, or enter any FIREFLIGHT PHOTO images into competition without the express written permission of FIREFLIGHT PHOTO. FIREFLIGHT PHOTO retains the copyright to all images, per USC Title 17 (US Copyright Law).

Once the poster has been created and the quantity of posters produced, Lynnea Parker agrees to destroy (delete) the digital files sent to her and ensure those files do not become available to sources outside of her control.

Copyright and Licensing Notice

The images that are being provided to you are licensed to you for the above bear safety poster only. Your license does not include use that results in financial gain, including but not limited to: advertising, stock photography, print sale profits, or resale of any nature. You may not post these images or files to the internet or anywhere else or use these digital files for any other purpose than agreed to. You may not email / transmit or share the original digital files with any other person or entity without the express written permission of FireFlight Photo.

I **Lynnea Parker** agree to the above terms dated 04 / 04 / **2016**

Signed: [redacted]

Lynnea Parker

Bear smart poster, photo license agreement

DATA USE SHARING AGREEMENT

Between Manitoba Sustainable Development (SD)

And –

Ms. Lynnea Parker (the Recipient)

The Parties agree as follows:

1. "Data" means the information provided by SD to the Recipient, as set out in Annex A, attached hereto.
2. "Personal Information" means the Data provided by SD as well as any numbers or documentation (including maps) created from the Data by the Recipient, where an individual's name or individual entity's information can be identified.
3. "Project" means the specific limited use to which the Recipient can apply the data, as set out in Annex B, attached hereto.
4. The Recipient agrees not to disclose Personal Information to any third party, and further to limit access to Personal Information to those persons directly employed by the Recipient who have a legitimate need for such access in connection with the Project.
5. The Recipient agrees to protect against disclosure or unauthorized use of Personal Information by having adequate facilities and arrangements in place to secure the Personal Information.
6. The Recipient agrees that in the event of an occurrence of unauthorized use or disclosure of Personal Information, the Recipient will immediately notify SD of such occurrence, in writing. The Recipient further agrees to destroy all Personal Information immediately, if instructed by SD to do so.
7. At the completion of the projects outlined in Annex B, all Data will be returned to SD and no copies of the Data will be retained by the Recipient.
8. The Recipient agrees that SD has made no representations or warranties in respect of the completeness and accuracy of the data provided pursuant to this Agreement, and further that SD will be held harmless by the Recipients from any losses, costs, damages or litigation the Recipient faces in respect of the Recipient's use of the Data provided pursuant to this Agreement.
9. By signing this Agreement, the Recipient confirms and attests that she has reviewed all terms and conditions contained in the Agreement, and does hereby agree to be bound by and carry out the Project described herein in accordance with the Agreement.

See Over

Data Sharing Agreement with Manitoba Sustainable Development, page 1/3

For Sustainable Development:	For the Recipients:	
Brian Joynt Name of Signing Authority (please print)	Ms. Lynnea Parker	Dr. Michael Campbell
Manager-Game, Fur & Human-Wildlife Conflict Title	Graduate Student, Natural Resources Institute U of M Title	Director and Professor, Natural Resources Institute U of M Title
[redacted] Signature	[redacted] Signature	[redacted] Signature
4 May 2018 Date	Feb. 22, 2018 Date	Feb 22. 2018 Date

Data Sharing Agreement with Manitoba Sustainable Development, page 2/3

ANNEX A

Data will include the following information from Black Bear District Occurrence Reports (BBDORs) from SD Districts of Neepawa and Shoal Lake from 2017:

1. City/Town
2. Occurrence location
3. Reported details including specifics about location, attractants, response, animal information, effect of the action, additional occurrence details noted.

Data will also include the Human-Black Bear Conflict Management Policy and Procedure.

ANNEX B

The Data will be used to develop a report to inform Graduate Student (Ms. Lynnea Parker) Master's program through the University of Manitoba under her supervisor Dr. Michael Campbell, Director and Professor Natural Resources Institute (University of Manitoba). The Data will be used:

1. To create a background report for use in Lynnea's analysis of "*The Effectiveness of Educational Messaging Strategies in Reducing Human-Black Bear Conflicts*" as provided by Manitoba Sustainable Development in comparison with a more directed or personal messaging about being Bear Smart, in areas adjacent to Riding Mountain National Park and within the SD districts of Neepawa and Shoal Lake, and

Data Access:

Data will be accessible by Ms. Lynnea Parker to assist in the project identified above.

Data Protection Protocols:

Ms. Parker is given access to the data and will be provided with a copy of this agreement to ensure that she is familiar with, and adhere to, the required protocols. Data security measures will include the use of password protection for the digital file. Paper copies of BBDORs must remain on-site at 200 Saulteaux Crescent in Winnipeg, Manitoba.

Publication and Representation:

Any publication or public presentation of the data provided by SD will acknowledge SD's data contribution and will be at an aggregate level to ensure confidentiality.

A digital copy of the reports/publications generated by the Recipient's use of the data must be provided to SD.

Data Sharing Agreement with Manitoba Sustainable Development, page 3/3

Appendix II - Summary Results

Kruskal-Wallis H Test syntax for SPSS

```
*Nonparametric Tests: Independent Samples.
NPTESTS
  /INDEPENDENT TEST (Perceived_Control) GROUP (Area)
KRUSKAL_WALLIS(COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.

MEANS TABLES=Perceived_Control BY Area
  /CELLS=MEDIAN COUNT.

EXAMINE VARIABLES=Perceived_Control BY Area
  /PLOT BOXPLOT HISTOGRAM NPPLOT
  /COMPARE GROUPS
  /STATISTICS DESCRIPTIVES EXTREME
  /CINTERVAL 95
  /MISSING PAIRWISE
  /NOTOTAL.
```

Generalized Estimating Equation (models 1 to 3) syntax for SPSS

```
* Generalized Estimating Equations.
GENLIN Willingness (REFERENCE=FIRST) BY ATTRACTANT TYPE (ORDER=ASCENDING)
  /MODEL ATTRACTANT TYPE INTERCEPT=YES
 DISTRIBUTION=BINOMIAL LINK=LOGIT
  /CRITERIA METHOD=FISHER(1) SCALE=1 MAXITERATIONS=100 MAXSTEPHALVING=5
PCONVERGE=1E-006(ABSOLUTE)
    SINGULAR=1E-012 ANALYSISTYPE=3(WALD) CILEVEL=95 LIKELIHOOD=FULL
  /REPEATED SUBJECT=Respondent ID SORT=YES CORRTYPE=INDEPENDENT ADJUSTCORR=YES
COVB=ROBUST
    MAXITERATIONS=100 PCONVERGE=1e-006(ABSOLUTE) UPDATECORR=1
  /MISSING CLASSMISSING=EXCLUDE
  /PRINT CPS DESCRIPTIVES MODELINFO FIT SUMMARY SOLUTION.
```

Appendix III - Reliability Analysis: Hierarchical Omega

Reliability syntax for R

```
AttitudeBelief<-read.csv("AB_variables.csv")
head(AttitudeBelief)
AttitudeBelief_COPY <- AttitudeBelief[1:4]
AttitudeBelief_COPY <- na.omit(AttitudeBelief_COPY)
install.packages("MBESS")
library(MBESS)

ci.reliability(data = AttitudeBelief_COPY, type = "hierarchical", interval.type = "bca", B = 10000,
conf.level = 0.95)

**----------------------------
SocialNorm<-read.csv("SN_variables.csv")
head(SocialNorm)
SocialNorm_COPY <- SocialNorm[1:6]
SocialNorm_COPY <- na.omit(SocialNorm_COPY)
  library(MBESS)

ci.reliability(data = SocialNorm_COPY, type = "hierarchical", interval.type = "bca", B = 10000, conf.level =
0.95)

**----------------------------
PerceivedControl<-read.csv("PC_variables.csv")
head(PerceivedControl)
PerceivedControl_COPY <- PerceivedControl[1:5]
PerceivedControl_COPY <- na.omit(PerceivedControl_COPY)
library(MBESS)

ci.reliability(data = PerceivedControl_COPY, type = "hierarchical", interval.type = "bca", B = 10000,
conf.level = 0.95)
```

Appendix IV - Validity Testing: One-way ANOVA

One-way ANOVA syntax for SPSS

```
ONEWAY Message_Evaluation BY Appeal
  /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
  /PLOT MEANS
  /MISSING ANALYSIS
  /POSTHOC=TUKEY LSD C ALPHA(0.05).

UNIANOVA Message_Evaluation BY Appeal
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=Appeal.
```

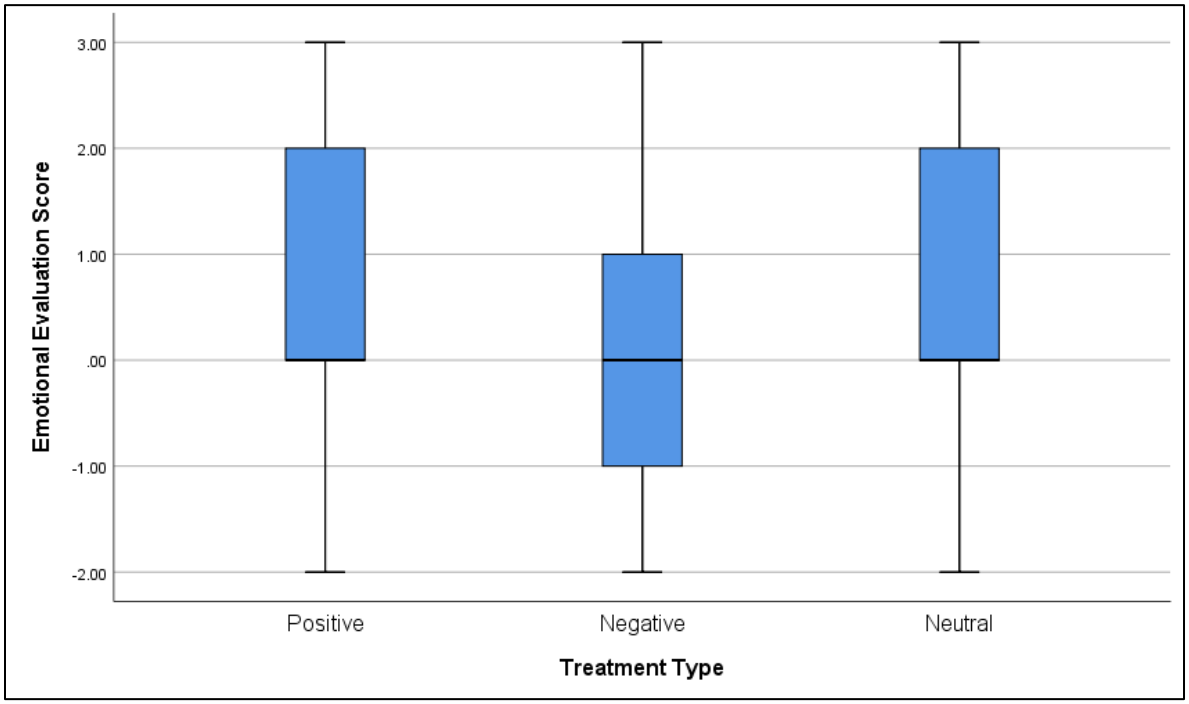
Sample sizes by appeal group

Messaging Groups	**Sample Size**
Positive appeal	66
Negative appeal	64
Neutral appeal	74
Total	**204**

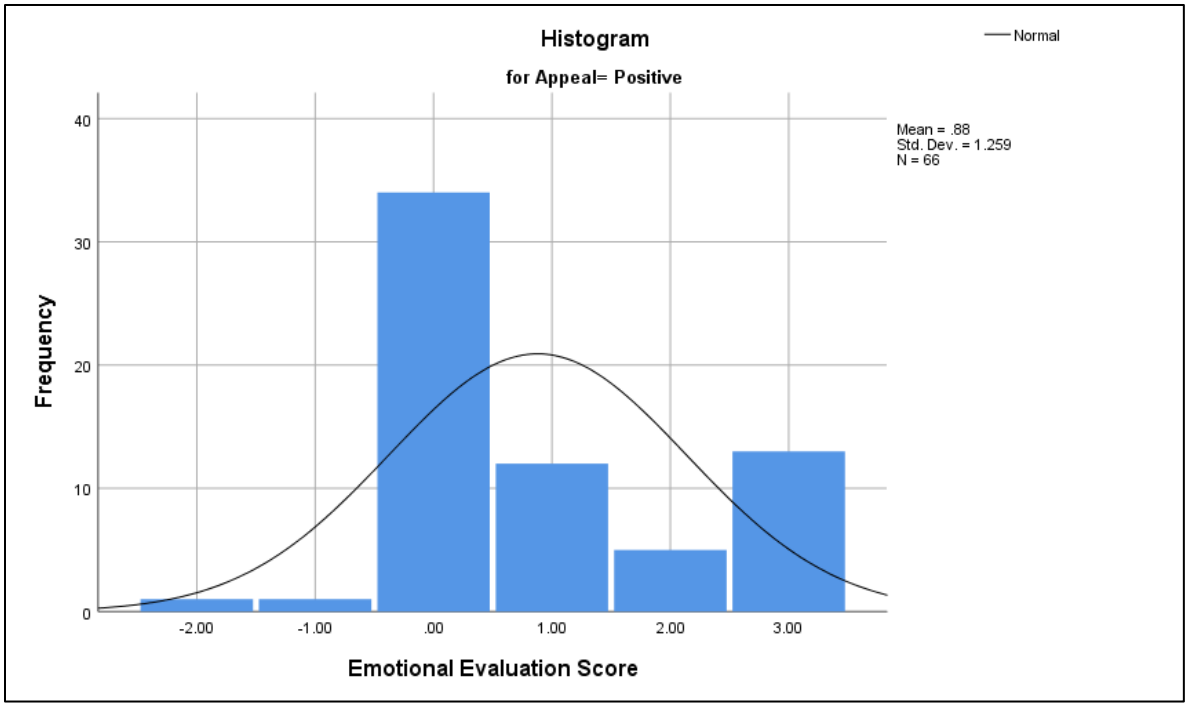
Skewness and Kurtosis Calculations for each group of the dependant variable

Appeal Group	**Type**	**Statistic**	**Std. Error**	**z-score[1]**
Positive Appeal Group	Skewness	0.617	0.295	2.09
	Kurtosis	-0.642	0.582	-1.10
Negative Appeal Group	Skewness	0.617	0.295	2.27
	Kurtosis	-0.642	0.582	-1.22
Neutral Appeal Group	Skewness	0.617	0.295	1.72
	Kurtosis	-0.642	0.582	-0.75

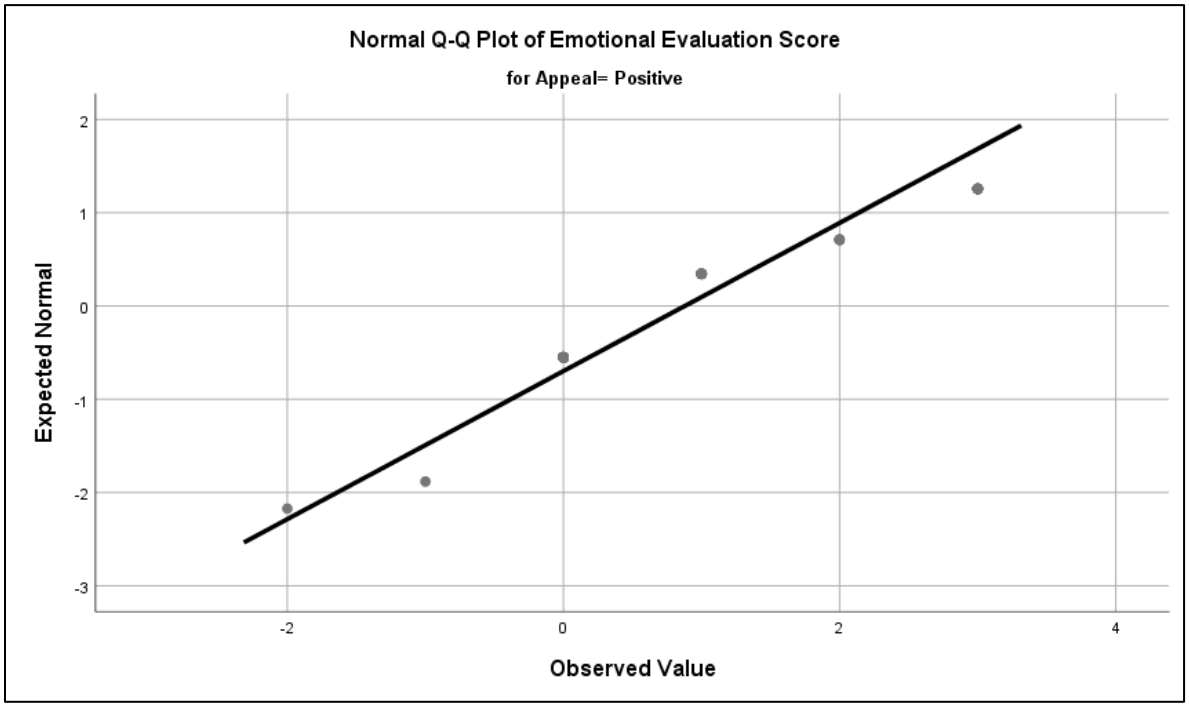
[1] z-scores within ± 2.58 indicate the presence of normality, based on a 95% CI, $p = 0.001$



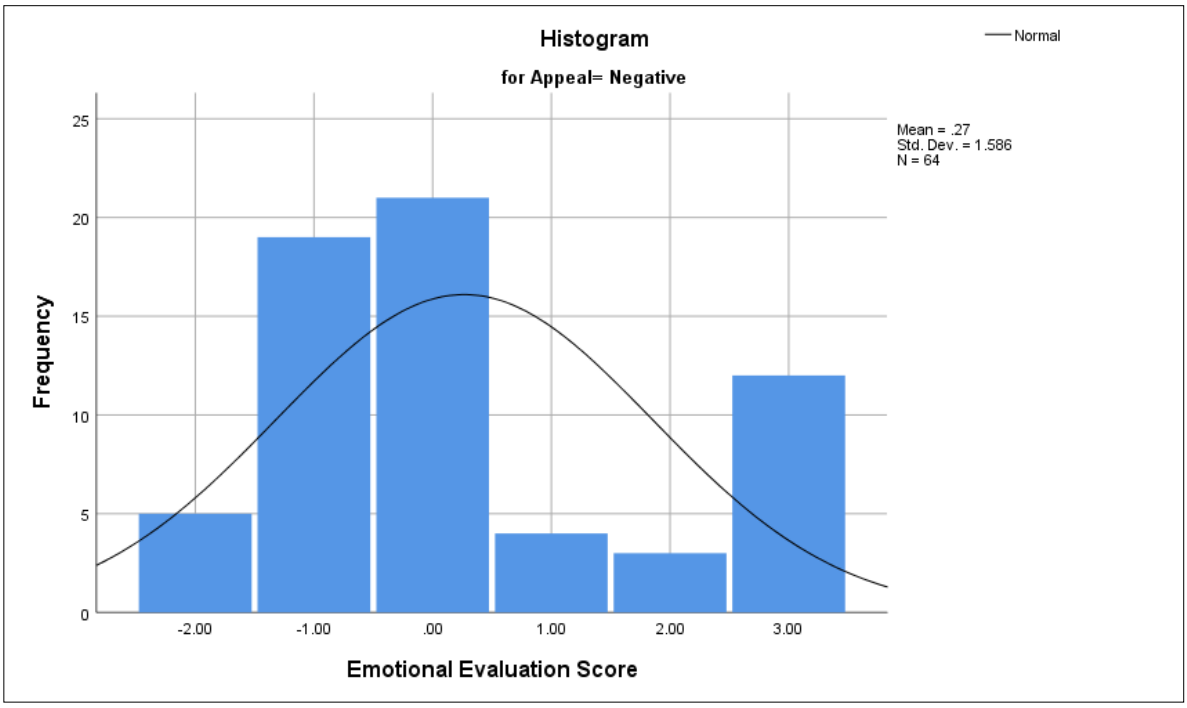
Boxplots for evaluation of bear smart messages (Q1) presented by messaging type (appeal)



