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The Leashed We Can Do: Effects of Targeted Conservation Messaging on Dog Leashing Behaviour

A thesis

submitted in partial fulfilment

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of

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By

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Abstract

The current study investigated whether the viewing of posters conveying kiwi conservation or dog safety messaging would influence behaviour change in the form of reasons given to leash their dog: would participants leash their dog more for concerns about dog safety and welfare, or more for concerns related to kiwi conservation. The results showed that both Poster A (kiwi conservation message) and Poster B (dog welfare message) had a significant effect on how participants answered, “how likely are you to leash your dog in the bush?” with participants choosing both the kiwi conservation message and the dog welfare message more frequently post survey than they did pre survey. This finding supports previous NZ based research by Macdonald (2015) and Macaskill (2025) who both found that highlighting pet welfare was more effective at increasing conservation behaviour than highlighting the intended conservation behaviour.

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Introduction

Kiwi are a flightless bird, endemic to Aotearoa, New Zealand (NZ) (Buller, 1983). Kiwi are the smallest of the ratite family, which encompasses primarily large flightless birds such as the ostrich, emu, cassowary, rhea, elephant bird, and moa (Mitchell et al. 2019). Interestingly, Mitchell et al. (2019) discovered that kiwi are most closely related to elephant birds originating from Madagascar rather than NZs native Moa, although both giants are now extinct. The term "kiwi" represents an umbrella term that covers five distinct species. These species are defined by Miskelly et al. (2008) as: the North Island Brown *(Apteryx mantelli)*, the Great Spotted *(Apteryx haastii)*, the Little Spotted *(Apteryx owenii)*, the Haast Tokoeka *(Apteryx australis)*, and the Rowi *(Apteryx rowi)*. Each species is found in distinct regions of NZ, where they occupy regional territories that do not overlap. The North Island Brown kiwi is found only in the North Island, with populations in the Coromandel, Northland, and Taranaki. The North Island Brown is also the primary species displayed in captivity, both in NZ and internationally (DOC, 2025). The Great Spotted kiwi lives primarily in subalpine regions in the South Island near Nelson and Arthur's Pass. The Little Spotted kiwi has been relocated to live primarily on predator free offshore islands around the coast of NZ, although a small number of this species have recently been reintroduced to the mainland around Nelson (DOC, 2025). Rowi kiwi are only found in the Okarito region of the South Island where they neighbour habitats occupied by the Tokoeka kiwi living in Haast and Fiordland.

The kiwi's phenotype is unique. Kiwi are brown, ground-dwelling birds, weighing between 1.3kg and 3.3kg, with characteristic feathers that have been likened to fur. A distinct feature of kiwi is their long beak which they use to probe for foraging. Nostrils positioned at the end of the beak help them to locate food such as earthworms, grubs, and insects (Colbourne et al., 2020). With the absence of an egg tooth, kiwi chicks must kick their way out of their shell, resulting in a single hatching that can take several days. Upon hatching, the

chick will remain in the burrow for up to a week while they absorb the remainder of the yolk sac. Once the yolk sac is fully absorbed, the kiwi chick will begin foraging for insects just like their parents (Sales, 2005). As part of the ratite family, kiwi chicks are precocial, meaning they are born fully formed with feathers and solid leg bones that enable them to walk and care for themselves almost immediately post-birth (Prier et al., 2013). The other uniquely important feature of kiwi is that they are flightless and so have vestigial wing nubs, underdeveloped chest muscles, and no sternum, which makes them particularly vulnerable to crush injuries that might occur from encounters with large predators such as dogs (Macaskill, 2025).

Conservation threats

According to NZs Department of Conservation (DOC, 2025), there are approximately 70,000 kiwi left. This means that kiwi are classified as vulnerable on the International Union of the Conservation of Natures Red List (IUCN, 2025). According to the IUCN (2025), Little Spotted kiwi and Rowi kiwi populations are increasing but require continued conservation efforts to ensure population growth. While North Island Brown kiwi populations are stable, the Tokoeka and Great Spotted kiwi populations are decreasing due to conservation efforts being directed towards higher risk populations (e.g., Little Spotted Kiwi). Unfortunately, DOC (2025) reports that 2% of kiwi outside of predator proof sanctuaries are killed every year, which amounts to roughly 20 birds per week.

One of the primary factors directly impacting kiwi conservation is associated with NZs colonisation. Prior to colonisation, kiwi had no natural mammalian predators aside from humans (McLennan et al., 1996), but following colonisation pests such as mustelids (e.g., stoats, ferrets), possums, and dogs arrived in NZ and have contributed to kiwi population decline. Stoats are the biggest threat to kiwi chicks (DOC, 2025). Without pest control, chick survival rates are approximately 6%, however, managed populations with active stoat

trapping and 1080 poison baiting have seen chick survival rates increase to around 60% (Germano et al., 2018). While stoats represent a significant concern for chicks, ferrets, a larger mustelid, are capable of killing small adult kiwi and, while commonly found in wetlands and rabbit dense areas, are also capable of penetrating native bush and can devastate adult kiwi populations (DOC, 2025). In addition to ferrets, according to DOC (2025), any dog, regardless of size, is the biggest threat to adult kiwi, with this threat potentially shortening average kiwi life spans from 30-40 years to 13-14 years. Dogs have had a negative impact on conservation in many other global habitats, with domestic dogs significantly factoring into 11 vertebrate extinctions, and threatening at least 188 vulnerable species (Macaskill et al., 2025). Whilst dogs are not necessarily hunting kiwi for food, chasing kiwi can produce injuries that often lead to death. Kiwi also have a very distinct scent and vocalisations which makes them particularly attractive to dogs, and easy to track, resulting in roaming dogs, both feral and off leash domestic pets, having a devastating effect on kiwi populations. This is most obviously seen in Northland, where dogs were responsible for at least 33% of all reported kiwi deaths between 1990 and 2021 (Macaskill, 2025). During a period of six months in 2023, dogs were the cause of 23 reported kiwi deaths in Northland, with seven deaths occurring over a two-week period (Macaskill, 2025).