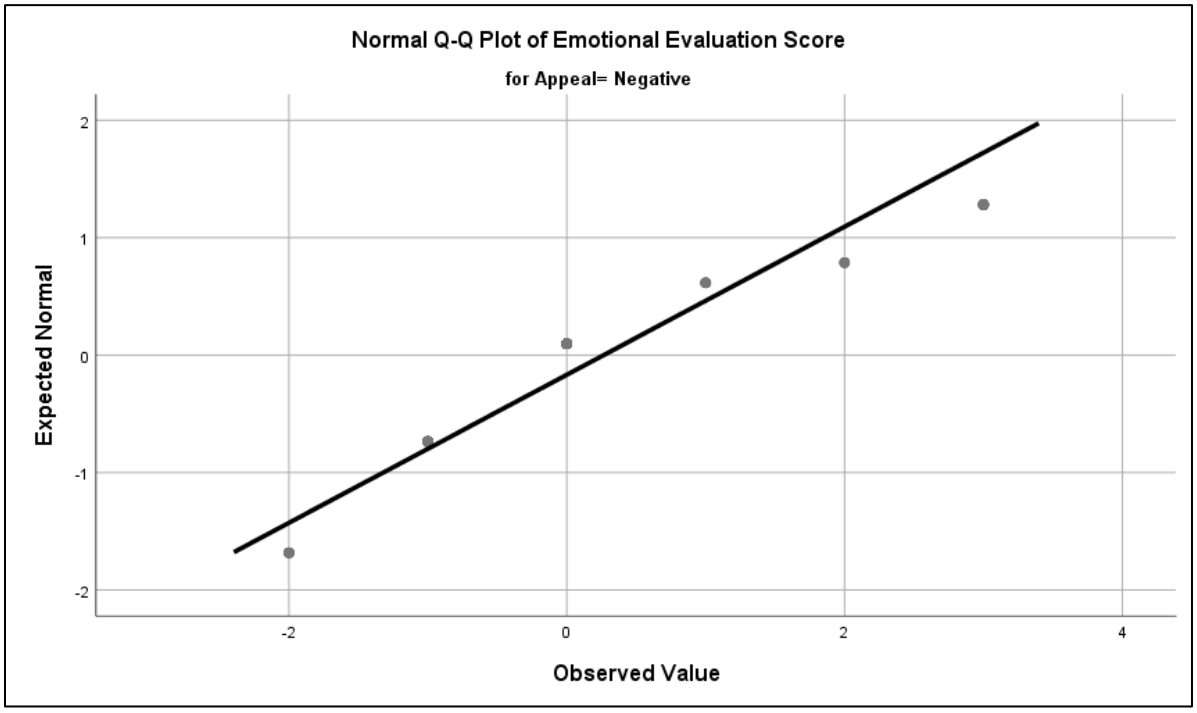
Histogram for the positive appeal group based on message evaluation scores



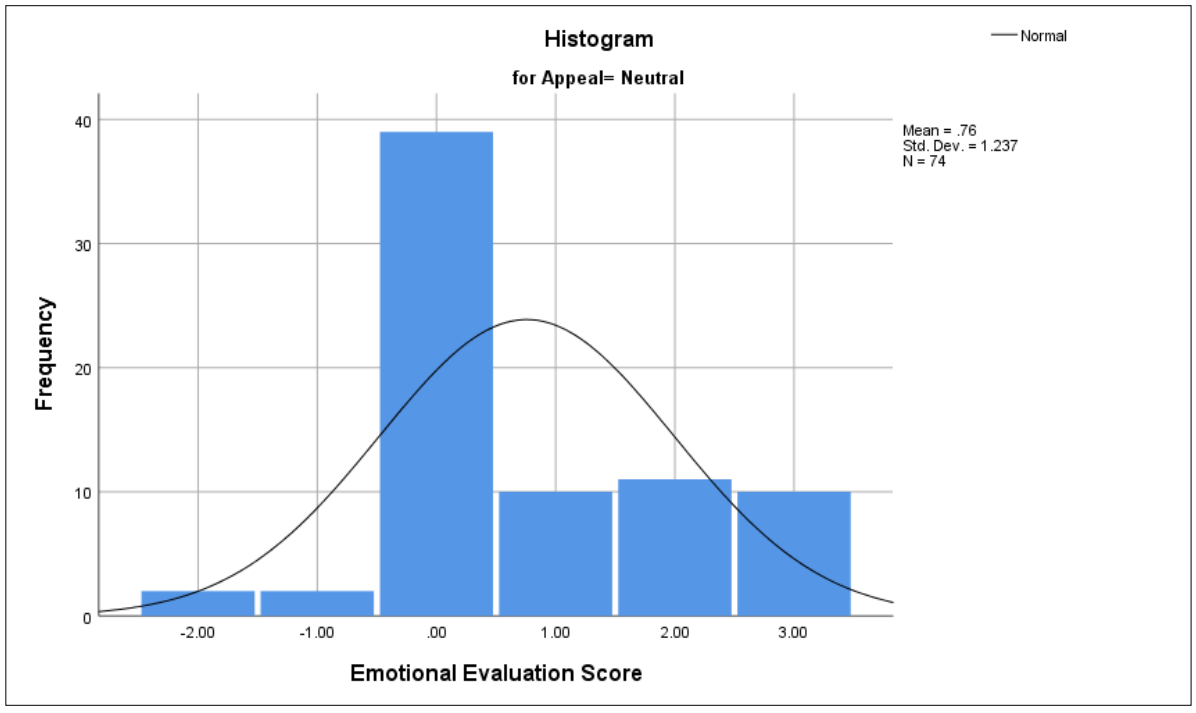
Q-Q Plot for the positive appeal group based on message evaluation scores



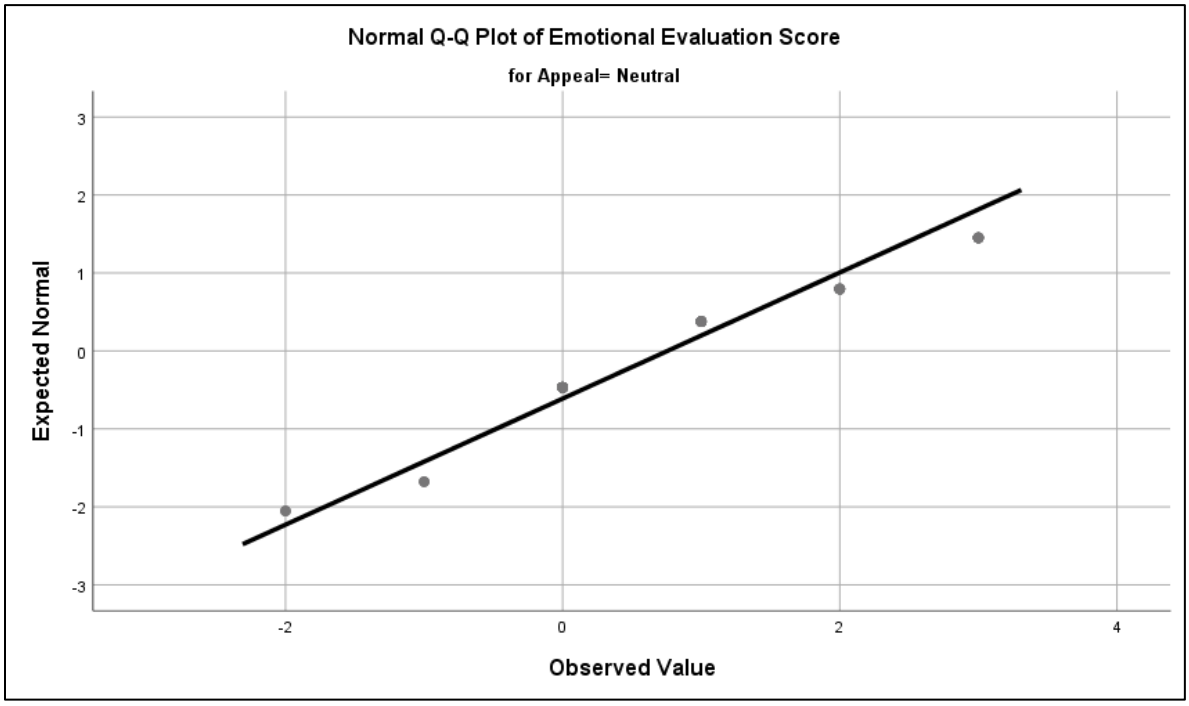
Histogram for the negative appeal group based on message evaluation scores



Q-Q Plot for the negative appeal group based on message evaluation scores



Histogram for the neutral appeal group based on message evaluation scores



Q-Q Plot for the neutral appeal group based on message evaluation scores

Appendix V - Effects of Treatment: Two-way ANOVA

Two-way ANOVA syntax for SPSS

```
UNIANOVA Behavioural_Intention_Original BY Treatment Area
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /SAVE=PRED RESID SRESID
  /PLOT=PROFILE(Treatment*Area Area*Treatment)
  /EMMEANS=TABLES(Treatment*Area)
  /PRINT=ETASQ DESCRIPTIVE HOMOGENEITY OPOWER
  /PLOT=RESIDUALS
  /CRITERIA=ALPHA(.05)
  /DESIGN=Treatment Area Treatment*Area.

UNIANOVA BI_LogTrans BY Treatment Area
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /SAVE=PRED RESID SRESID
  /PLOT=PROFILE(Treatment*Area Area*Treatment)
  /EMMEANS=TABLES(Treatment*Area)
  /PRINT=ETASQ DESCRIPTIVE HOMOGENEITY OPOWER
  /PLOT=RESIDUALS.

SORT CASES BY Area Treatment.
SPLIT FILE LAYERED BY Area Treatment.
EXAMINE VARIABLES=Behavioural_Intention_Original BI_LogTrans
  /PLOT BOXPLOT HISTOGRAM NPPLOT
  /COMPARE GROUPS
  /STATISTICS DESCRIPTIVES EXTREME
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.
```

Sample sizes for treatment groups

Treatment	**Sample Size**
Control Group	68
Messaging Group	211
Total	**279**

Sample sizes for area groups

Area	**Sample Size**
Agricultural	90
Residential	94
Recreational	95
Total	**279**

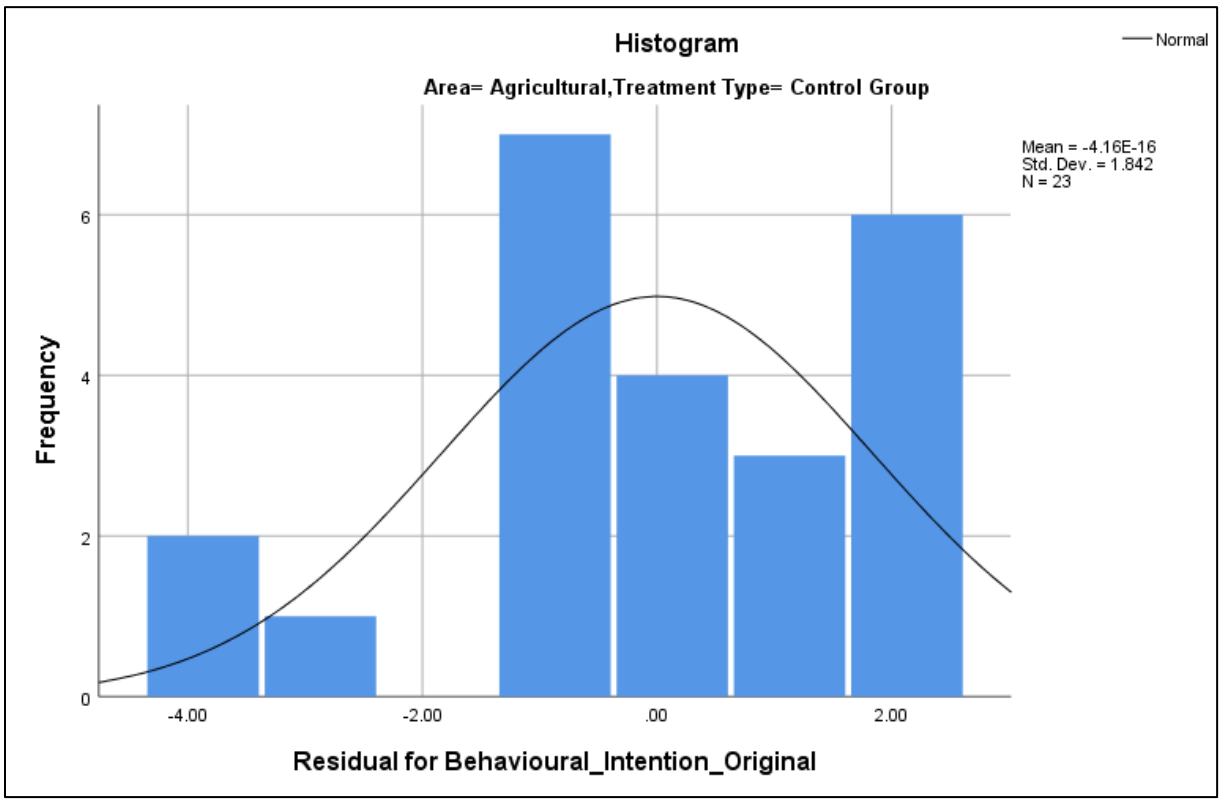
Sample sizes for treatment and area subgroups

Treatment	Area	Sample Size
Control	Agricultural	23
	Residential	24
	Recreational	21
Messaging	Agricultural	67
	Residential	70
	Recreational	74
Total		**279**

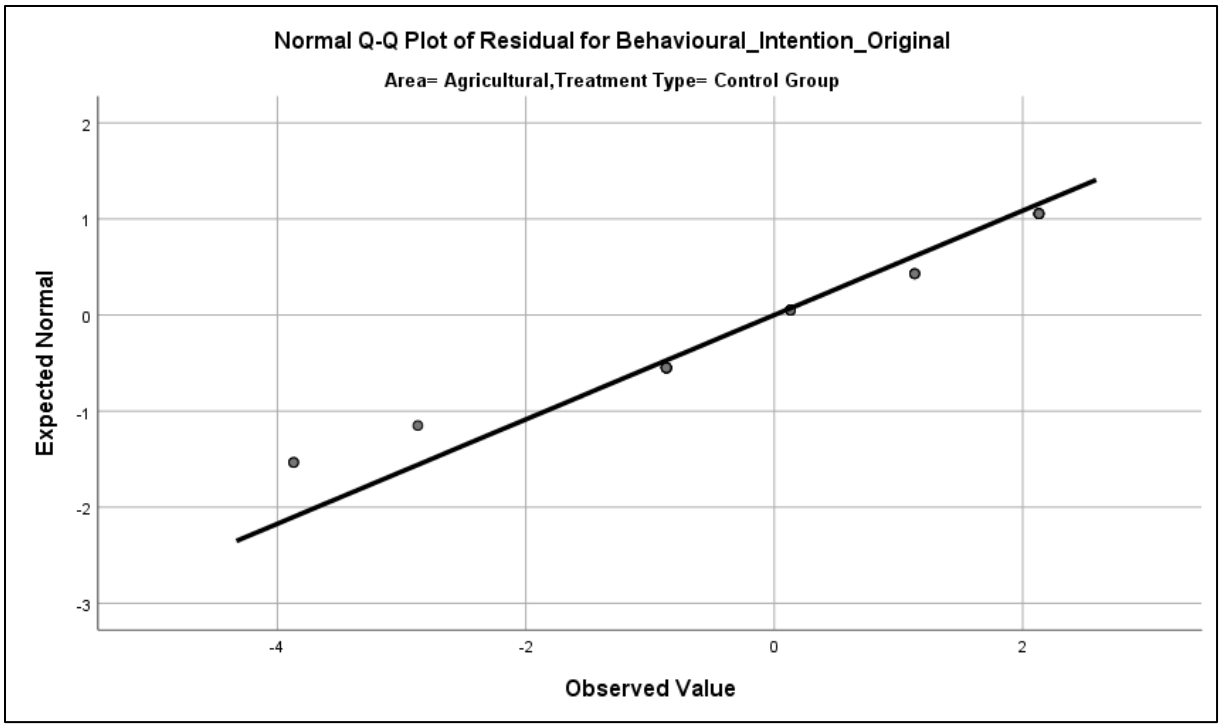
Skewness and kurtosis results for residuals of behavioural intention

Area Group	Treatment Group	Skewness Statistic	Std. Error	z-score[1]	Kurtosis Statistic	Std. Error	z-score[1]
Agricultural	Control	-0.652	0.481	-1.36	-0.087	0.935	-0.09
	Messaging	-1.120	0.293	-3.82	0.490	0.578	0.85
Residential	Control	-2.187	0.472	-4.63	5.293	0.918	5.77
	Messaging	-1.713	0.287	-5.97	2.496	0.566	4.41
Recreational	Control	-2.016	0.501	-4.02	2.728	0.972	2.81
	Messaging	-2.277	0.279	-8.16	5.023	0.552	9.10
Transformed Agricultural	Control	-0.346	0.481	-0.72	-1.125	0.935	-1.20
	Messaging	0.311	0.293	1.06	-1.317	0.578	-2.28
Transformed Residential	Control	1.234	0.472	2.61	0.233	0.918	0.25
	Messaging	0.937	0.287	3.26	-0.572	0.566	-1.01
Transformed Recreational	Control	1.791	0.501	3.57	1.487	0.972	1.53
	Messaging	1.512	0.279	5.42	0.937	0.552	1.70

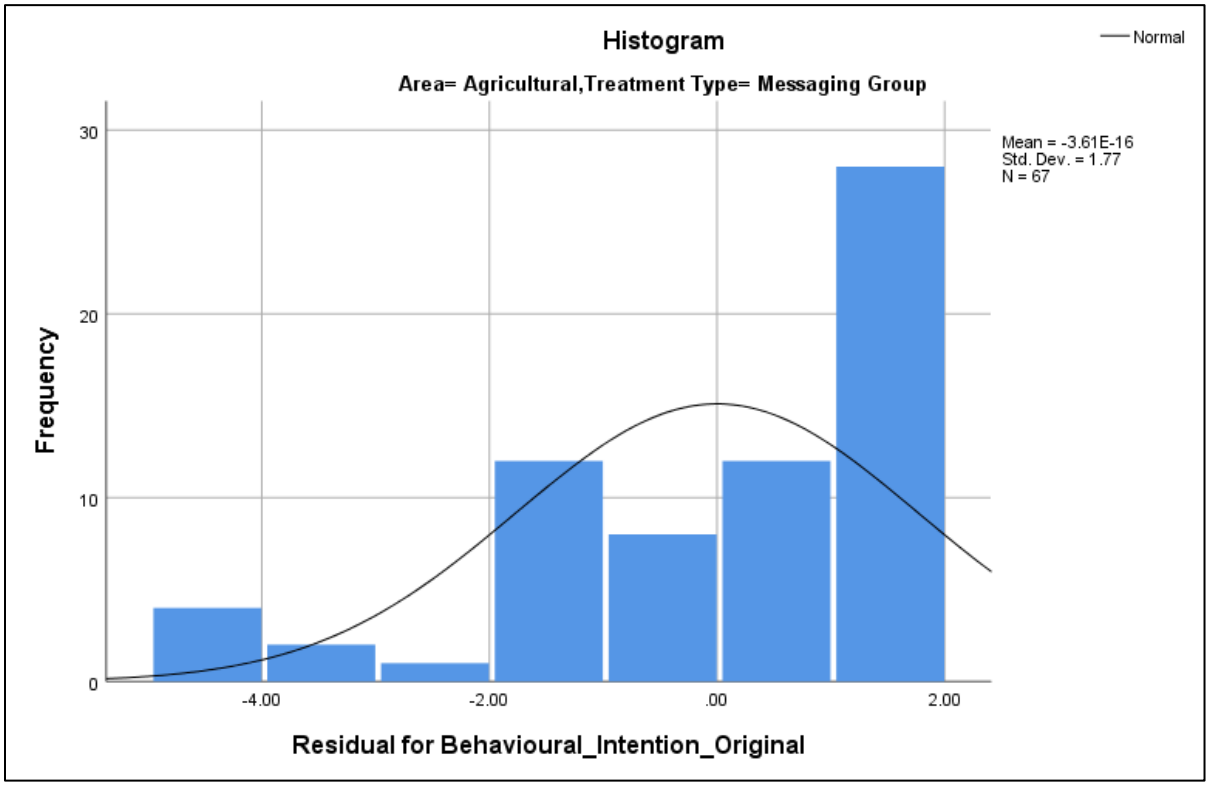
[1] z-scores within ± 2.58 indicate the presence of normality, based on a 95% CI, $p = 0.001$



Histogram for the agricultural group and control group based on behavioural intention scores

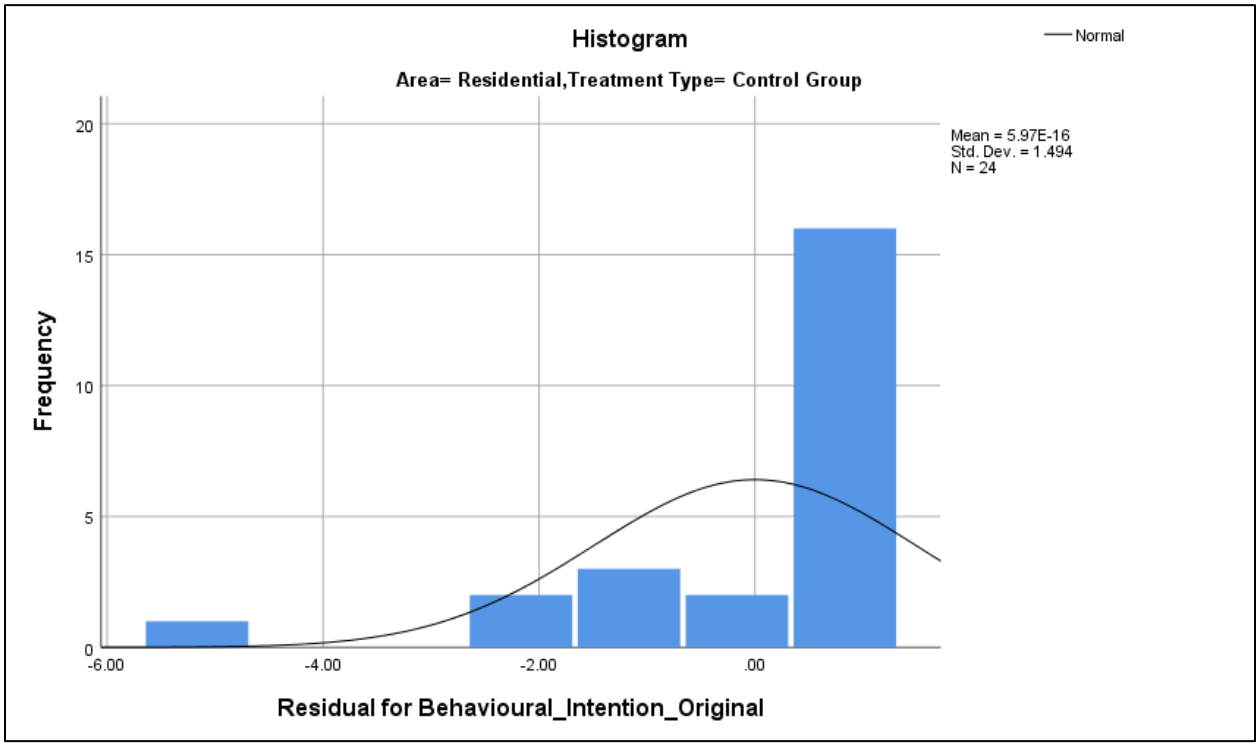


Q-Q Plot for the agricultural group and control group based on behavioural intention scores