Conservation efforts

Several groups are working to protect the different species of kiwi in NZ (DOC, 2025). Save the Kiwi is focused primarily on North Island kiwi, Save our Iconic Kiwi supports South Island kiwi, and Operation Nest Egg (ONE) supports kiwi from egg to young adulthood. Across the 2024/2025 financial year, Save the Kiwi has facilitated 57 kiwi chick hatchings, housed 54 kiwi chicks in their creches, and translocated 222 kiwi chicks into release locations in Taranaki, Tongariro, and Wellington (Save the Kiwi, 2025). Alongside the Save the Kiwi project, The Kiwi Recovery Plan was written in partnership between DOC,

over 100 Treaty Partners and active stakeholders and outlines the 10-year conservation plan for Kiwi in NZ (Germano et al., 2018). The plan has drawn on expertise gathered from more than 50 kiwi biologists, kiwi recovery workers, tangata whenua, DOC staff, community leaders, academics and management staff at captive facilities. The plan covers 15 different goals and strategies to achieve 100,000 kiwi by 2030 by growing each species population by at least 2% per year, restoring kiwi to their historical locations, and maintaining genetic diversity within species. Consultation was gathered from groups including Conservation Boards, Forest and Bird, Kiwis for Kiwi (now known as Save the Kiwi), and the Zoo Aquarium Association (ZAA). While current and historical conservation efforts have managed to halt and reverse the decline of the three rarest kiwi (Haast Tokoeka, Rowi, and Little Spotted kiwi), as of 2015, populations of the Great Spotted kiwi, North Island Brown kiwi, and Tokoeka kiwi are rapidly declining due to poor or inactive conservation management at a rate of 2-3% annually (DOC, 2025; Germano et al., 2018; IUCN, 2025). This lack of active conservation efforts may be due to populations of Great Spotted and Tokoeka kiwi not yet being of concern (Germano et al., 2018). Despite this, both populations are actively declining, and the IUCN (2025) predicts both species will continue to suffer in the absence of conservation intervention.

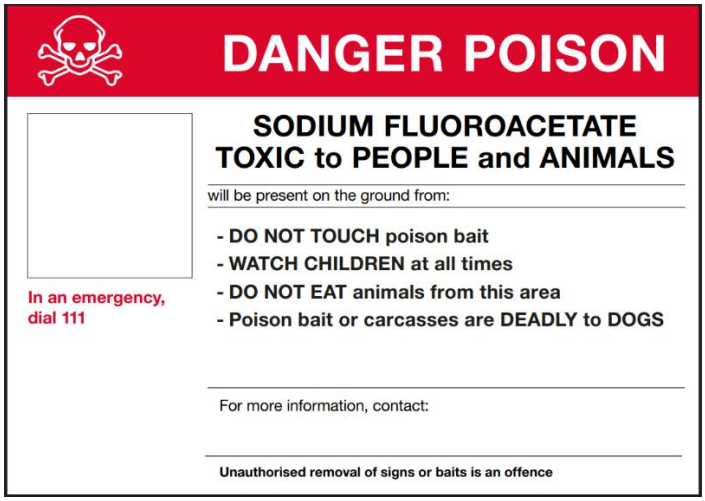
The current Kiwi Recovery Plan aims to increase all kiwi populations by 2% annually (Germano et al., 2018) through increased management of populations of kiwi through both DOC and community partnership, increasing pest management, and in particular addressing the threat of dogs. There will also be a concentrated focus on genetic management of kiwi, ensuring the longevity of certain species which have faced severe genetic challenges (for example, Little Spotted kiwi once numbered just five individuals, resulting in inbreeding and poor genetic diversity) (DOC, 2025). A DOC initiative called ONE (Our Nest Egg) is an effective procedure for increasing numbers of certain kiwi populations (e.g., Brown and

Rowi) which focuses on taking eggs laid in the wild, hatching them in captivity, raising the chick in a predator free environment, and then releasing the chick once it is old enough to fend for itself (Colbourne et al., 2005). Unfortunately, this intervention is ineffective with other populations like the Great Spotted kiwi, as human interventions such as removal of eggs or monitoring of nest sites cause undue stress, resulting in adult kiwi abandoning nests and vacating predator managed areas in favour of locations untouched by humans.

Another common conservation tool in NZ is the use of 1080 poison, a bait which is airdropped in more difficult to reach bushland. The toxic ingredient in 1080 is sodium fluoroacetate, a synthetic salt version of toxins found in several toxic plants around the world that are poisonous to mammals (DOC, 2025). As the primary predators in NZ bush are mammals e.g., possums, stoats, ferrets, 1080 is viewed as an effective way to manage pest populations without harming native bird and fish wildlife. The pellets are biodegradable (made from cereal and sugar) therefore there is no risk of 1080 leaving any permanent residues in the environment as it gets broken down by microorganisms and fungi and returns to plant matter (Goh et al., 2005). When ingested, 1080 induces organ failure and death in mammals in as little as two hours (Goh et al., 2005). Unfortunately, dogs are especially susceptible to 1080 poisoning and can die if they ingest the poison directly or consume an animal that has died from 1080 poisoning (DOC, 2025). To alert and inform the public, DOC (2025) typically displays warning signs at the entrance to bush tracks for the duration that 1080 is expected to be in the area. These signs typically display an image of 1080 pellets and state that 1080 is a poison toxic to both humans and animals, specifically mentioning that it is fatal when ingested by dogs. On their website, DOC specifically recommends keeping dogs leashed, but leashing of dogs for safety is not explicitly stated on signs placed at bush tracks.