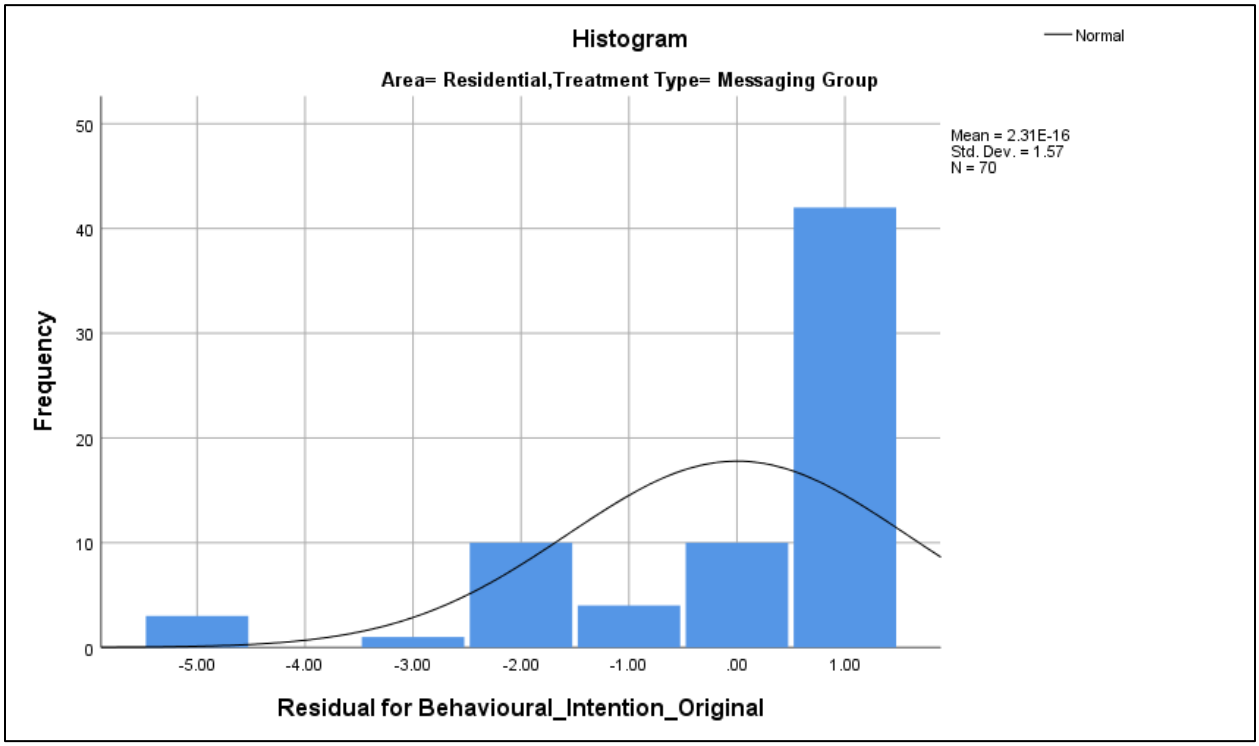
Histogram for the agricultural group and messaging group based on behavioural intention scores

Q-Q Plot for the agricultural group and messaging group based on behavioural intention scores



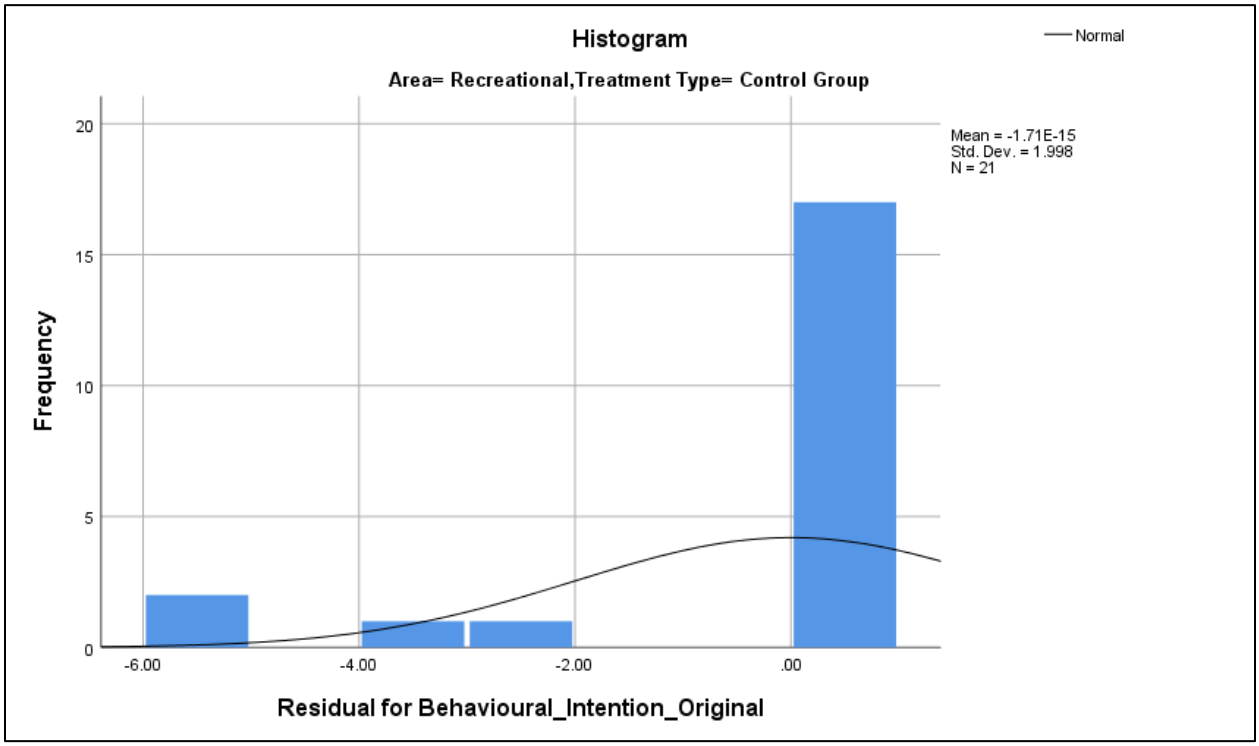
Histogram for the residential group and control group based on behavioural intention scores

Q-Q Plot for the residential group and control group based on behavioural intention scores

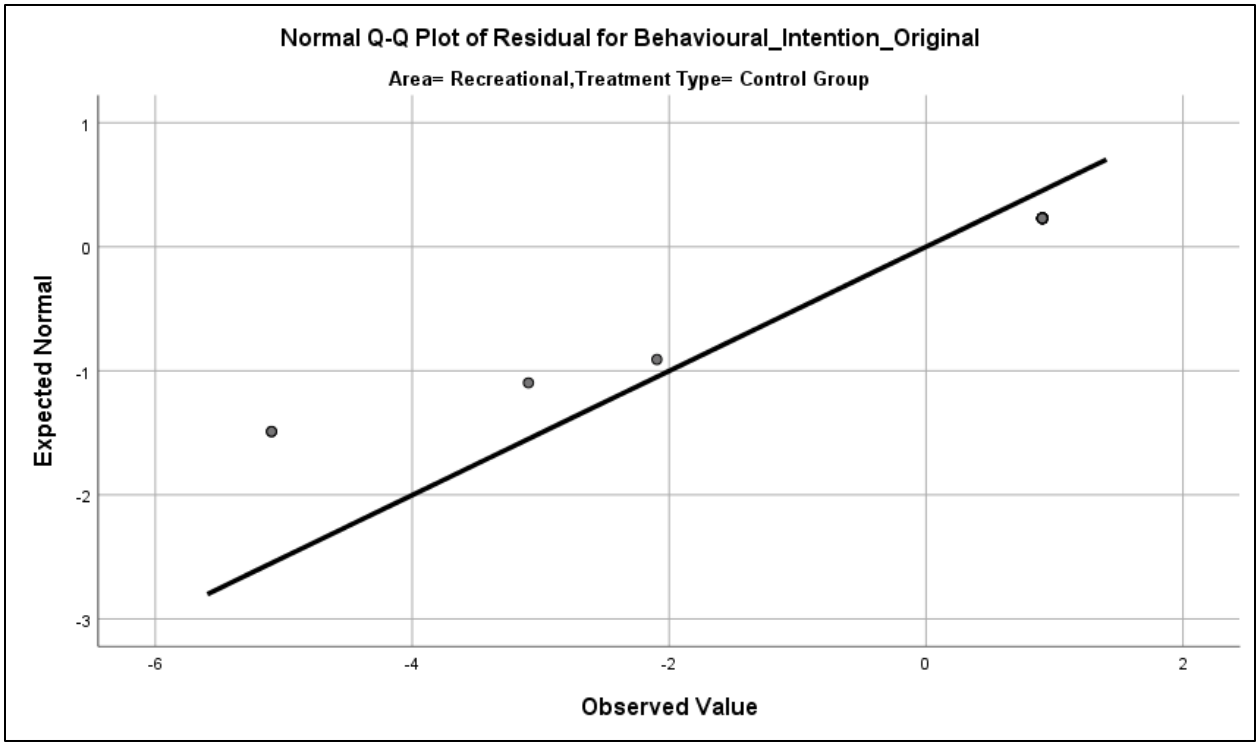


Histogram for the residential group and messaging group based on behavioural intention scores

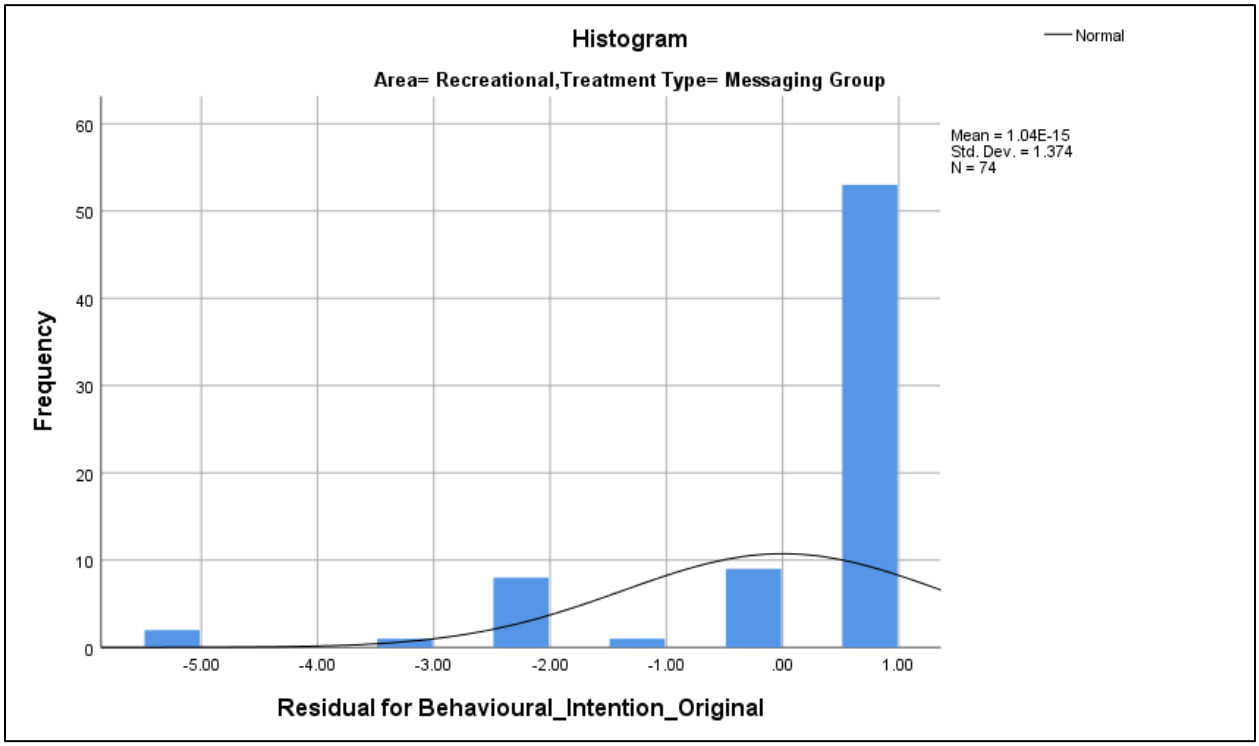
Q-Q Plot for the residential group and messaging group based on behavioural intention scores



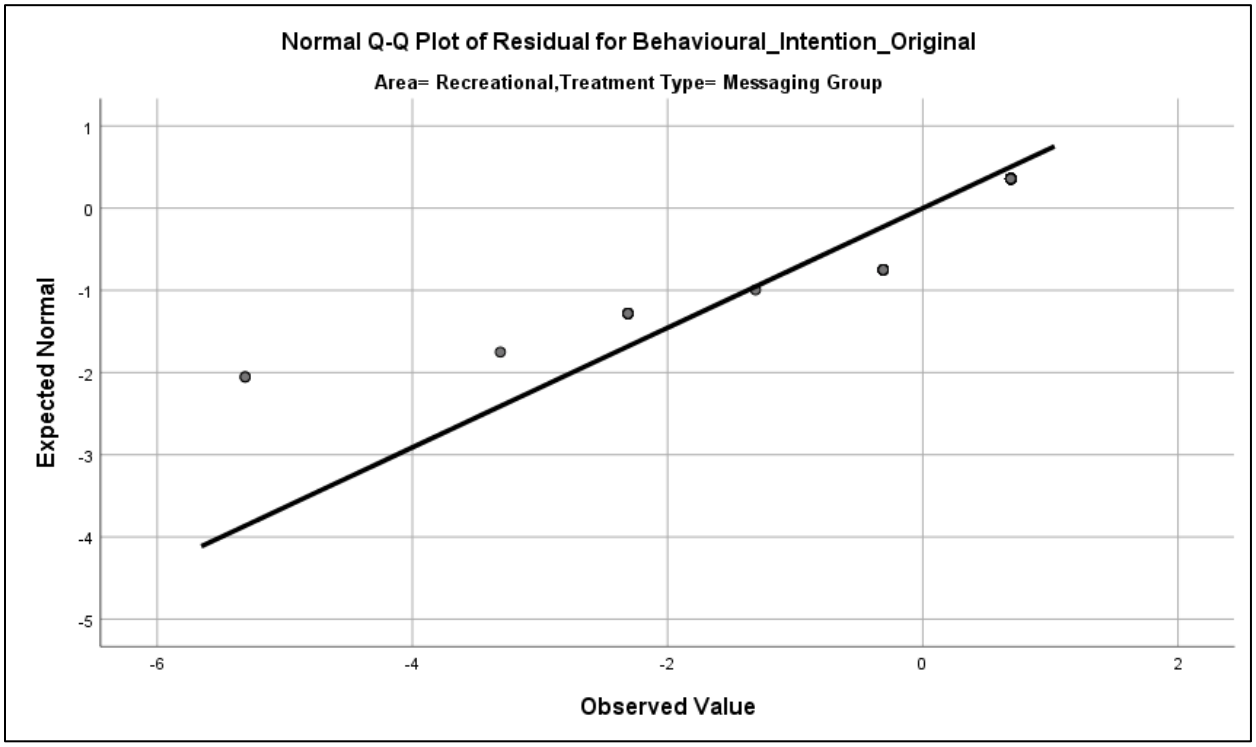
Histogram for the recreational group and control group based on behavioural intention scores



Q-Q Plot for the recreational group and control group based on behavioural intention scores



Histogram for the recreational group and messaging group based on behavioural intention scores



Q-Q Plot for the recreational group and messaging group based on behavioural intention scores

Appendix VI - Theory of Planned Behaviour: One-way ANOVAs

Syntax for three one-way ANOVA models in SPSS

Model 1:

```
BOOTSTRAP
  /SAMPLING METHOD=SIMPLE
  /VARIABLES TARGET=Attitude_Belief INPUT=Area
  /CRITERIA CILEVEL=95 CITYPE=PERCENTILE NSAMPLES=10000
  /MISSING USERMISSING=EXCLUDE.

ONEWAY Attitude_Belief BY Area
  /STATISTICS DESCRIPTIVES EFFECTS HOMOGENEITY WELCH
  /PLOT MEANS
  /MISSING ANALYSIS
  /POSTHOC=GH ALPHA(0.05).
```

Model 2:

```
UNIANOVA Social_Norm BY Area
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /POSTHOC=Area(LSD)
  /PLOT=PROFILE(Area) TYPE=LINE ERRORBAR=CI MEANREFERENCE=NO YAXIS=AUTO
  /EMMEANS=TABLES(Area) COMPARE ADJ(LSD)
  /PRINT ETASQ DESCRIPTIVE LOF PARAMETER HOMOGENEITY OPOWER
  /PLOT=RESIDUALS
  /CRITERIA=ALPHA(.05)
  /DESIGN=Area.
```

Model 3:

```
*Nonparametric Tests: Independent Samples.
NPTESTS
  /INDEPENDENT TEST (Perceived_Control) GROUP (Area) KRUSKAL_WALLIS(COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Sample sizes for area groups for all models

Area	**Model 1: Attitude and belief**	**Model 2: Social Norm**	**Model 3: Perceived Control**
Agricultural	90	90	89
Residential	94	94	93
Recreational	95	95	95
Total	**279**	**279**	**277**

Skewness and kurtosis results for attitude and belief by group

Area Group	Skewness Statistic	Std. Error	z-score[1]	Kurtosis Statistic	Std. Error	z-score[1]
Agriculture	-1.269	0.254	-5.00	0.907	0.503	1.80
Residential	-1.925	0.249	-7.73	3.285	0.493	6.66
Recreational	-2.314	0.247	-9.37	5.356	0.490	10.93

[1] z-scores within ± 2.58 indicate the presence of normality, based on a 95% CI, $p = 0.001$

Skewness and kurtosis results for social norm by group

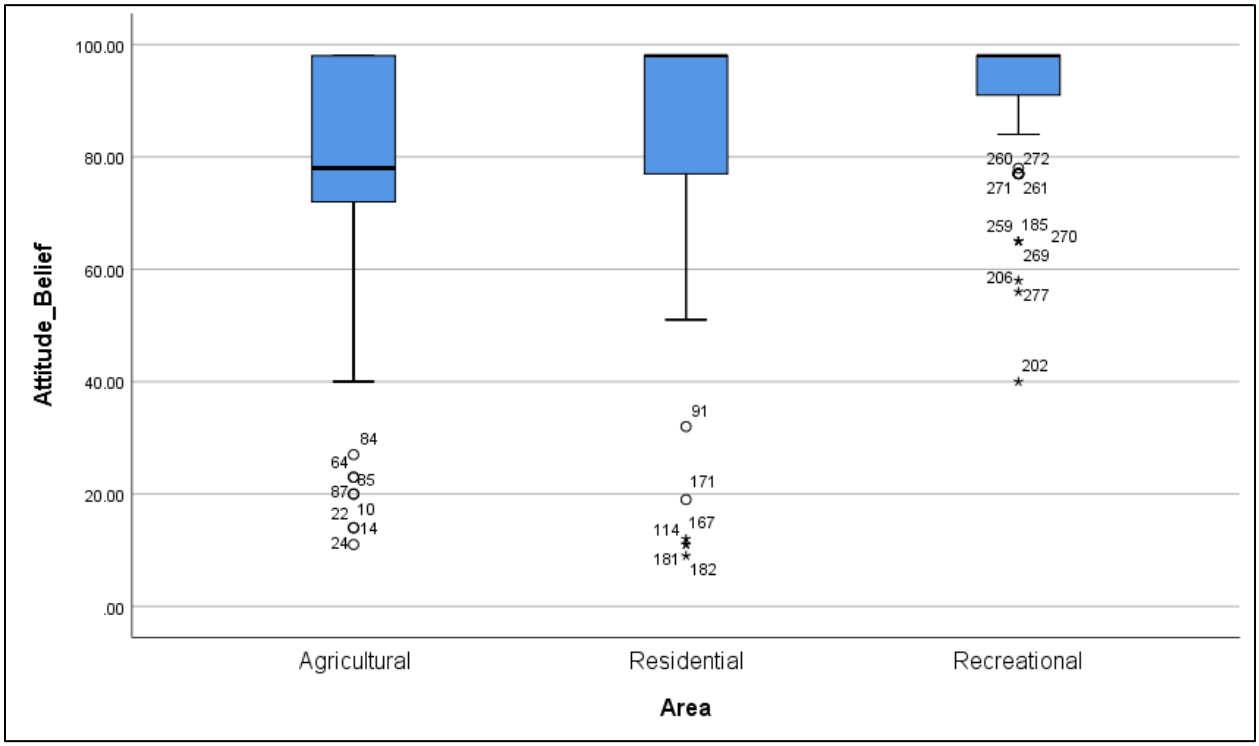
Area Group	Skewness Statistic	Std. Error	z-score[1]	Kurtosis Statistic	Std. Error	z-score[1]
Agriculture	0.440	0.254	1.73	-0.575	0.503	-1.14
Residential	-0.150	0.249	-0.60	-0.741	0.493	-1.50
Recreational	-0.668	0.247	-2.70	-0.059	0.490	-0.12

[1] z-scores within ± 2.58 indicate the presence of normality, based on a 95% CI, $p = 0.001$

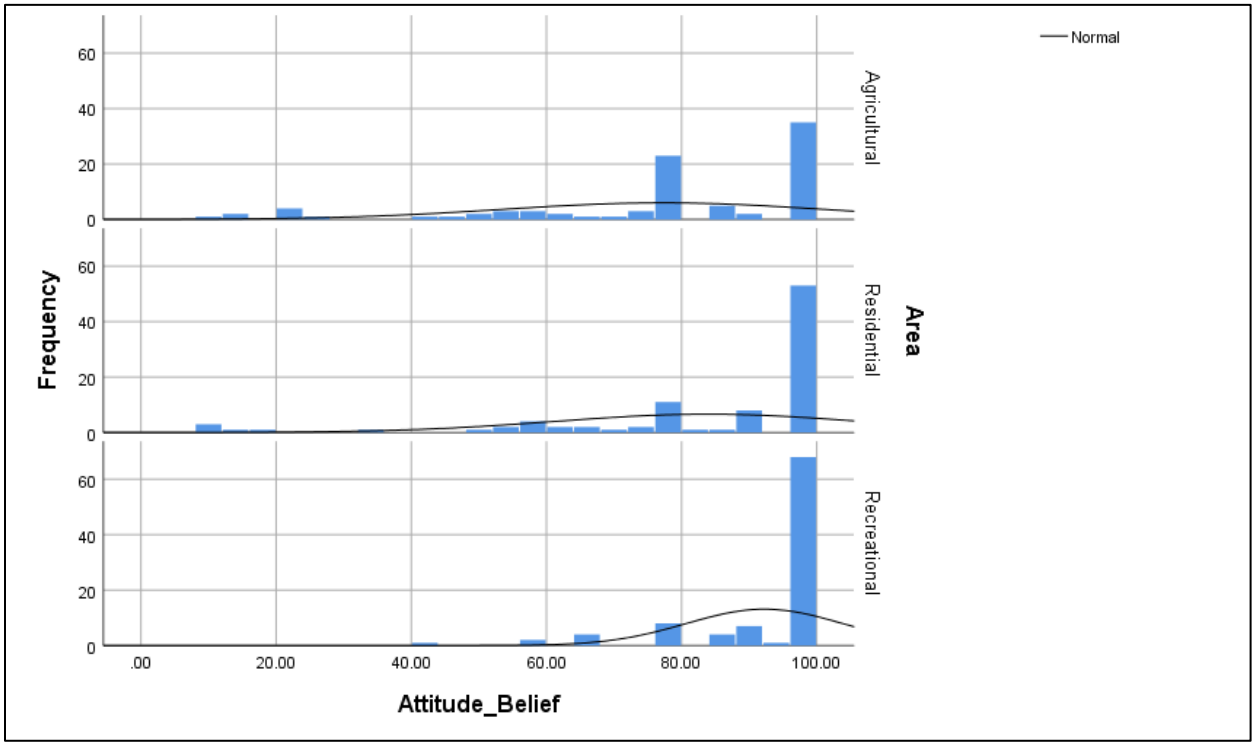
Skewness and kurtosis results for perceived control by group

Area Group	Skewness Statistic	Std. Error	z-score[1]	Kurtosis Statistic	Std. Error	z-score[1]
Agriculture	-1.007	0.255	-3.95	0.766	0.506	1.51
Residential	-1.986	0.250	-7.94	4.659	0.495	9.41
Recreational	-2.670	0.247	-10.81	9.365	0.490	19.11

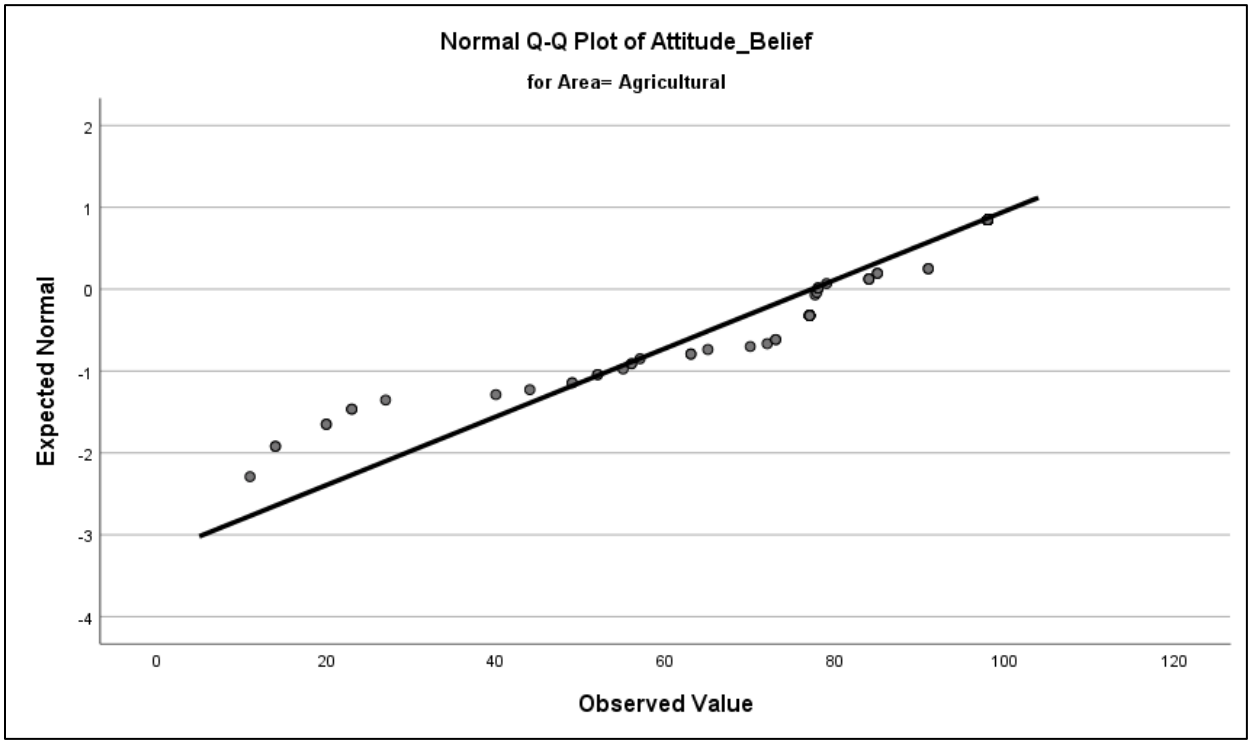
[1] z-scores within ± 2.58 indicate the presence of normality, based on a 95% CI, $p = 0.001$