Figure 1

Example of 1080 Warning Signage Template from the New Zealand Department of Conservation (DOC, 2025).



Both the conservation efforts of DOC and high dog ownership numbers in NZ may be factors in the high impact that dogs have on kiwi populations. There is increasing overlap between urban development and kiwi habitats, where kiwi are beginning to be released into areas that are in closer proximity to cities, and city expansion results in urban environments encroaching on kiwi territory. One example of this is in Wellington where the Capital Kiwi Project has released 63 kiwi into the hills around Wellington city since 2022 (Capital Kiwi Project, 2025) The release area spans 23,000 hectares and contains 4,600 mustelid traps but is unfenced, with the territory bordering existing human suburbs from Porirua, past Karori in central Wellington, leading down to the Cook Strait coastline (Capital Kiwi Project, 2025). Another recent example illustrating the proximity of wild kiwi populations with human populations was seen when two kiwi were filmed chasing each other in a Northland garden (Tswanya, 2025). Unfortunately, as human populations increase, so do dog populations, which increases the likelihood of interactions between dogs and kiwi (Germano et al., 2018; Gompper, 2013), especially in those areas where the divide between urban living and wild

kiwi habitat has become less distinguishable. An additional factor concerns education, where dog owners may not be aware of the impact dogs have or could have on kiwi, or may not think it is possible for their dog to even encounter kiwi. For example, Macaskill et al. (2025) found that when people encounter an off-leash dog, they do not perceive it as being a risk to kiwi, particularly if the dog is in an urban or semi-urban area. This suggests a lack of awareness of where kiwi populations may be located close to urban environments. The authors propose that this could be due to owner ignorance about how even a curious dog can be a serious injury risk to kiwi, or the belief that only "bad" dogs pose a threat to kiwi, with owners also typically assuming that their dog does not fall into this category.

Persuasive messaging

With DOC increasing or aiming to further introduce kiwi close to urban environments and dog owners being unaware of both the impact and likelihood of their dog encountering kiwi, education and conservation messaging seems particularly important. International studies have investigated how persuasive messages emphasising different aspects of conservation and dog safety influence dog leashing behaviour. In Australia, Williams et al. (2009) interviewed local dog owners and found that owners were more likely to leash their dog if they believed their dog was a risk to other humans but were less likely to leash their dog if they believed it would interfere with their dogs' right for recreation. Jorgensen and Brown (2017) investigated persuasive conservation messages and found that messages placed in an American national park that encouraged avoidance of dog bites and dog fights increased dog leashing behaviour more than messages encouraging leashing to protect native plovers. In Australia, Packer et al. (2025) investigated reasons that encouraged greater leashing of dogs in a nature reserve inhabited by protected bandicoots. They found that owners were more likely to leash their dog to protect other humans from their dog, or to protect their dog from attacks from other animals, rather than to protect the bandicoots from their dog.

Meanwhile, Dayer et al. (2022) investigated reasons for non-compliance with new dog-leashing rules along the Atlantic Flyway and found that some owners were more inclined to do what they felt was best for their dog (not leashing) as opposed to leashing their dog to protect coastal birds. This research suggests that owners attend more to messages directly concerning their pet rather than any conservation message, which raises the question of whether targeting owners with pet welfare messages rather than conservation messages might be a more effective vehicle to achieve conservation goals.

The findings from two NZ-based studies illustrate this point further. Macdonald (2015) investigated the effectiveness of targeted messaging to encourage containing cats overnight in the Wellington area where the primary goal was conserving the native bird population. Similar to the research cited above, they found that participants were more likely to engage in behaviour change and confine their cats overnight when they were presented with messages that promoted cat welfare – such as less injuries, less risk of car strike etc – than messages that informed them of the risk their cat posed to native bird wildlife. Similarly, Macaskill et al. (2025) investigated the behaviour of reporting wandering dogs. They found that people were more likely to report a wandering dog out of concern for the dogs' welfare, rather than concern for kiwi conservation.

This research invites further exploration into conservation messaging, particularly concerning the most important features of a conservation message, the impact of pet attachment on conservation messages and whether conservation values impact on adherence to conservation messages. We know that behaviour can be influenced through the use of persuasive messaging. As mentioned above, Jorgensen and Brown (2017) found that persuasive messaging that promotes pet welfare, like reducing dog/dog attacks, can elicit more compliance with a leash law than messages which criticise lack of compliance or threats of fines. Walsh (2021) investigated which type of targeted messages were more likely to

elicit compliance with registering dogs in the Far North District of NZ. They found that both the dog attack and the kiwi conservation message had an impact on registration behaviour, although message effectiveness varied across different groups; pig dog owners were more responsive to kiwi conservation messages, and owners of older dogs were more responsive to dog attack messages. This research suggests a more dominant role of pet attachment over conservation values.

One way to measure owners' attitudes towards their pets is the Lexington Attachment to Pets Scale (LAPS) which provides an indication of the level of attachment an individual has to their pet. Prior research suggests that high pet attachment scores may also be associated with high attachment to wild animals, however it is not yet known what effect this may have on adherence to conservation messaging (Hosey et al., 2018; Johnson et al., 1992). People's attendance to conservation messages can also be influenced by their general values related to conservation. The New Ecological Paradigm (NEP) is a scale which measures conservation and environmental attitudes and can provide insight into people's underlying conservation beliefs (Dunlap et al., 2000). Prior research has established the NEP as an effective tool for understanding attitudes towards climate and conservation, especially in student populations (Harraway et al., 2012), however implementation of the NEP in non-Western contexts such as Indonesia and Tanzania revealed that the NEP was ineffective at measuring ecological attitudes (Dorward et al., 2024). This could be due to differences in environmental interactions between Western and non-Western countries e.g., differences in conservation, farming, urban development etc. More research is needed to determine the impact of pet attachment or conservation values on effective conservation messaging.