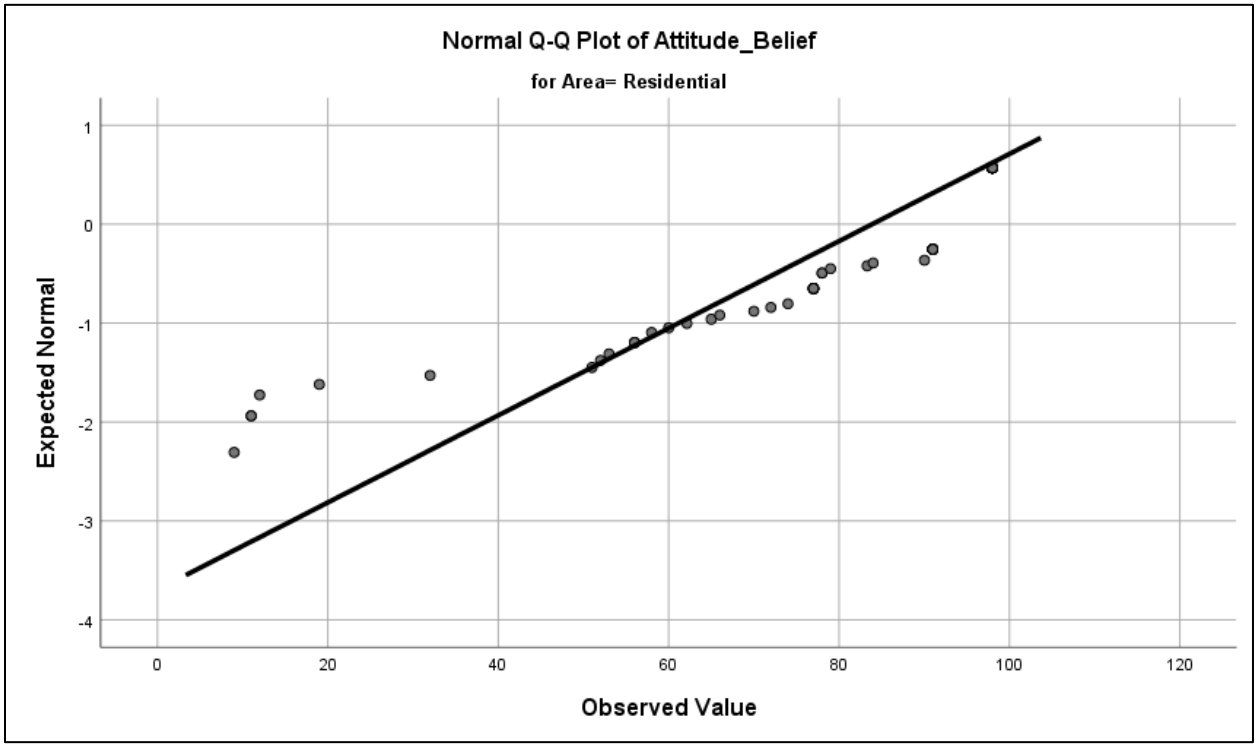
Model 1: Boxplots by area group based on attitude and belief



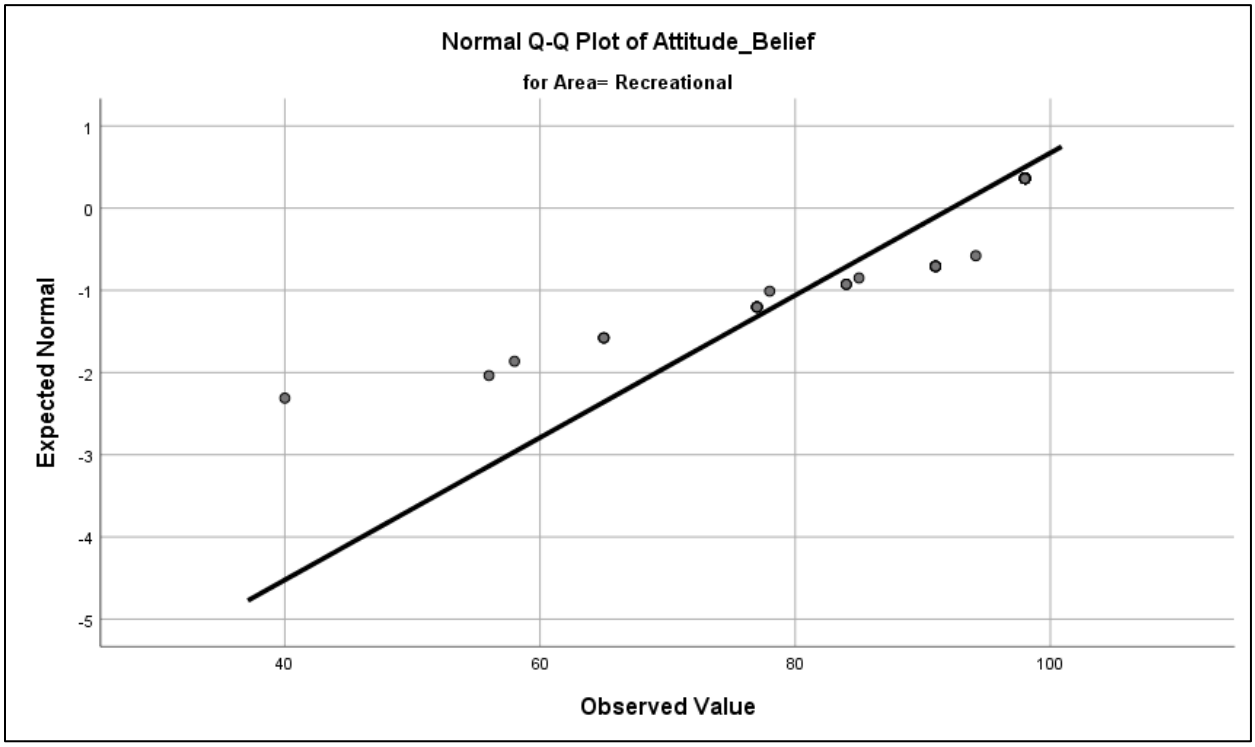
Model 1: Histograms by area group based on attitude and belief



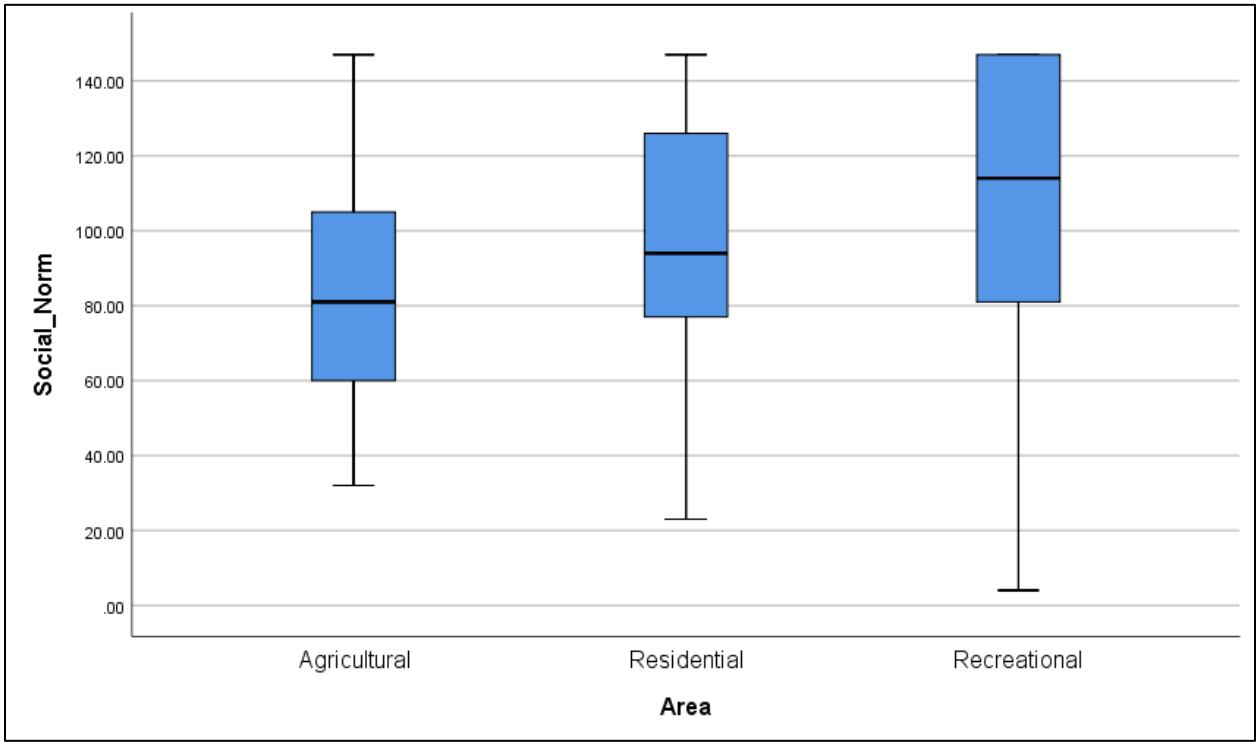
Model 1: Q-Q Plot for the agricultural group based on attitude and belief



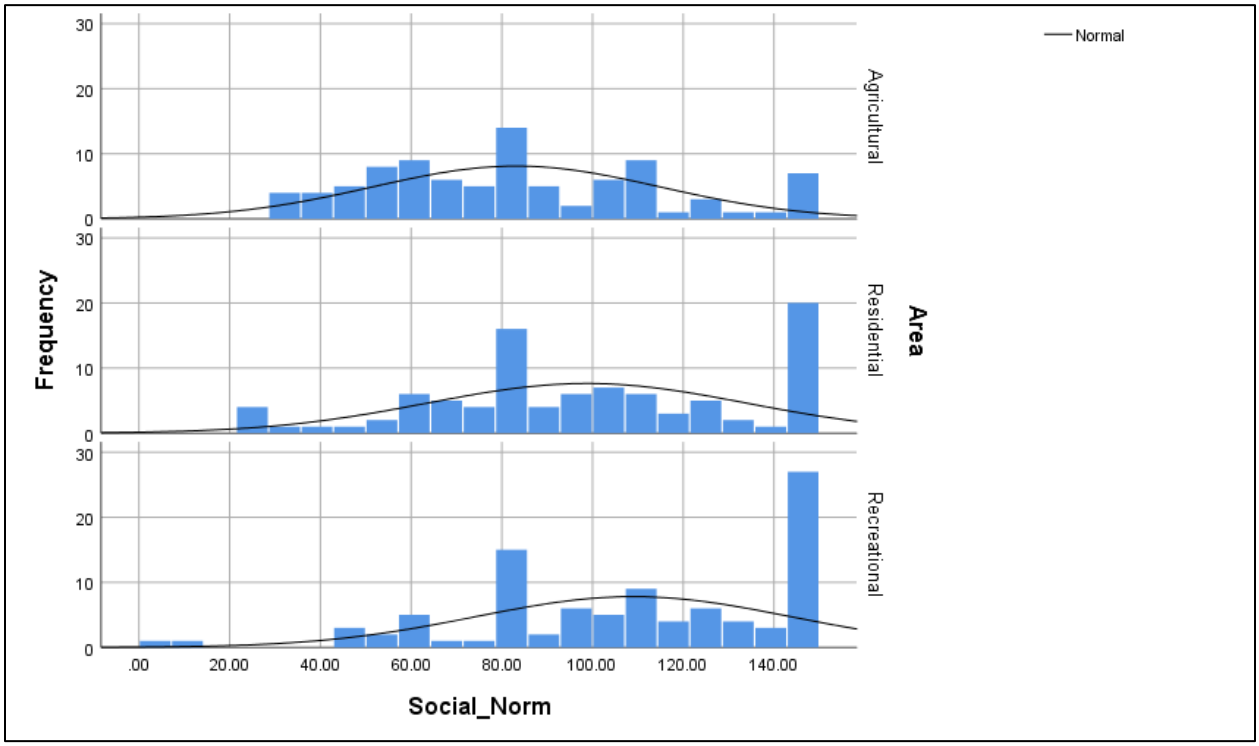
Model 1: Q-Q Plot for the residential group based on attitude and belief



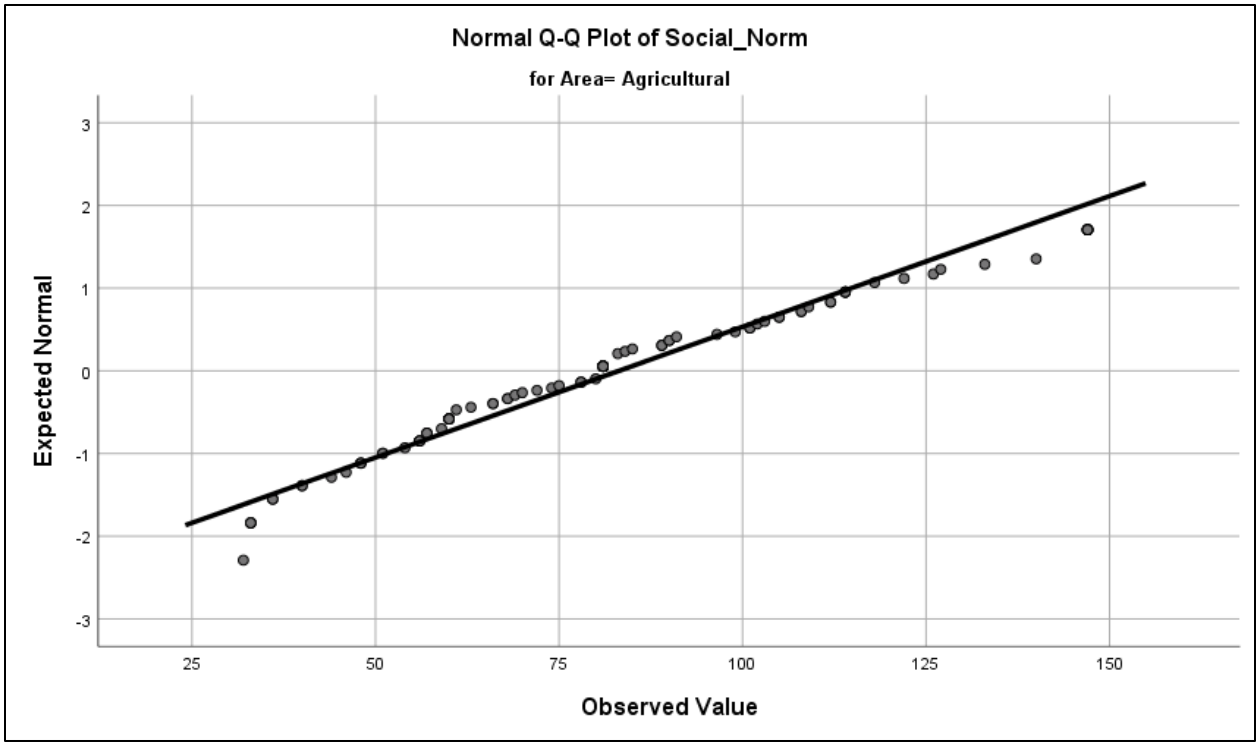
Model 1: Q-Q Plot for the recreational group based on attitude and belief



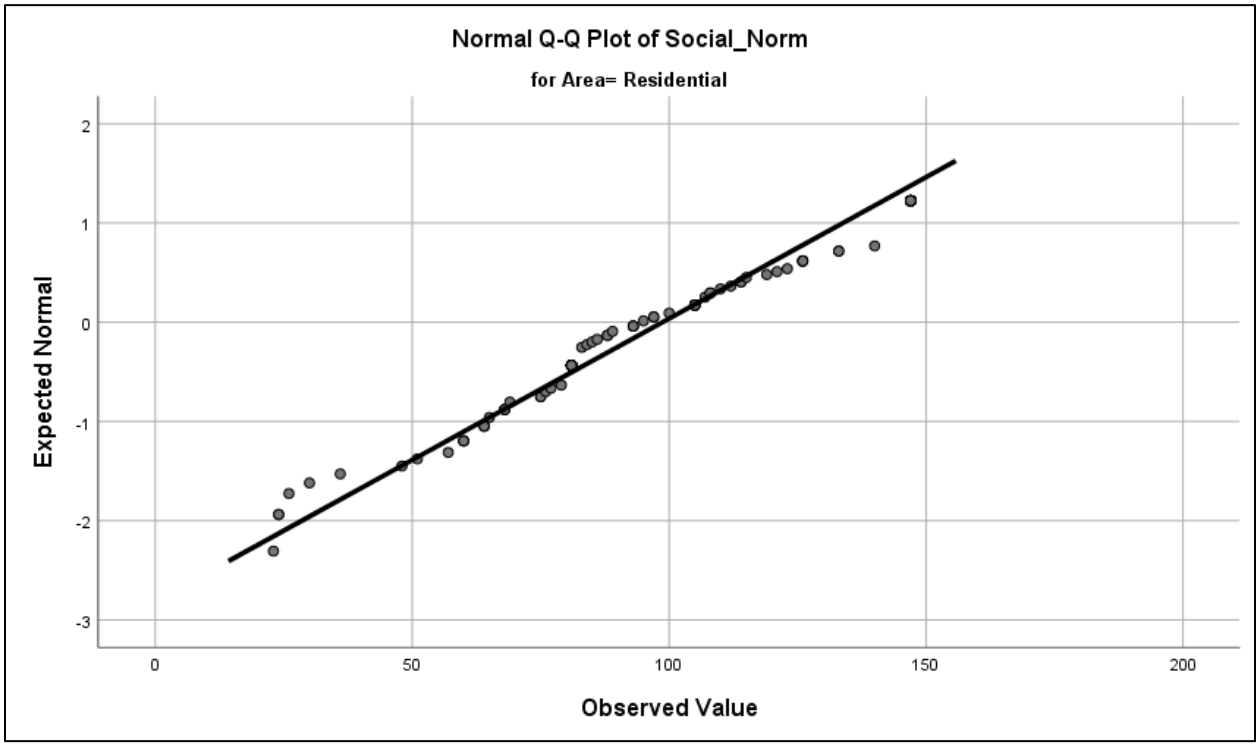
Model 2: Boxplots for area groups based on social norm



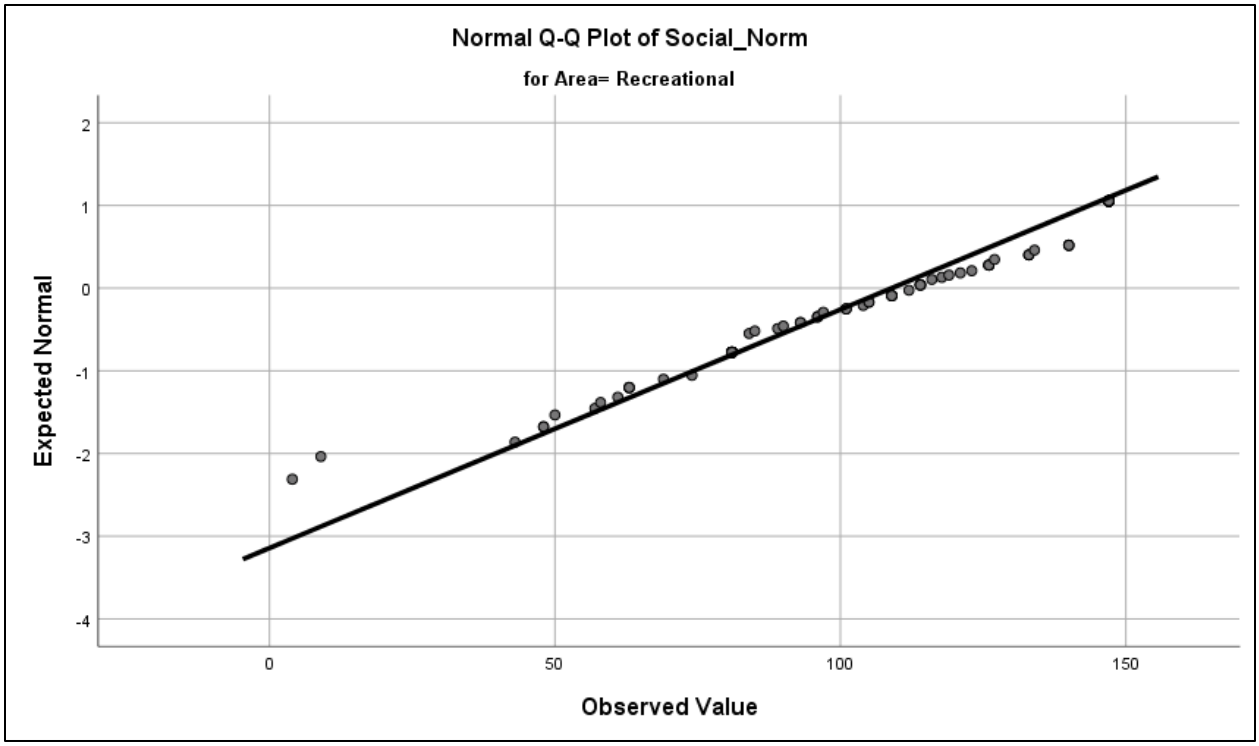
Model 2: Histograms for area groups based on social norm



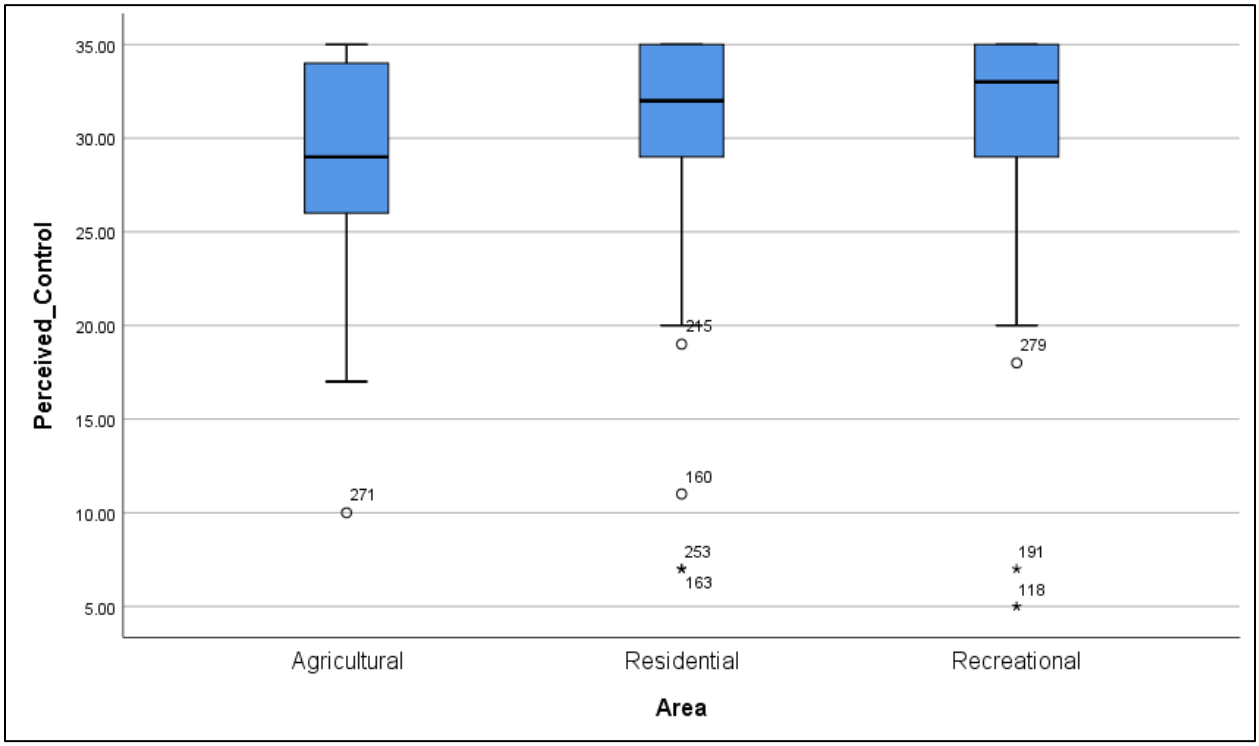
Model 2: Q-Q Plots for the agricultural area group based on social norm



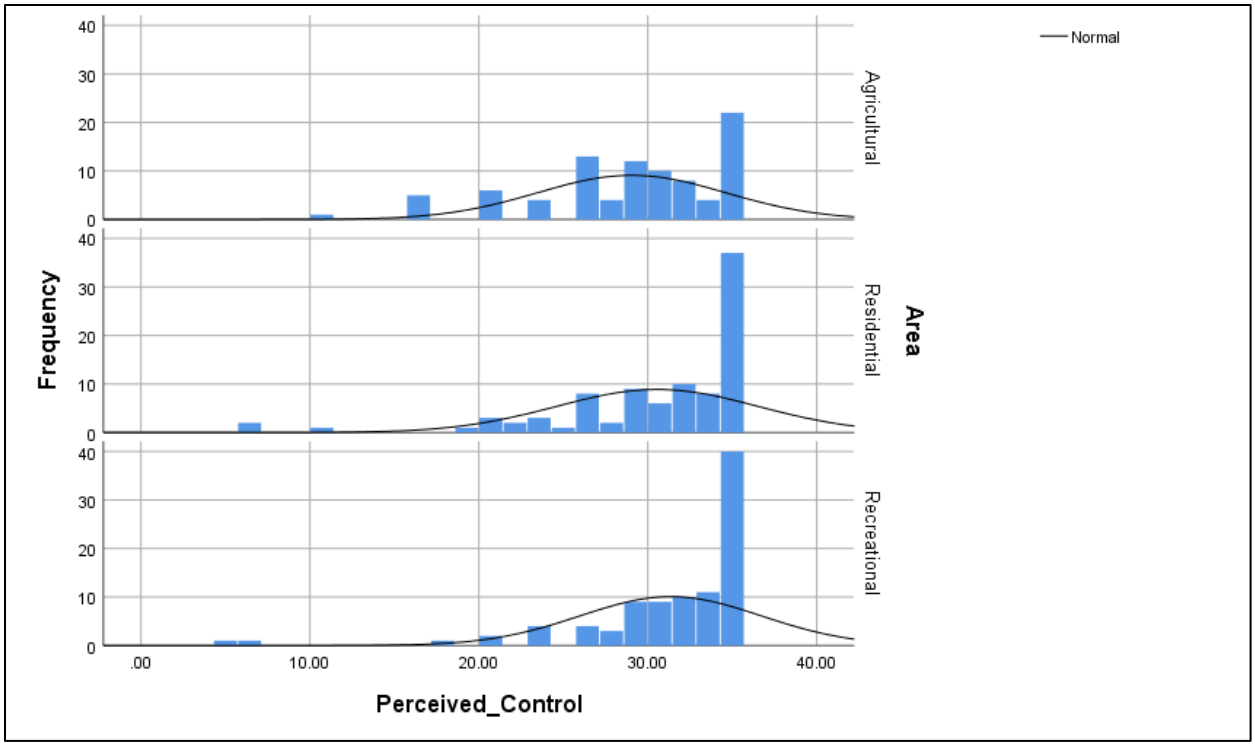
Model 2: Q-Q Plots for the residential area group based on social norm



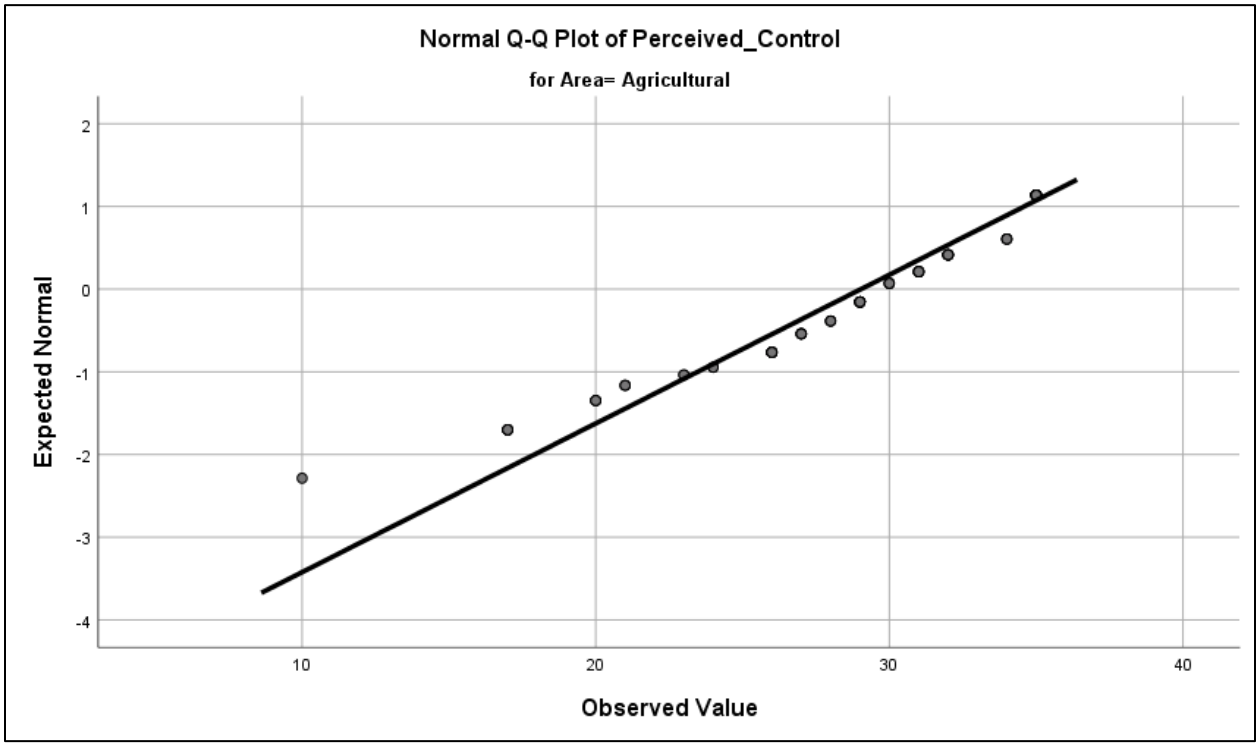
Model 2: Q-Q Plots for the recreational area group based on social norm



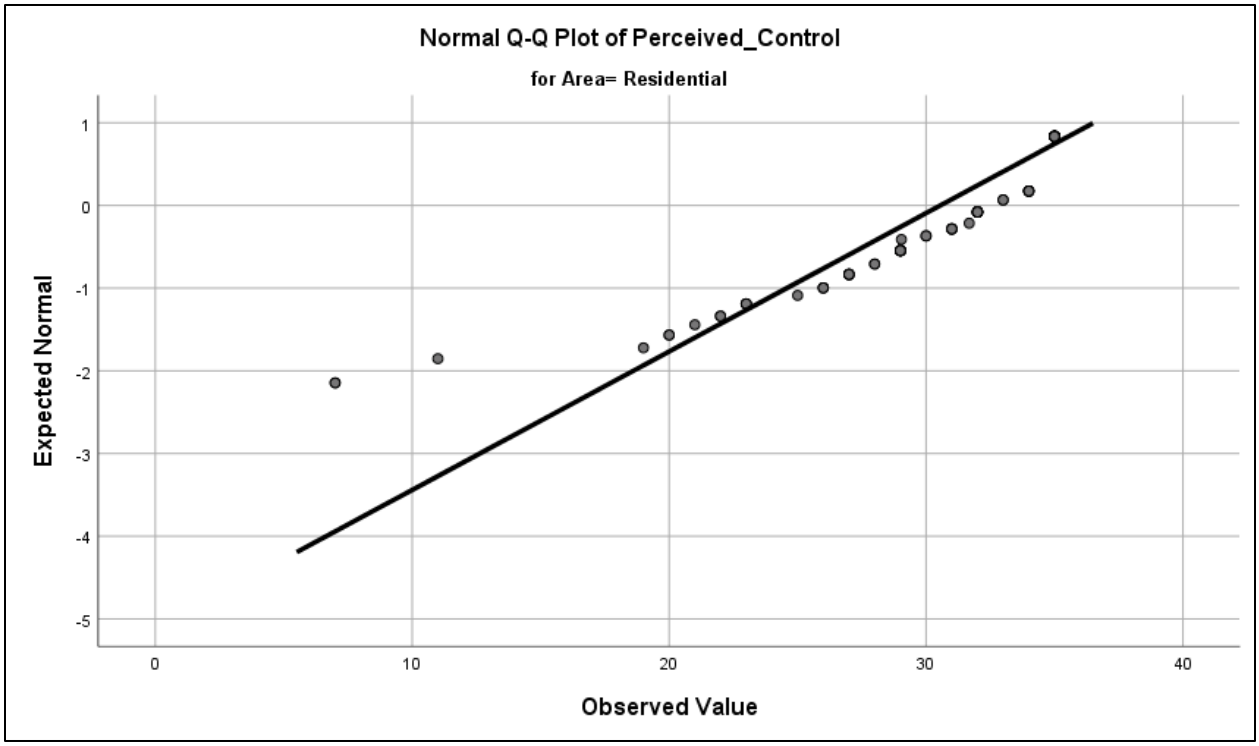
Model 3: Box plots by area group based on perceived control



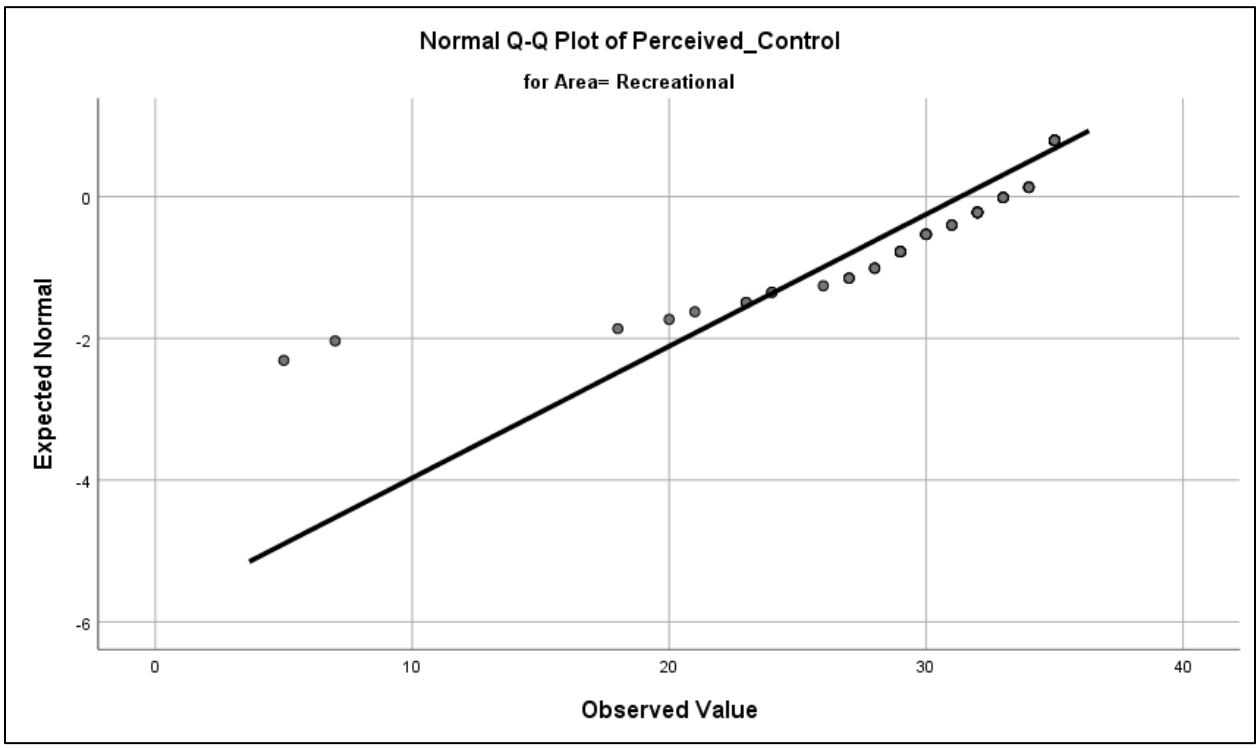
Model 3: Histogram for area groups based on perceived control



Model 3: Q-Q Plot for the agricultural group based on perceived control



Model 3: Q-Q Plot for the residential group based on perceived control



Model 3: Q-Q Plot for the recreational group based on perceived control

Appendix VII - Theory of Planned Behaviour: Standard Multiple Regression

Syntax for four standard multiple regression models in SPSS

Model 1:

```
REGRESSION
/DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT NAttitud
  /METHOD=ENTER Residential_Area Recreational_Area
  /PARTIALPLOT ALL
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3)
  /SAVE PRED COOK LEVER SRESID SDRESID.
```

Model 2:

```
REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Social_Norm
  /METHOD=ENTER Recreational_Area Residential_Area
  /PARTIALPLOT ALL
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3)
  /SAVE PRED COOK LEVER SRESID SDRESID.
```

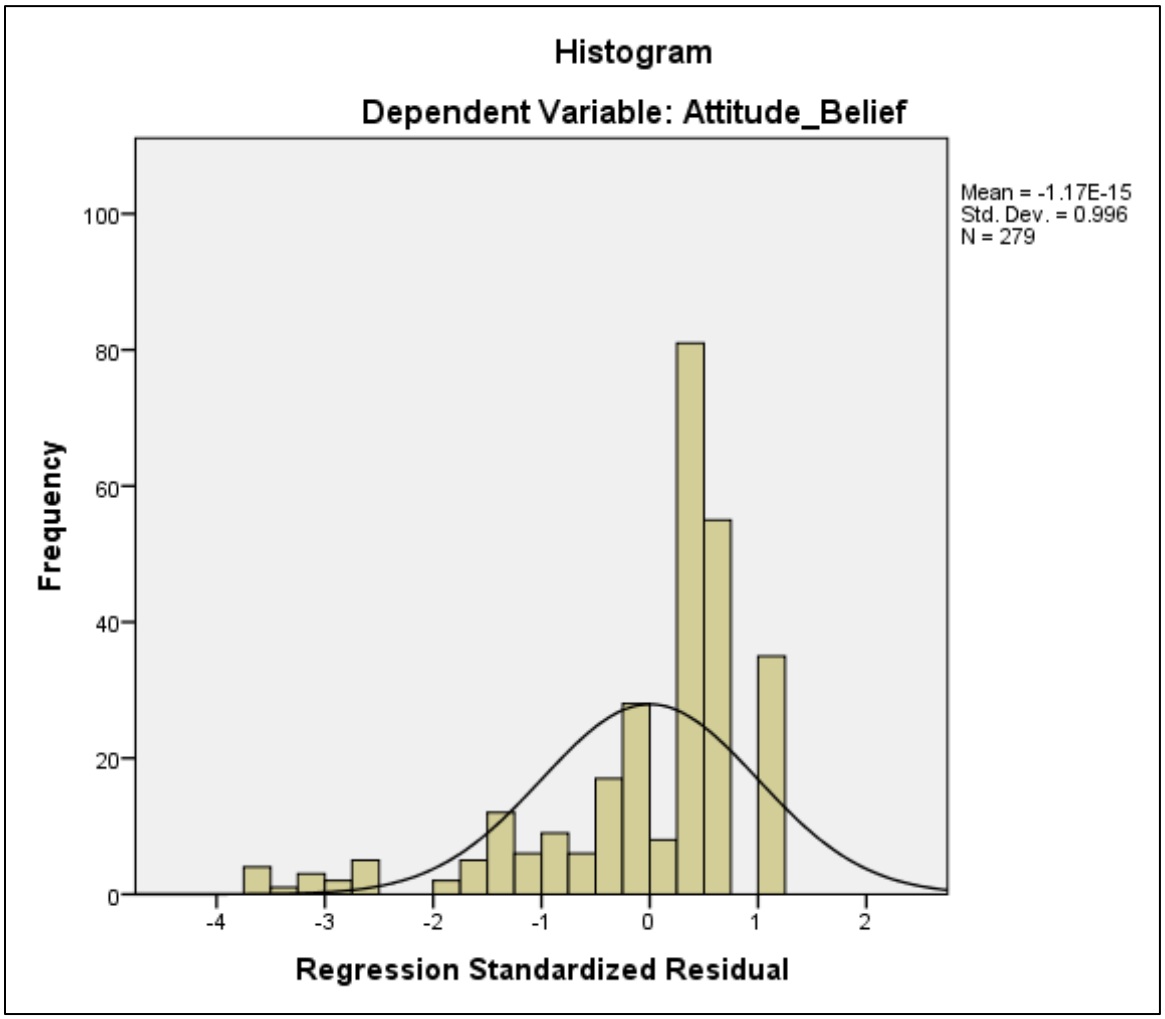
Model 3