Signage

Irrespective of the message conveyed, signage is a typical method to deliver advertising or public messages to elicit behaviour change. Meis and Kashima (2017) found

that signage addressing conservation messages can be effective at encouraging environmentally focused behaviour. For example, signage has been shown to be effective to encourage recycling (Austin et al., 1993; Durdan et al., 1985) and reduce electricity consumption (Kurz et al., 2006; Sussman & Gifford, 2012). Signage that appears familiar to the viewer, and which clearly states the purpose of the message increases the perceived effectiveness (Meis & Kashima, 2017). In contrast, when a message delivered via signage which is unfamiliar to the viewer, or lacks clarity of purpose, attention is decreased. For example, traffic safety signs to encourage drivers to reduce speeds in residential areas due to the presence of children playing or residents with mobility issues are often ineffective because of perceived ambiguity of where the children are playing or what kind of mobility issues may be present, reducing the clarity of the messages purpose (Sauerburger et al., 2012). Additionally, once the novelty of the sign wears off, the effectiveness of the sign decreases regardless of the number of signs (Sauerburger et al., 2012).

A number of factors can influence how humans attend to and comprehend a sign and its message. For example, Choquette and Hand (2021) found that informational signage placed at trailheads increased knowledge of the presence of rattlesnakes, but did not increase knowledge about conservation status, threats, or snakebite prevention methods. The authors surmised that this was due to excess written information presented on the sign, with participants losing interest in reading the information once they had read and understood the title. Likewise, in a study conducted in 176 zoos across 50 different countries, Roe et al. (2014) found that 95% of visitors reported reading exhibit signage primarily to learn the animal's name. Comments saying that the signage was inaccessible, too wordy, too boring, or too numerous, were made by 20% of visitors who reported not going on to continue reading the signage.

In support of these findings, research from cognitive psychology shows that for signs to be effective at communicating information, they need to be eye-catching and not textually complex whilst still communicating interesting information (Roe et al., 2014). Typically, signage that incorporates bold colours, images or large text headings are more salient to visitors and can result in the information on those signs being more likely to be recalled later (Leeabai et al., 2023). This was demonstrated by Di Stasi et al. (2012) who determined that images incongruent with the text on traffic signs increased reaction time e.g., airport signs with directional arrows pointing away from the airport resulted in a higher likelihood of incorrect turning at intersections and increased risk of accidents. This suggests signs that clearly communicate their purpose may be perceived as being more effective (Meis & Kashima, 2017). More specifically regarding dogs, particularly pet dogs, signage that focuses on demonstrating care for dogs, rather than condemning or criticising, are viewed as more effective (Capital Kiwi & Predator Free, 2022).

Signage in Relation to Behaviour

The communication of messaging also has strong origins in behaviour analysis. Behaviour analysis is a scientific approach to understanding and changing behaviour. At its core is the idea that behaviour is shaped by conditioning—the process through which experiences alter how organisms behave (Akpan, 2025). Conditioning can be divided into two forms: classical conditioning and operant conditioning. Classical conditioning involves stimuli which elicit responses, e.g., a loud noise eliciting fear or startle reflexes; whereas operant conditioning involves stimuli which evoke responses, e.g., a light signalling lever pressing behaviour in a rat. The theory of classical conditioning (also called respondent or Pavlovian conditioning) is widely credited to Ivan Pavlov (1849-1936) and his study of the process of digestion (Akpan, 2025). Pavlov found that dogs salivated at the presentation of meat powder without prior training. The meat powder was termed an *unconditioned stimulus*

(US) as it elicited an untrained behavioural response, and the process of salivation was termed an *unconditioned response (UR)* as the behaviour was elicited automatically in the presence of the meat powder. Pavlov then determined that certain neutral stimuli i.e., a bell, termed a *neutral stimulus (NS),* did not elicit salivation. However, when the bell and the powdered meat were simultaneously presented over a number of pairings, salivation occurred. Later, when only the bell was presented, salivation also occurred, suggesting that the bell (previously a neutral stimulus) had become a *conditioned stimulus (CS)* when paired with the US (meat powder) and had come to elicit a *conditioned response (CR)*. Classical conditioning often involves repeated pairings of the US with the NS for the NS to become a CS, although this pairing can be effective after only one trial (termed one-trial learning). Once the target response occurs in response to the NS, the behaviour has been acquired, and the NS is now a CS.

Classical conditioning is a primary form of learned behaviour that can be used to explain behaviours such as food avoidance in anorexia nervosa (Spix et al., 2023; Spix & Jansen, 2025), fear responses towards seemingly innocuous stimuli such as harmless animals or objects as seen in the infamous 'Little Albert' study (Watson & Rayner, 1920), and even influence unconscious bias towards neutral stimuli based on the perceived attractiveness of a person paired with certain stimuli (Strick et al., 2008). Strick et al. (2008) demonstrated that objects paired with images of an attractive person making eye contact with the camera resulted in participants selecting the object more frequently than objects paired with an image of the same attractive person not making eye contact. Participants claimed that the lack of eye contact made the image less attractive. This suggests that objects paired with a stimulus that holds some form of attractive quality are more likely to be viewed favourably and more likely to result in the participant engaging in behaviour to obtain the object, a premise of classical conditioning that has been used as a basis of advertising.

Classical conditioning has a well-supported foundation in advertising, made famous by John B. Watson in the 1920s (Kreshel, 1990). Kreshel (1990) notes that Watson aimed for his advertising campaigns to evoke one of what he deemed the three primary emotions: fear, love, and rage, with the rationale being that these three emotions are the most likely to elicit some form of behavioural reaction. Watson reasoned that the pairing of emotionally charged stimuli alongside a marketable stimulus increased the likelihood of the consumer choosing to interact with the product (Kreshel, 1990). This approach was empirically studied by Gorn (1982) who identified that pairing liked and disliked music with different pen colours potentially influenced attitudes towards pen choice. However, subsequent studies (Allen & Madden, 1985; Gresham & Shimp, 1985; Macklin 1986) have failed to find support for the role of classical conditioning in advertising and have not replicated the work by Gorn (1982). To contrast, Stuart et al. (1987) found that even a single pairing of a product (toothpaste) with a pleasant scene was enough exposure to establish the toothpaste as a CS, potentially supporting the work previously established by Gorn (1982).

While decades of research have primarily focused on the effect of classical conditioning on advertising and choice; little research has explored the effects of classical conditioning and attitudes towards conservation messaging. There is also limited behavioural research evaluating the impact of signage on behaviour change, especially regarding conservation behaviours and attitudes towards animals. This could be, in part, due to the difficulties of measuring behaviour change in participants following being exposed to signage. Some studies suggest that humans feel more connected about animals and view them more positively when they are informed about a surprising cognitive or emotional ability (Davis et al., 2023). This is potentially due to the phenomenon known as *biophilia*, where humans assign human-like qualities to animals, increasing feelings of compassion, altruism, empathy, and connectedness towards them (Kirkey, 2024; Wilson, 1984). When viewed

from a behavioural perspective, a surprising fact about an animal may elicit empathy towards the animal. This effect may be amplified when paired with an image of the animal, particularly if it is conventionally cute (big eyes, fluffy, etc). From a classical conditioning perspective, biophilia may increase engagement with animal-related information by eliciting such positive emotional responses. When biophilic stimuli are paired with a message (e.g., encouraging leashing of dogs), the emotional response associated with the biophilic cue may become associated with the message itself, thereby increasing its impact. The message may then function as a US which elicits feelings of empathy or compassion (UR) towards the animal. When paired with the NS (the conservation message), the conservation message may then become a CS and start to elicit feelings of empathy towards the animal and increase engagement with the message. The effectiveness of utilising biophilia may be enhanced by choosing facts that emphasise animal or human well-being. For example, messages suggesting dogs may be harmed by fighting while off lead were more likely to increase leashing behaviour than signs conveying a message about dogs causing ecological harm (Jorgensen & Brown, 2017).

Similarly, Li (2025) discussed how biophilic messages emphasising how bat conservation kept humans safe by limiting possible transmission of zoonoses (infections from animals to humans) and highlighted the reciprocal relationship between bats and humans (bats help pollinate crops). This increased communities' acceptance of conservation efforts towards bat colonies in Bangladesh and Liberia where bats are not already feared. Meanwhile, Overcast (2025) investigated how biophilic messages promoting the broader human-animal bond can increase willingness to engage with conservation messages. These studies demonstrate that biophilic messages designed to increase empathy and connectedness towards animals can encourage behaviour change. When viewed from within a classical conditioning framework, a pet may function as a US that naturally elicits feelings of affection

or love (the unconditioned response). When a previously NS, such as a sign or image, is repeatedly paired with the pet, an associative learning process occurs. Through this repeated pairing, the NS acquires conditioned properties and becomes a CS, capable of eliciting the emotional response independently. The affection evoked by the sign or image thus constitutes a CR.

This study aims to investigate whether a persuasive statement on a poster elicits a change in response to engaging with a target behaviour (leashing a dog). The study is designed to complement research by Macdonald (2015), Jorgensen and Brown (2017), Walsh (2021) and Macaskill (2025), who each evaluated persuasive emotive statements and the effects different messages had on target conservation behaviour change. Two different statements were used to test this theory. Both have been designed to target two different motivating factors based on the research by Jorgensen and Brown (2017) and Walsh (2021). These statements target conservation of kiwi and welfare of dogs respectively and were placed on posters with similar graphic details. Based on prior research, we expect to find that participants are more likely to report a change in engaging with the target behaviour in response to viewing the dog welfare message. This expectation corresponds with classical conditioning theory, where love for our dogs paired with the statement is more likely to elicit the target behaviour, rather than the kiwi conservation message (Macaskill, 2025; Macdonald, 2015; Jorgensen & Brown, 2017; Walsh, 2021).

Method

Participants

Participants were recruited from a student cohort at the School of Psychological and Social Sciences, University of Waikato. Approximately 200 students completed the survey. Undergraduate students were recruited through the School's Introduction to Psychology Research Program (IPRP), whilst graduate students were recruited via a flyer advertising the study. The flyer was advertised to students during lectures as well as posted in hallways around the School of Psychology. All participants were older than 17 at the time of survey completion. The age range of participants was 17 to 61. Undergraduate students that accessed and completed the survey through IPRP received 1 research credit towards their overall trimester grade. Graduate students did not receive research credit but were thanked for completing the survey.

Apparatus

The survey was accessed by undergraduate students via the IPRP platform on SONA, whilst graduate participants accessed the survey via a QR code presented on a flyer. The flyer redirected participants to the survey platform, Qualtrics. The survey was only accessible online.

Posters

The intervention posters were designed by the primary researcher with the help of a generative AI tool (ChatGPT). Poster design was influenced by research showing that clear signage that utilises familiar imagery are more effective (Meis & Kashima, 2017). It was decided that the posters would address two messages: first, the leashing of dogs, an important conservation message considering the impact dogs have on kiwi, and second, a warning about dog safety related to 1080 poison. As such, Poster A contained the message "Roaming dogs

are the leading cause of death for adult kiwi", with cute cartoon images of the five species of kiwi listed below the leashed dog graphic (see Figure 2). Poster B contained the message "Leashes save lives. 1080 is fatal to dogs", with a cartoon image of green pellets and a black skull and crossbones in front of a leashed dog graphic to emphasise the danger of 1080 (see Figure 3). Both posters displayed the same colour palette, dog leashing image and the message "Please leash your dog" for consistency.

Figure 2

Poster A: Kiwi Conservation Message.