```
REGRESSION
/DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT NPerceiv
  /METHOD=ENTER Residential_Area Recreational_Area
  /PARTIALPLOT ALL
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3)
```

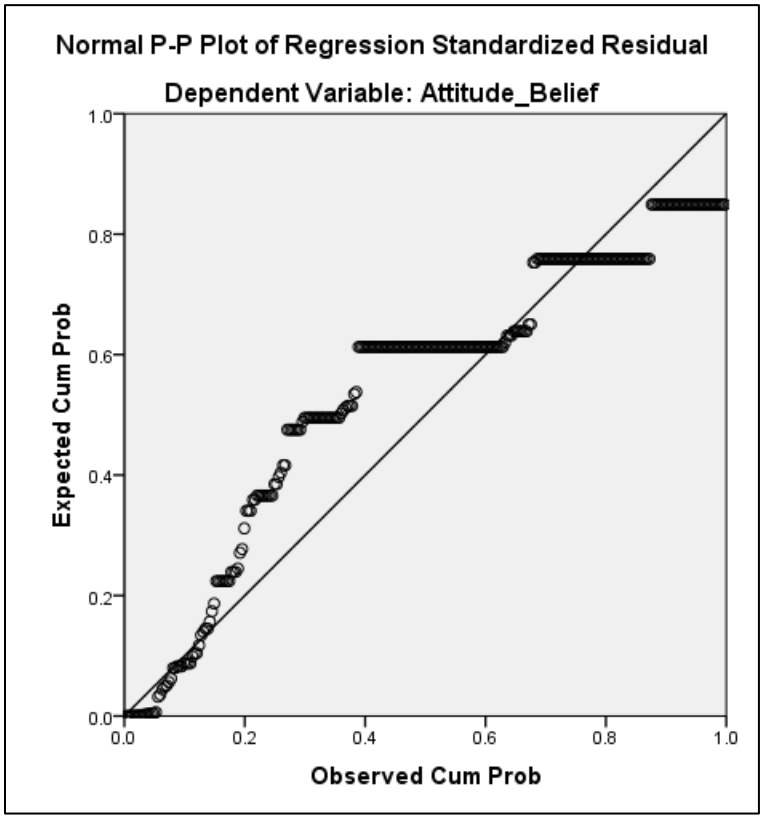
/SAVE PRED COOK LEVER SRESID SDRESID.

Model 4:

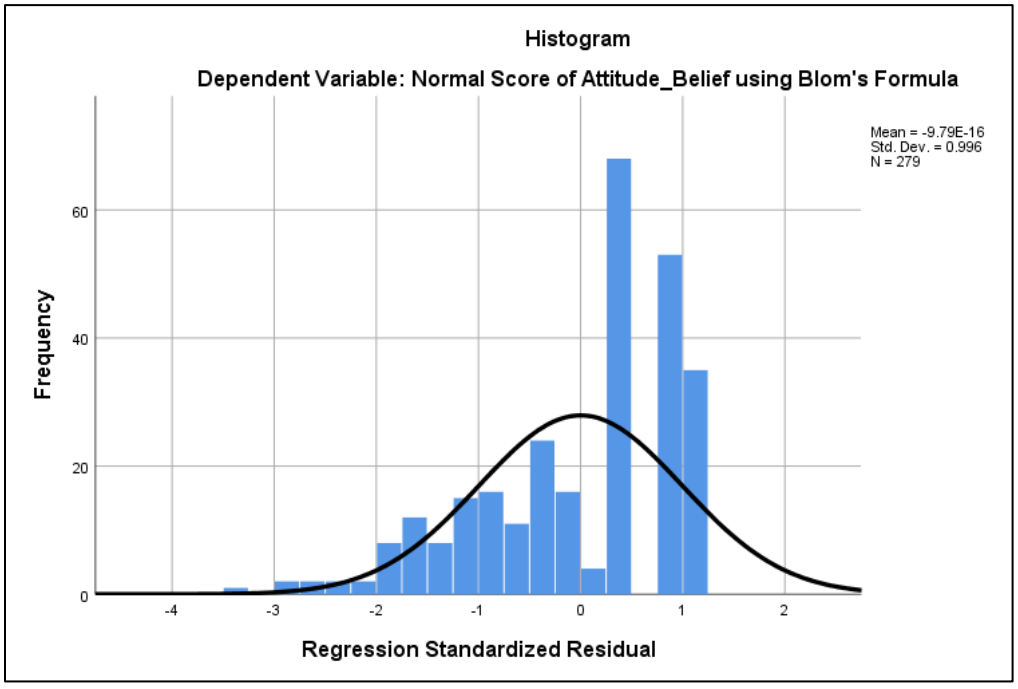
```
REGRESSION
/DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Behavioural_Intention_Original
  /METHOD=ENTER Residential_Area Recreational_Area NPerceiv NAttitud Social_Norm
  /PARTIALPLOT ALL
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3)
  /SAVE PRED COOK LEVER SRESID SDRESID.
```



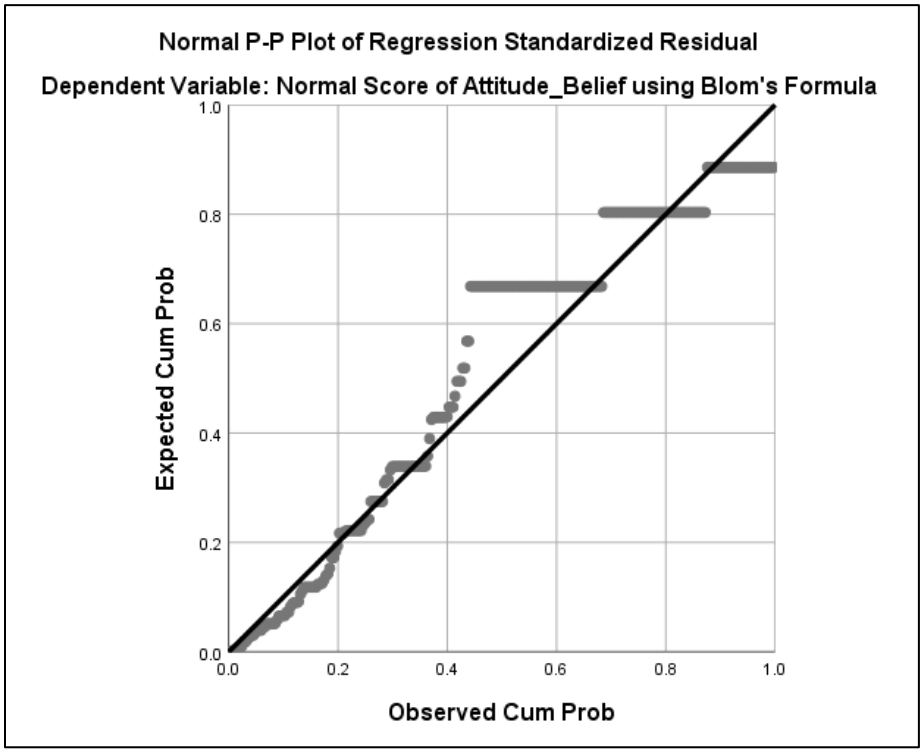
Model 1: histogram featuring the distribution of the untransformed dependant variable



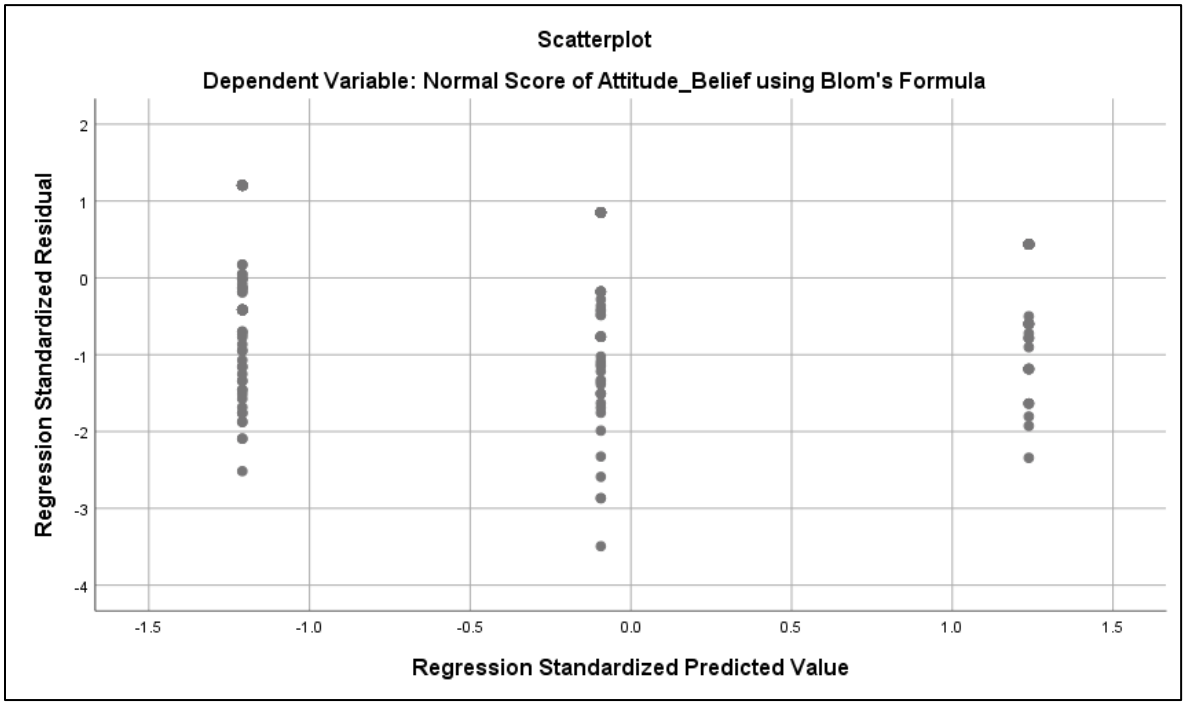
Model 1: P-P Plot featuring the distribution of the untransformed dependant variable



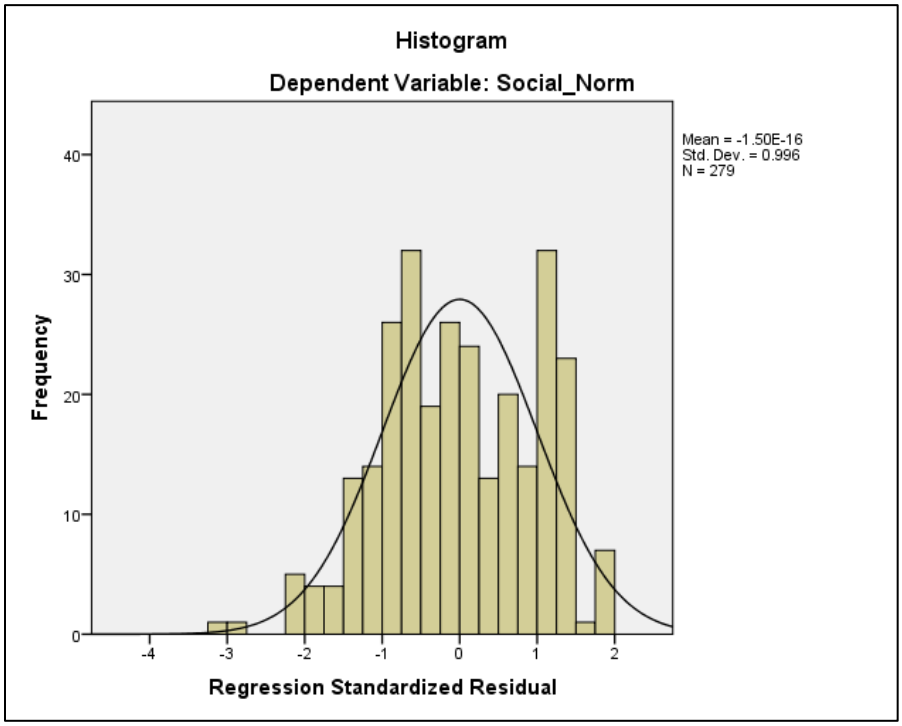
Model 1: histogram featuring the distribution of the transformed dependant variable



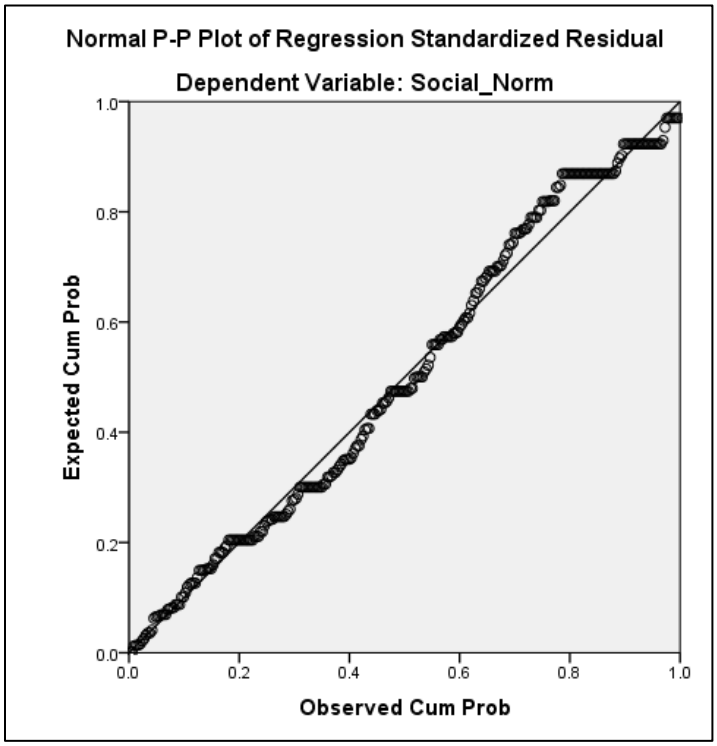
Model 1: P-P Plot featuring the distribution of the transformed dependant variable



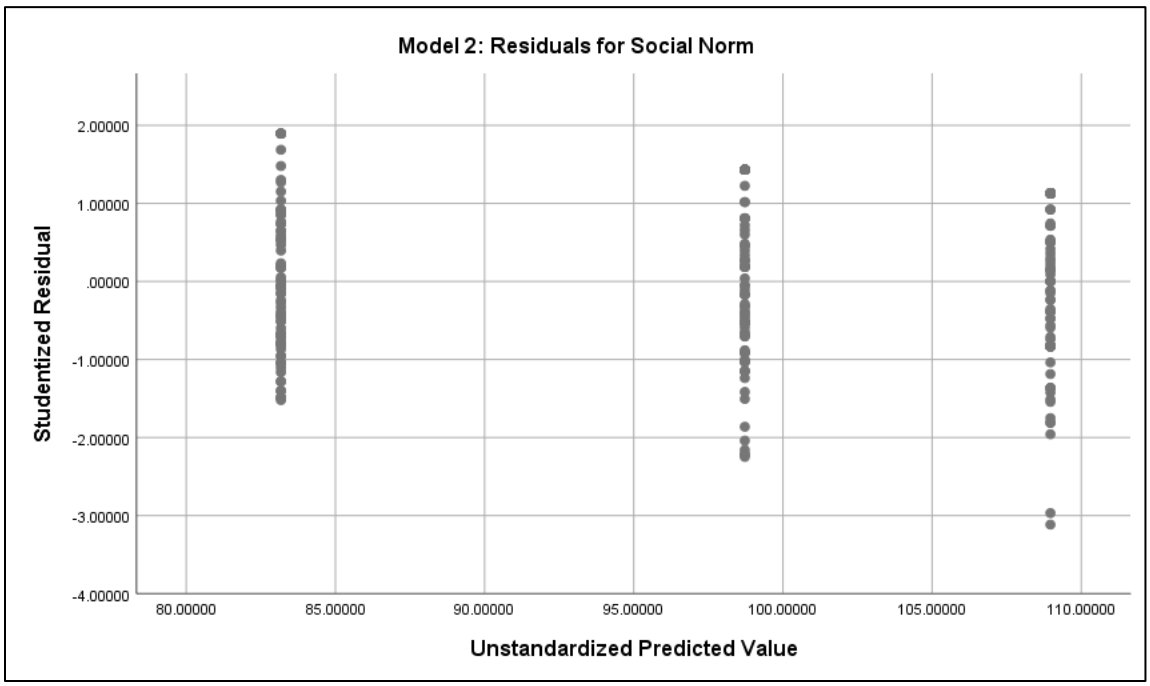
Model 1 Simple scatterplot with the studentized residuals plotted against the unstandardized predicted value of the transformed dependant variable



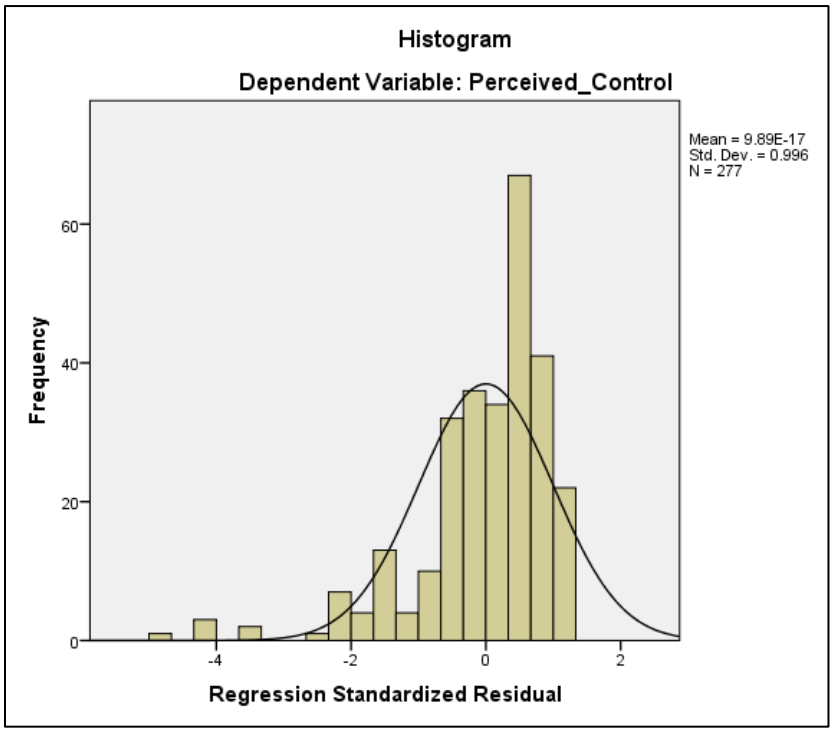
Model 2: histogram featuring the distribution of the dependant variable



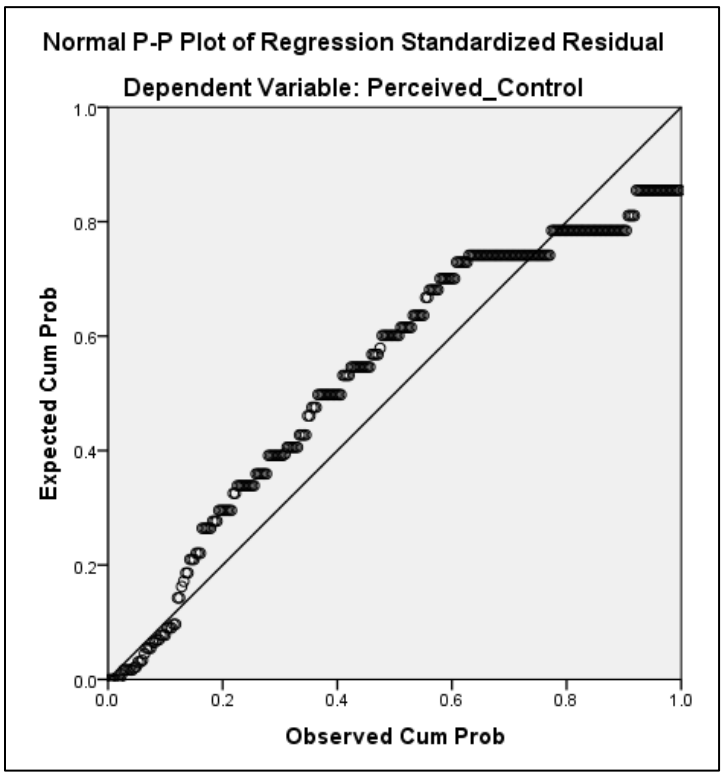
Model 2: P-P Plot featuring the distribution of the dependant variable



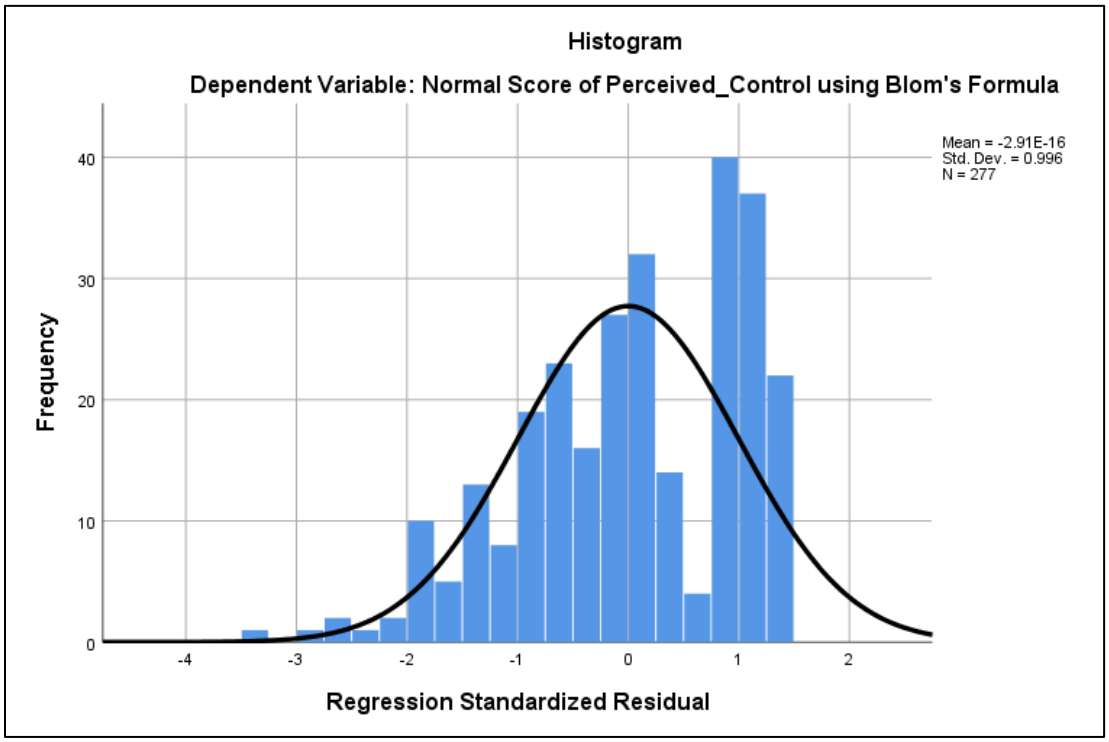
Model 2 Simple scatterplot with the studentized residuals plotted against the unstandardized predicted value of the transformed dependant variable



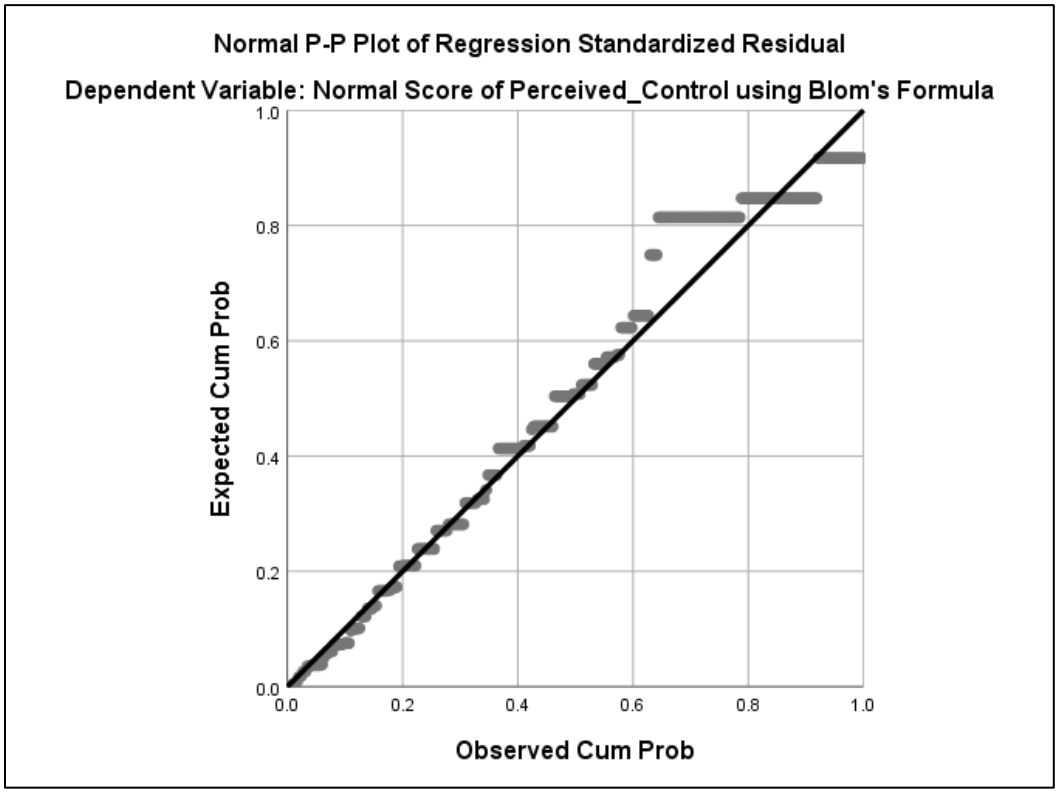
Model 3: histogram featuring the distribution of the untransformed dependant variable



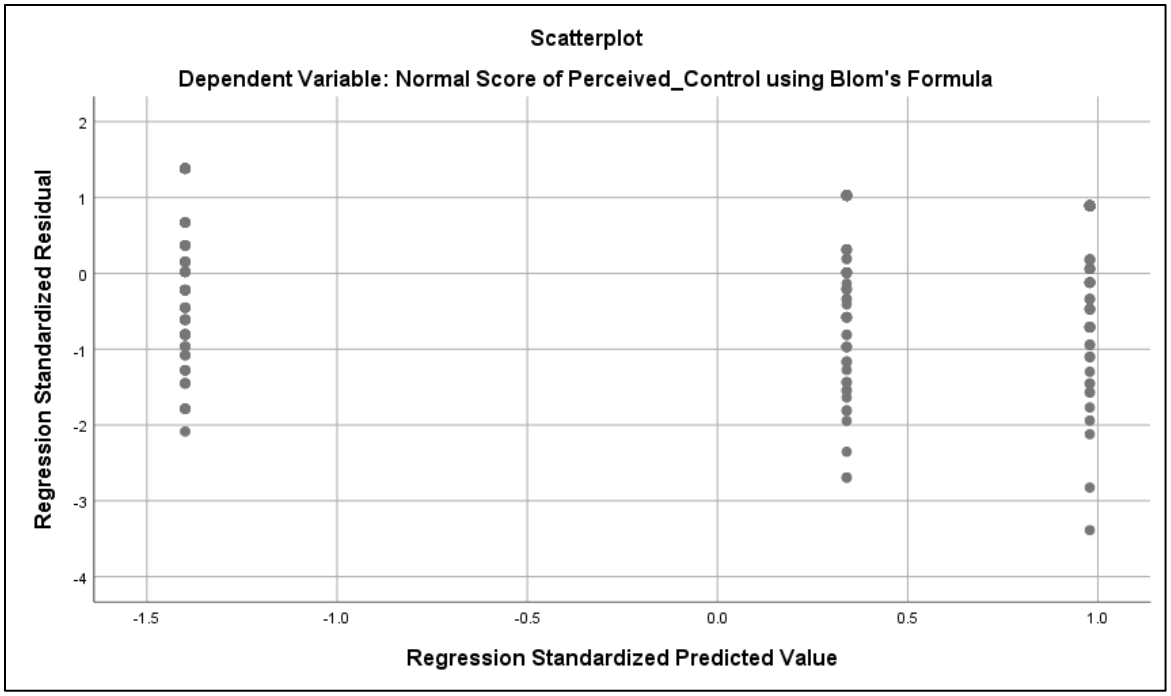
Model 3: P-P Plot featuring the distribution of the untransformed dependant variable



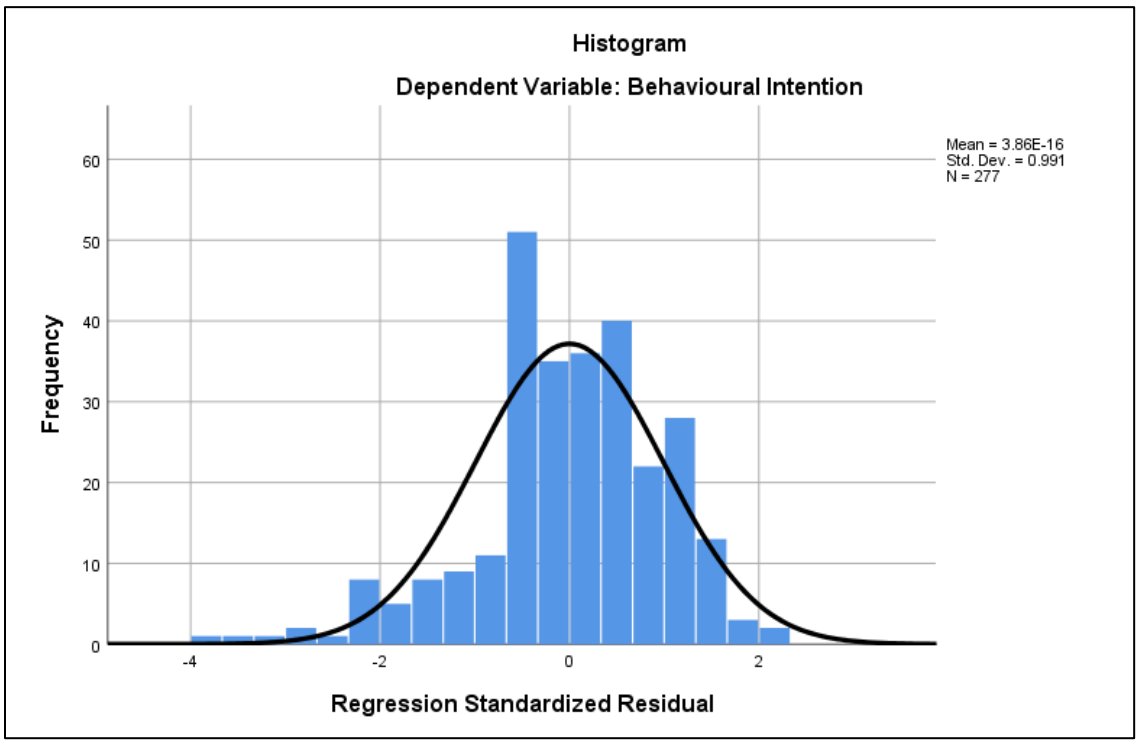
Model 3: histogram featuring the distribution of the transformed dependant variable



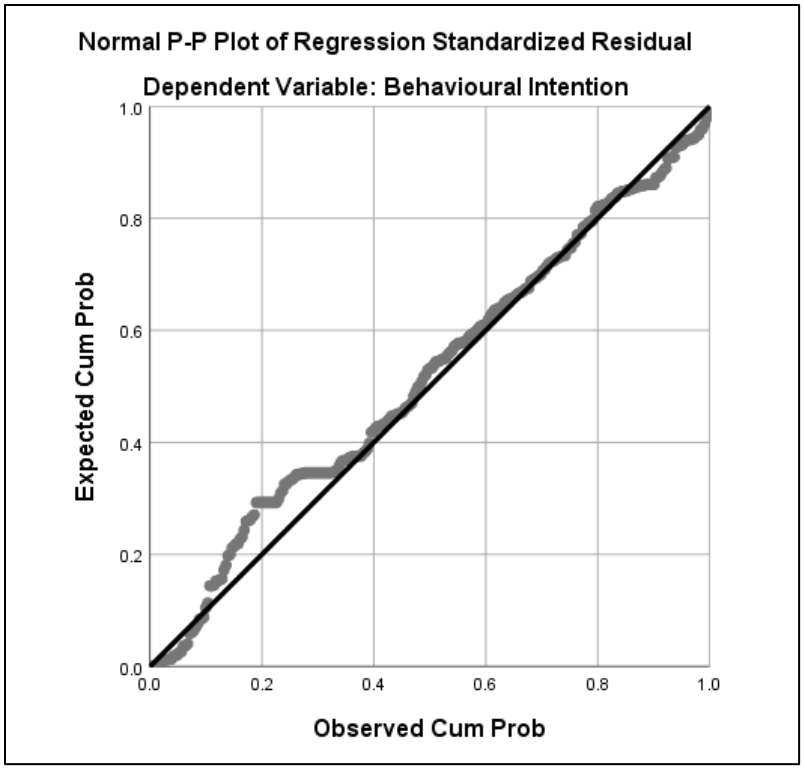
Model 3: P-P Plot featuring the distribution of the transformed dependant variable



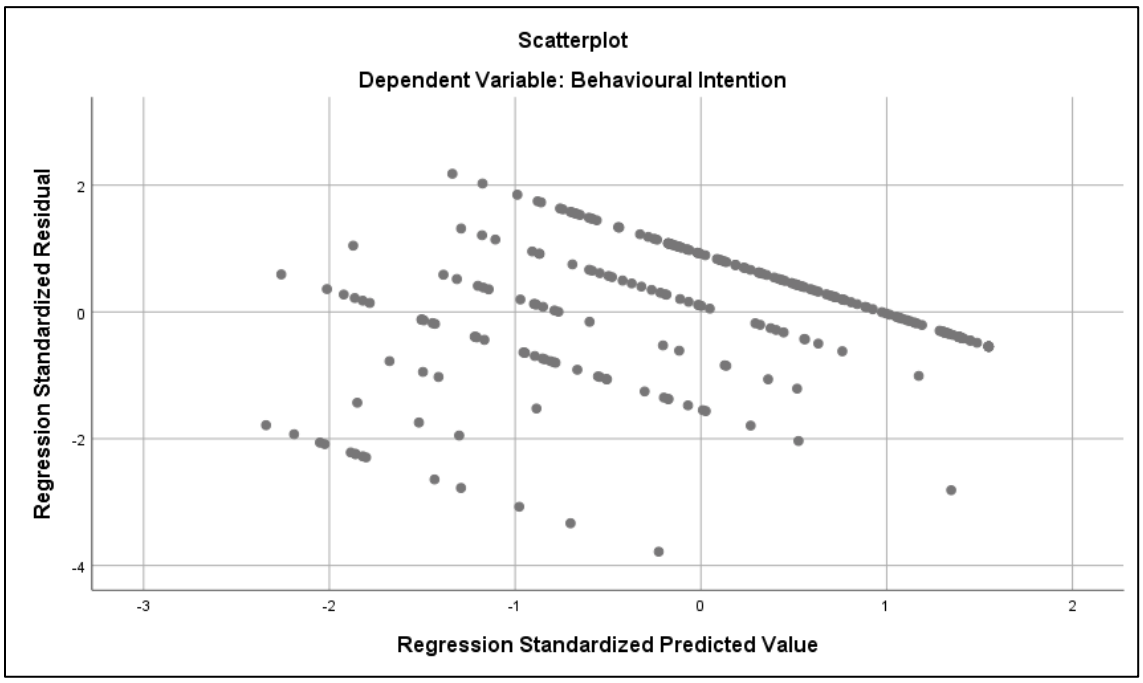
Model 3: Simple scatterplot with the studentized residuals plotted against the unstandardized predicted value of the transformed dependant variable



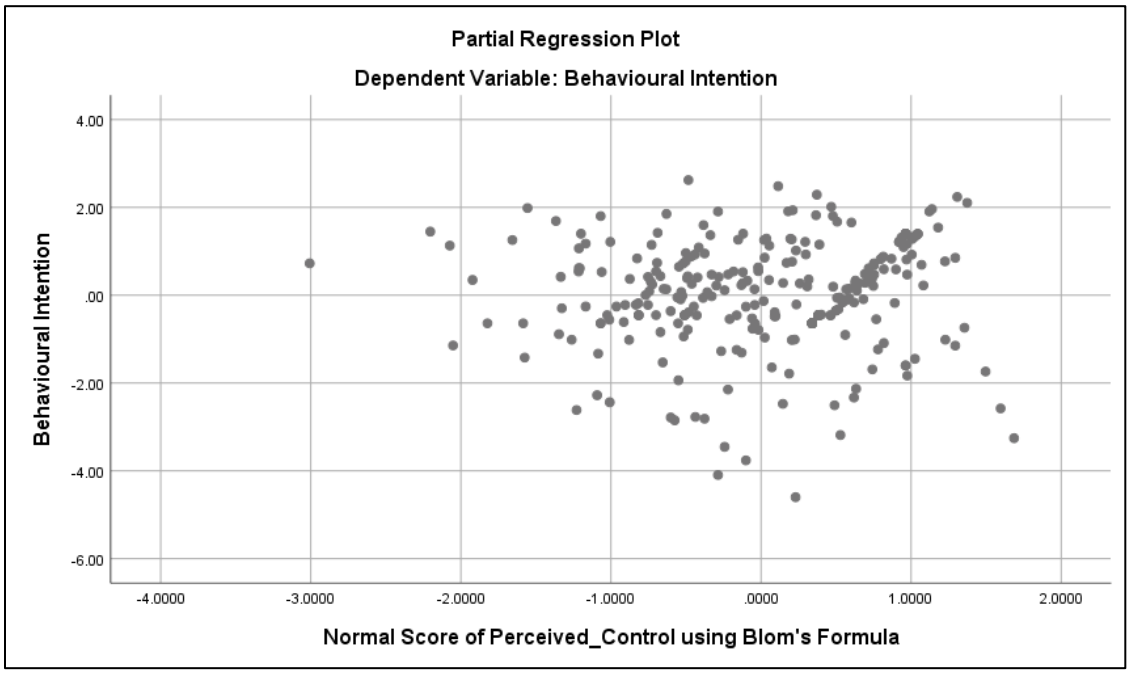
Model 4: histogram featuring the distribution of the dependant variable



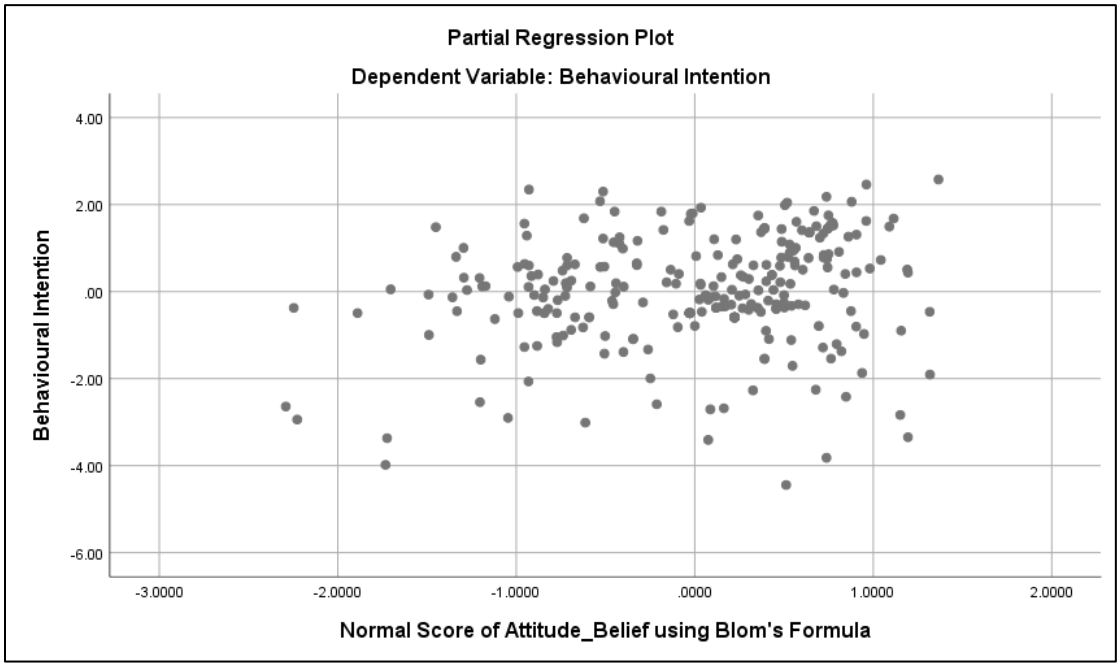
Model 4: P-P Plot featuring the distribution of the dependant variable



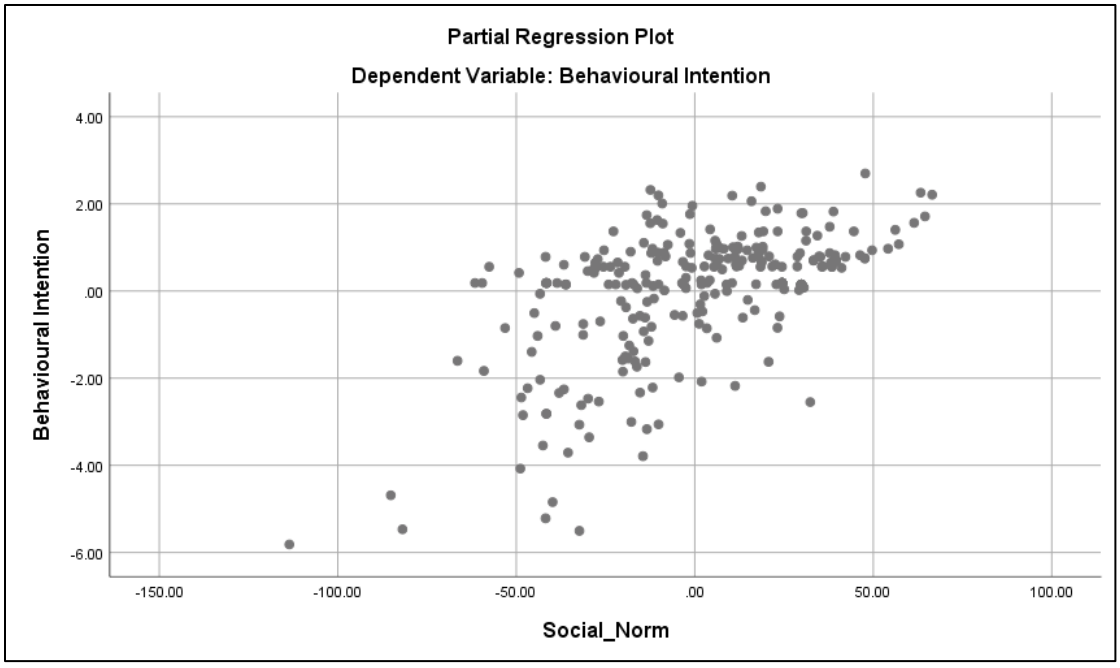
Model 4: Simple scatterplot with the studentized residuals plotted against the unstandardized predicted value of the dependant variable



Model 4: Partial regression plot for perceived control (transformed) and behavioural intention



Model 4: Partial regression plot for attitude and belief (transformed) and behavioural intention



Model 4: Partial regression plot for social norm and behavioural intention

Appendix VIII - Additional Results

Questionnaire part II mean results presented by area

	Question	Full Description	Scale[1]	Mean	Std. Dev.
Agricultural	Q3a	Removing and/or securing known black bear attractants, such as garbage, on my property this summer will help reduce black bear conflicts	Likely - Unlikely	6.427	1.397
	Q3b	I consider reducing black bear conflicts to be	Good - Bad	6.348	1.289
	Q4a	Removing and/or securing known black bear attractants on my property this summer will improve black bear conservation	Likely - Unlikely	5.787	1.837
	Q4b	I consider improving black bear conservation to be	Good - Bad	6.182	1.335
	Q5a	Removing and/or securing black bear attractants on properties, including my own, will help prevent the habituation and food conditioning of black bears	Very Likely - Very Unlikely	6.101	1.477
	Q5b	I consider preventing the habituation and food conditioning of black bears to be	Good - Bad	6.273	1.345
	Q6a	black bears that become a nuisance are killed	Very Likely – Very Unlikely	5.258	2.135
	Q6b	I consider the killing of nuisance black bears to be	Good - Bad	3.830	2.102
	Q7a	black bears in residential areas should be trapped and relocated	Definitely - Definitely Not	5.697	1.661
	Q7b	I consider the trapping and relocating of black bears to be	Good - Bad	5.659	1.735
	Q8a	Living in proximity to Riding Mountain National Park increases my contact with nature and wildlife	Definitely - Definitely Not	6.633	1.096
	Q8b	My contact with nature and wildlife is	Good - Bad	6.420	1.122
	Q9a	Habituated and/or food conditioned black bears in my neighbourhood are a public safety concern	Definitely - Definitely Not	5.156	1.829
	Q9b	I consider this public safety concern to be	Good - Bad	4.931	2.030
	Q10a	Black bears that are exhibiting natural behaviours, and are not a nuisance, present a public safety concern	Very Likely - Very Unlikely	2.607	2.032
	Q10b	I consider this public safety concern to be	Good - Bad	4.806	1.893
	Q11	Do you enjoy seeing black bears?	Very Much - Not at All	6.178	1.458
	Q12	Are you afraid of black bears?	Not Afraid - Afraid	5.422	2.000
Residenti	Q3a	Removing and/or securing known black bear attractants, such as garbage, on my property this summer will help reduce black bear conflicts	Likely - Unlikely	6.495	1.340
	Q3b	I consider reducing black bear conflicts to be	Good - Bad	6.699	0.918

	Q4a	Removing and/or securing known black bear attractants on my property this summer will improve black bear conservation	Likely - Unlikely	6.054	1.731
	Q4b	I consider improving black bear conservation to be	Good - Bad	6.467	1.190
	Q5a	Removing and/or securing black bear attractants on properties, including my own, will help prevent the habituation and food conditioning of black bears	Very Likely - Very Unlikely	6.366	1.366
	Q5b	I consider preventing the habituation and food conditioning of black bears to be	Good - Bad	6.570	1.127
	Q6a	black bears that become a nuisance are killed	Very Likely - Very Unlikely	5.297	2.121
	Q6b	I consider the killing of nuisance black bears to be	Good - Bad	3.761	2.130
	Q7a	black bears in residential areas should be trapped and relocated	Definitely - Definitely Not	5.380	2.059
	Q7b	I consider the trapping and relocating of black bears to be	Good - Bad	5.473	1.858
	Q8a	Living in proximity to Riding Mountain National Park increases my contact with nature and wildlife	Definitely - Definitely Not	6.819	0.775
	Q8b	My contact with nature and wildlife is	Good - Bad	6.436	1.103
	Q9a	Habituated and/or food conditioned black bears in my neighbourhood are a public safety concern	Definitely - Definitely Not	5.628	1.802
	Q9b	I consider this public safety concern to be	Good - Bad	4.816	2.154
	Q10a	Black bears that are exhibiting natural behaviours, and are not a nuisance, present a public safety concern	Very Likely - Very Unlikely	2.688	2.147
	Q10b	I consider this public safety concern to be	Good - Bad	4.893	1.908
	Q11	Do you enjoy seeing black bears?	Very Much - Not at All	6.106	1.701
	Q12	Are you afraid of black bears?	Not Afraid - Afraid	4.670	2.211
Recreational	Q3a	Removing and/or securing known black bear attractants, such as garbage, on my property this summer will help reduce black bear conflicts	Likely - Unlikely	6.789	0.634
	Q3b	I consider reducing black bear conflicts to be	Good - Bad	6.828	0.789
	Q4a	Removing and/or securing known black bear attractants on my property this summer will improve black bear conservation	Likely - Unlikely	6.642	0.798
	Q4b	I consider improving black bear conservation to be	Good - Bad	6.862	0.579
	Q5a	Removing and/or securing black bear attractants on properties, including my own, will help prevent the habituation and food conditioning of black bears	Very Likely - Very Unlikely	6.684	0.902
	Q5b	I consider preventing the habituation and food conditioning of black bears to be	Good - Bad	6.589	1.388
	Q6a	black bears that become a nuisance are killed	Very Likely - Very Unlikely	5.568	1.928
	Q6b	I consider the killing of nuisance black bears to be	Good - Bad	2.979	1.923

	Q7a	black bears in residential areas should be trapped and relocated	Definitely - Definitely Not	5.989	1.512
	Q7b	I consider the trapping and relocating of black bears to be	Good - Bad	6.042	1.443
	Q8a	Living in proximity to Riding Mountain National Park increases my contact with nature and wildlife	Definitely - Definitely Not	6.821	0.583
	Q8b	My contact with nature and wildlife is	Good - Bad	6.553	0.875
	Q9a	Habituated and/or food conditioned black bears in my neighbourhood are a public safety concern	Definitely - Definitely Not	5.660	1.893
	Q9b	I consider this public safety concern to be	Good - Bad	5.011	2.053
	Q10a	Black bears that are exhibiting natural behaviours, and are not a nuisance, present a public safety concern	Very Likely - Very Unlikely	2.301	1.607
	Q10b	I consider this public safety concern to be	Good - Bad	4.573	1.924
	Q11	Do you enjoy seeing black bears?	Very Much - Not at All	6.379	1.178
	Q12	Are you afraid of black bears?	Not Afraid - Afraid	4.362	2.218