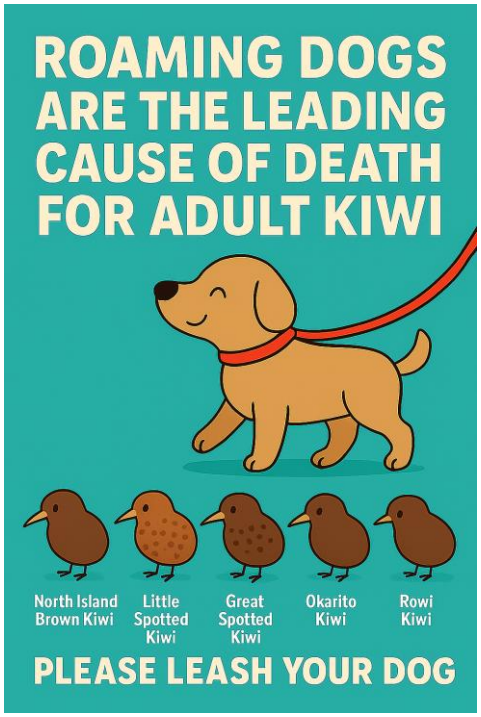


Figure 3

Poster B: Dog Welfare Message.

A 29-item survey was designed which incorporated elements of questionnaires by Jorgenson and Brown (2017) and Johnson et al. (1992). The survey began by asking participants to state how likely they were to leash their dog in the bush and then asked them to select what they believed to be the most important reason to leash their dog from a list of predetermined responses (see Table 3). Following this question, the survey progressed to the LAPS and the NEP, before presenting either Poster A or Poster B. Participants then indicated a yes/no response confirming that they had had viewed either poster A or B. Three dog ownership questions were then asked to gauge how many participants owned a dog currently, had grown up with a dog, or wanted to own a dog in the future. These questions were based on Johnson et al. (1992) who asked pet ownership questions during the development of the LAPS to enable further analyses. These questions were included to compare scale responses from the LAPS and NEP against, as well as to establish whether personal dog

interaction/ideation influenced the effectiveness of the posters. Other questions were based off Jorgenson and Brown's (2017) survey of the ecological effects of roaming dogs in national parks and included general knowledge about kiwi distribution and the number of species, knowledge about what 1080 is, and questions to determine whether participants were aware of any current leashing signage and where 1080 might be found. Finally, demographic information was collected including age, gender and length of residence in NZ. The survey concluded by revisiting the initial question asking participants to once again state their likelihood of leashing their dog and to select the most important reason for doing so, presented in an identical format to the beginning of the survey (Table 3).

Scales

Two scales were incorporated into the survey to provide insight into participants answers and to strengthen analyses of the self-reported data. The first scale was the Lexington Attachment to Pets Scale (LAPS) created by Johnson et al. (1992). The LAPS is a 23-item scale consisting of three subscales, *General Attachment, People Substituting,* and *Animal Rights/Welfare.* The *General Attachment* subscale addresses the general level of attachment one displays towards a pet. The *People Substituting* subscale evaluates how centrally one places their pet in their life. The *Animal Rights/Welfare* subscale contains questions that are primarily about the pets' status in the household. The LAPS utilises a four-point Likert scale to code responses from 0=strongly disagree; 1=somewhat disagree; 2=somewhat agree; to 3=strongly agree. The coding is reversed for questions framed negatively (questions 8 and 21 in Table 2). Higher scores indicate a stronger level of attachment towards pets.

The second scale incorporated into the survey was the Revised New Ecological Paradigm (NEP) created by Dunlap et al. (2000). The NEP is a 15-item scale consisting of

five subscales, *Reality of Limits to Growth, Antianthropocentrism, Fragility of Nature's Balance, Rejection of Exemptionalism, and Possibility of an Ecocrisis.* These subscales allow for a more detailed breakdown of participants attitudes towards the environment and conservation. *Reality of Limits to Growth* concentrates on how the earth has finite resources and a limited population capacity. *Antianthropocentrism* states that animals and plants have intrinsic value and disputes humans right to rule nature. *Fragility of Nature's Balance* places a spotlight on the actions of humans and how easily ecosystems can be disrupted. *Rejection of Exemptionalism* is the opposition of human ingenuity allowing an escape from natural laws and environmental control. *Possibility of an Ecocrisis* highlights the severity of environmental issues and disputes claims that the climate crisis is exaggerated. The NEP utilises a five-point Likert scale to code responses from 1=strongly agree; 2=slightly agree; 3=neither agree nor disagree; 4=slightly disagree; to 5=strongly disagree. Agreement with the eight odd-numbered questions indicates a pro-ecological view, whilst scores for the seven even-numbered questions are reversed such that disagreement for these questions indicates a pro-ecological view (see Table 1). Both the NEP and LAPS have good internal validity (alpha of .83 and .93 respectively) and have been used for several decades (Dunlap et al., 2000; Johnson et al., 1992).

Table 1

NEP items (Dunlap et al., 2000).

1. We are approaching the limit of the number of people the earth can support.
2. Humans have a right to modify the natural environment to suit their needs.
3. When humans interfere with nature it often produces disastrous consequences.
4. Human ingenuity will ensure that we do NOT make the earth unliveable.
5. Humans are severely abusing the environment.
6. The earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have as much right as humans to exist.
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
9. Despite our special abilities humans are still subject to the laws of nature.
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated.
11. The earth is like a spaceship with very limited room and resources.
12. Humans were meant to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Table 2

LAPS items (Johnson et al., 1992).

1. My pet means more to me than *any* of my friends.
2. Quite often I confide in my pet.
3. I believe that pets should have the same rights and privileges as family members.
4. I believe my pet is my best friend.
5. Quite often, my feelings towards people are affected by the way they react to my pet.
6. I love my pet because he/she is more loyal to me than most of the people in my life.
7. I enjoy showing other people pictures of my pet.
8. I think my pet is just a pet.
9. I love my pet because it never judges me.
10. My pet knows when I'm feeling bad.
11. I often talk to other people about my pet.
12. My pet understands me.
13. I believe that loving my pet helps me stay healthy.
14. Pets deserve as much respect as humans do.
15. My pet and I have a very close relationship.
16. I would do almost anything to take care of my pet.
17. I play with my pet quite often.
18. I consider my pet to be a great companion.
19. My pet makes me feel happy.
20. I feel that my pet is a part of my family.
21. I am not very attached to my pet.
22. Owning a pet adds to my happiness.
23. I consider my pet to be a friend.

Procedure

Participants provided consent to participate in the research prior to accessing the whole survey. Once consent was given, participants were randomly assigned to one of two groups (A or B) using the randomiser function in Qualtrics. The first survey question asked participants to choose the most important reason they would leash a dog for from a selection of possible responses (see Table 3 for full list of possible responses). Following this initial question, they were asked to fill in the LAPS and NEP scales. Participants were then presented with Poster A or B, depending on which group they were randomly assigned to at the start of the survey and were asked to confirm whether they had viewed the poster. After viewing the poster, participants were asked a collection of demographic questions about themselves and three questions relating to dog ownership: (*Do you currently own a dog*? *Did you grow up with a dog? Do you want to own a dog?*). Finally, participants were presented with the post survey question, which was the same question presented prior to completing the survey (see Table 3) where participants were asked once again to state the reason they would be most likely to leash their dog. After completing the survey, participants were directed to a debrief page where they were informed of the purpose of the survey and study. See Appendix A for full survey.

Table 3

Pre/Post Survey Questions and Response Options.

How likely are you to leash your dog in the bush?
Extremely unlikely
Somewhat unlikely
Neither likely nor unlikely
Somewhat likely
Extremely likely
Of the options below, which reason is most likely to result in you leashing your dog?
Dog / dog aggression (e.g. dog fights)
Dog wandering and getting lost
Dog attacking other humans
Dog being poisoned from eating 1080 (Dog welfare)
Dog chasing/attacking kiwi (Kiwi conservation)
Dogs do not need to be leashed in the bush

Note. Questions were presented identically pre survey and post survey.

Once all responses were collected, survey data was downloaded from Qualtrics as an excel file. In excel, the data was cleaned in preparation for analysis, and all survey responses were coded. Following this process, data were imported into SPSS for more in-depth analysis.

Ethical Statement

Ethical approval for the study was granted by the University of Waikato Psychology Research and Ethics Committee, application FS2025-12.

Results

The characteristics of all 201 participants are shown in Table 4. Overall, 60.2% were between the ages of 17 and 20, 78.6% were female, and 70.7% had lived in NZ since birth. Of the participants, 48.3% currently owned a dog, and 83.1% stated they would like to own a dog.

LAPS

Table 5 displays a summary of the scale scores for both the LAPS and the NEP. As illustrated in Table 5, women and gender diverse participants were significantly more likely to report higher mean total scores across the LAPS subscales compared to men. Whilst the gender variable did not have a normal distribution, the Levene statistic indicated the data was homogenous (p = .086) suggesting that a parametric test would be appropriate. A one-way ANOVA was conducted to test the difference between total LAPS scores and the three gender groups. The ANOVA revealed a statistically significant difference in mean total LAPS scores between at least two different groups in the Gender variable F (2, 193) = 6.07, p = .003, with Tukey's HSD test confirming that the mean value of Total LAPS scores was significantly different between Women and Men (p = .002, 95% C.I. = [2.69, 14.09]). There was no statistically significant difference in mean LAPS scores between Women and Gender diverse groups (p = .872) or Men and Gender diverse groups (p = .658). There was no significant interaction between Gender and total mean NEP scores.

When analysing age, participants aged between 41-45 had higher mean LAPS scores, indicating higher levels of attachment to pets, whilst participants aged 31-35 had higher mean NEP scores indicating a stronger pro-ecological world view. However, there were no significant interactions between Age and any scores on the LAPS and NEP. To analyse if there were any significant differences between mean total LAPS scores and the three dog

ownership questions (*Do you currently own a dog? Did you grow up with a dog? Would you like to own a dog?*) a Mann-Whitney U was conducted. Results indicated that people who owned a dog (mean rank of 118.22) had significantly higher total LAPS scores than people who did not own a dog (mean rank of 79.95; z = -4.72, p = <.001) however there were no significant differences between total LAPS scores, people who grew up with a dog, wanted to own a dog, or any other demographic variables.

There were significant interactions with total LAPS scores and several of the subscales. A one-way ANOVA was conducted to test the difference between *General Attachment* scores and the three gender groups (male, female, gender diverse). The ANOVA revealed a statistically significant difference in mean *General Attachment* between at least two different groups in the Gender variable F (2, 193) = 4.36, p = .014, with Tukey's HSD test confirming that the mean value of scores was significantly different between Women and Men (p = .010, 95% C.I. = [0.69, 6.30]) suggesting that women have stronger attachment to pets than men. There was no statistically significant difference in mean *General Attachment* scores between Women and Gender diverse groups (p = .859) or Men and Gender diverse groups (p = .798).

A one-way ANOVA between Gender and the *People Substitution* subscale scores revealed a significant interaction between these variables F (2, 193) = 7.40, p = <.001, with Tukey's HSD test confirming that the mean value was significantly different between Women and Men (p = <.001, 95% C.I. = [1.34, 5.62]) suggesting that women place their pet in a more central position in their life. There was no statistically significant difference in mean *People Substitution* scores between Women and Gender diverse groups (p = .969) or Men and Gender diverse groups (p = .419).