[1] 7-point Likert scale: positive scores = 7, neutral scores = 4, negative scores = 1					

Questionnaire part III mean results presented by area

	Question	Full Description	Scale[1]	Mean	Std. Dev.
Agricultural	Q13	My neighbours think I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	4.213	1.458
	Q14	I would consider doing what my neighbours perceive I should do to secure attractants on my property this summer	Definitely Will Not - Definitely Will	4.876	1.499
	Q15	My family thinks I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	4.483	1.759
	Q16	I would consider doing what my family perceives I should do to secure attractants on my property this summer	Definitely Will Not - Definitely Will	4.944	1.598
	Q17	I believe I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.322	1.798
	Q18	I believe it is my responsibility to ensure that black bears do not become food conditioned or habituated on my property this summer	Strongly Disagree - Strongly Agree	5.967	1.652
	Q19	I believe my neighbours have a responsibility to ensure that black bears do not become food conditioned or habituated on their property this summer	Strongly Disagree - Strongly Agree	6.033	1.465
Residential	Q13	My neighbours think I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	4.745	1.837
	Q14	I would consider doing what my neighbours perceive I should do to secure attractants on my property this summer	Definitely Will Not - Definitely Will	5.426	1.562
	Q15	My family thinks I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.149	1.784
	Q16	I would consider doing what my family perceives I should do to secure attractants on my property this summer	Definitely Will Not - Definitely Will	5.745	1.444
	Q17	I believe I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	6.043	1.544
	Q18	I believe it is my responsibility to ensure that black bears do not become food conditioned or habituated on my property this summer	Strongly Disagree - Strongly Agree	6.330	1.484
	Q19	I believe my neighbours have a responsibility to ensure that black bears do not become food conditioned or habituated on their property this summer	Strongly Disagree - Strongly Agree	6.213	1.436
Recreational	Q13	My neighbours think I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	4.851	1.917
	Q14	I would consider doing what my neighbours perceive I should do to secure attractants on my property this summer	Definitely Will Not - Definitely Will	5.819	1.429

	Q15	My family thinks I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.383	1.861
	Q16	I would consider doing what my family perceives I should do to secure attractants on my property this summer	Definitely Will Not - Definitely Will	6.032	1.371
	Q17	I believe I should remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	6.263	1.524
	Q18	I believe it is my responsibility to ensure that black bears do not become food conditioned or habituated on my property this summer	Strongly Disagree - Strongly Agree	6.747	0.825
	Q19	I believe my neighbours have a responsibility to ensure that black bears do not become food conditioned or habituated on their property this summer	Strongly Disagree - Strongly Agree	6.611	1.179
[1] 7-point Likert scale: positive scores = 7, neutral scores = 4, negative scores = 1					

Questionnaire part IV mean results presented by area

	Question	Full Description	Scale[1]	Mean	Std. Dev.
Agricultural	Q20a	I have the financial means to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.344	1.819
	Q20b	I am physically capable of securing and/or removing black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.900	1.615
	Q20c	I have the time to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.578	1.716
	Q20d	It is up to me whether or not I choose to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.822	1.745
	Q20e	I know how to secure and/or remove attractants from my property this summer	Strongly Disagree - Strongly Agree	6.416	0.889
Residential	Q20a	I have the financial means to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.925	1.663
	Q20b	I am physically capable of securing and/or removing black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	6.207	1.426
	Q20c	I have the time to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	6.011	1.687
	Q20d	It is up to me whether or not I choose to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.978	1.694
	Q20e	I know how to secure and/or remove attractants from my property this summer	Strongly Disagree - Strongly Agree	6.319	1.322
Recreational	Q20a	I have the financial means to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	6.389	1.371
	Q20b	I am physically capable of securing and/or removing black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	6.495	1.271
	Q20c	I have the time to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	6.495	1.245
	Q20d	It is up to me whether or not I choose to secure and/or remove black bear attractants from my property this summer	Strongly Disagree - Strongly Agree	5.389	2.070
	Q20e	I know how to secure and/or remove attractants from my property this summer	Strongly Disagree - Strongly Agree	6.579	1.078

[1] 7-point Likert scale: positive scores = 7, neutral scores = 4, negative scores = 1

Questionnaire part V frequency results presented by area

	Question	Full Description	Will Remove or Secure	Will Not Remove or Secure	Not Decided	Not Applicable
Agricultural	Q21	In the past I have experienced conflict with black bears on my property	49	41		
	Q22	In the past I have removed and/or secured known black bear attractants from my property to prevent conflict	59	30		
	Q23	I will remove black bear attractants from my property this summer	65	22		
	Q24a	I will remove or securely store this attractant on my property this summer: Bird feeders/bird seed	33	18	0	28
	Q24b	I will remove or securely store this attractant on my property this summer: Ripe fruit from trees or shrubs	30	19	7	26
	Q24c	I will remove or securely store this attractant on my property this summer: livestock and pets	14	26	0	38
	Q24d	I will remove or securely store this attractant on my property this summer: outdoor pet food	26	16	2	38
	Q24e	I will remove or securely store this attractant on my property this summer: BBQs	30	32	6	14
	Q24f	I will remove or securely store this attractant on my property this summer: Garbage	62	4	3	13
	Q24g	I will remove or securely store this attractant on my property this summer: Grain bins and farm feed	15	18	5	43
	Q24h	I will remove or securely store this attractant on my property this summer: outdoor fridges and freezers	25	12	2	42
	Q24i	I will remove or securely store this attractant on my property this summer: Other	14	7	60	9
Residential	Q21	In the past I have experienced conflict with black bears on my property	50	43		
	Q22	In the past I have removed and/or secured known black bear attractants from my property to prevent conflict	76	16		
	Q23	I will remove black bear attractants from my property this summer	80	13		
	Q24a	I will remove or securely store this attractant on my property this summer: Bird feeders/bird seed	14	7	0	60
	Q24b	I will remove or securely store this attractant on my property this summer: Ripe fruit from trees or shrubs	26	26	4	30
	Q24c	I will remove or securely store this attractant on my property this summer: livestock and pets	18	17	1	49

	Q24d	I will remove or securely store this attractant on my property this summer: outdoor pet food	25	7	1	52
	Q24e	I will remove or securely store this attractant on my property this summer: BBQs	42	24	4	16
	Q24f	I will remove or securely store this attractant on my property this summer: Garbage	64	4	1	16
	Q24g	I will remove or securely store this attractant on my property this summer: Grain bins and farm feed	24	7	3	52
	Q24h	I will remove or securely store this attractant on my property this summer: outdoor fridges and freezers	5	4	1	74
	Q24i	I will remove or securely store this attractant on my property this summer: Other	6	7	0	71
Recreational	Q21	In the past I have experienced conflict with black bears on my property	24	71		
	Q22	In the past I have removed and/or secured known black bear attractants from my property to prevent conflict	79	16		
	Q23	I will remove black bear attractants from my property this summer	80	13		
	Q24a	I will remove or securely store this attractant on my property this summer: Bird feeders/bird seed	15	3	4	57
	Q24b	I will remove or securely store this attractant on my property this summer: Ripe fruit from trees or shrubs	14	8	4	52
	Q24c	I will remove or securely store this attractant on my property this summer: livestock and pets	15	6	1	56
	Q24d	I will remove or securely store this attractant on my property this summer: outdoor pet food	13	3	0	63
	Q24e	I will remove or securely store this attractant on my property this summer: BBQs	36	28	5	9
	Q24f	I will remove or securely store this attractant on my property this summer: Garbage	55	1	0	23
	Q24g	I will remove or securely store this attractant on my property this summer: Grain bins and farm feed	14	1	1	63
	Q24h	I will remove or securely store this attractant on my property this summer: outdoor fridges and freezers	1	1	0	76
	Q24i	I will remove or securely store this attractant on my property this summer: Other	1	3	0	74