Finally, the *Animal Welfare* subscale was analysed. A one-way ANOVA was conducted between the Gender variable and *Animal Welfare* scores which revealed a significant difference in scores between at least two different groups in the Gender variable F (2, 193) = 3.11, p = .047. Tukey's HSD test confirmed that the mean value of scores was significantly different between Women and Men (p = .040, 95% C.I. = [0.05, 2.69]). There was no statistically significant difference in mean *Animal Welfare* scores between Women and Gender diverse groups (p = .812) or Men and Gender diverse groups (p = .929).

The LAPS subscales were also analysed against responses to the three dog ownership questions. To analyse *General Attachment* a Mann-Whitney U revealed that people who owned a dog had significantly higher *General Attachment* scores than people who did not own a dog (mean rank of 116.30 compared to mean rank of 81.76; z = -4.27, p = <.001). People who wanted to own a dog also had significantly higher *General Attachment* scores than people who did not want to own a dog (mean rank of 105.71 compared to mean rank of 61.55; z = -4.04, p = <.001).To explore whether there were any significant differences between the *People Substitution* subscale and people who owned a dog, an independent t-test was conducted. The results of the independent t-test indicated that the 95 people who owned a dog (M = 13.56, SD = 4.60) had significantly higher subscale scores than the 101 people who did not own a dog (M = 10.31, SD = 4.97) indicating that participants who owned a dog viewed dogs as a substitute for people more than people who did not own a dog (t(194) = -4.75, p = <.001). Similarly, an independent t-test was conducted between people who grew up with a dog and their *People Substitution* scores. Results of the independent t-test indicated that the 95 people who owned a dog (M = 13.56, SD = 4.60) had significantly higher scores than the 101 people who did not own a dog (M = 10.31, SD = 4.97; t(194) = -4.75, p = <.001). A Mann-Whitney U test indicated that there was a significant difference in *People*

Substitution scores between people who do want to own a dog and people who do not want to own a dog (mean rank of 106.59 compared to mean rank of 57.02; z = -4.53, p = <.001).

The *Animal Welfare* subscale scores were then analysed against dog ownership. A Mann-Whitney U test illustrated that people who owned a dog had significantly higher *Animal Welfare* scores than people who did not own a dog (mean rank of 115.59 compared to mean rank of 82.42; z = -4.12, p = <.001). Additionally, people who grew up with a dog (mean rank of 107.25) had significantly higher *Animal Welfare* scores than people who did not grow up with a dog (mean rank of 85.81; z = -2.62, p = .009). Participants who wanted to own a dog had significantly higher *Animal Welfare* scores than people who did not want to own a dog (mean rank of 105.08 compared to mean rank of 64.77; z = -3.70, p = <.001).

NEP

Total NEP scores were also analysed against responses to the three dog ownership questions that asked participants if they currently own a dog, whether they grew up with a dog, and if they would like to own a dog. A Mann-Whitney U indicated that people who owned a dog (mean rank of 108.43) had significantly higher Total NEP scores than people who did not own a dog, indicating a more pro-ecological view among people who owned a dog (mean rank of 89.16; z = -2.38, p = .017). There were no significant interactions between total NEP scores or subscale scores and the variables of growing up with a dog or wanting to own a dog.

Analysis of the NEP subscales using a Mann-Whitney U indicated that people who owned a dog (mean rank of 108.13) had significantly higher *Limits to Growth* subscale scores than people who did not own a dog (mean rank of 89.45; z = -2.33, p = .020) as well as significantly higher *Antianthropocentrism* scores (mean rank of 107.55 compared to mean rank of 89.99; z = -2.21, p = .027) suggesting that people who owned a dog are more likely to

believe that the earth has limited resources and that humans do not have the right to rule over nature. Additionally, a Mann-Whitney U indicated that there was a significant difference in *Rejection of Exemptionalism* scores between people who owned a dog (mean rank of 107.19) and people who did not own a dog (mean rank of 90.32; z = -2.103, p = .035) suggesting that people who owned a dog are more likely to believe that human ingenuity will not allow for escaping the consequences of our impact on nature.

The pre and post survey 'reasons to leash your dog' questions (see Table 3) were then analysed using Chi-Square and Fisher's Exact tests. There was a significant association between participants answering "extremely likely" to leashing their dog in the pre and post survey leashing question X^2(1, N = 201) = 39.09, p = <.001. Participants were more likely to answer "extremely likely" to leashing their dog when asked post survey. All possible responses to the pre survey question (How likely are you to leash your dog in the bush) were compared to all possible responses to the post survey question (How likely are you to leash your dog in the bush). There was a significant association between all pre survey leashing responses and all post survey leashing responses X^2(25, N = 201) = 79.53, p = <.001.

There was no significant association between participants answering that they were "extremely likely" to leash their dog pre survey and which poster was viewed (X^2(1, N = 201) = 1.283, p = .257), and there was no significant association between participants answering "extremely likely" in the post survey question and which poster had been viewed (Fisher's Exact test p = .090, X^2(1, N = 201) = 3.111, p = .078).

A Chi Square test between participants choosing to leash their dog for welfare reasons (i.e., Dog being poisoned from eating 1080 (Dog welfare) post survey (see Table 3 for full list of reasons) and poster viewed indicated a significant association between variables (Fisher's Exact test p = <.001, X^2(1, N = 201) = 25.547, p = <.001). Additionally, there was a

significant association between participants choosing the kiwi conservation reason (i.e., Dog chasing/attacking kiwi (Kiwi conservation) to leash their dog and poster viewed (Fisher's Exact test $p = <.001$, $X^2(1, N = 201) = 11.680$, $p = <.001$).

Table 4

Characteristics of survey participants.

Demographic Factors	*n* = 201	%
Age		
17-20	121	60.2
21-25	45	22.3
26-30	14	7.0
31-35	5	2.5
36-40	7	3.5
41-45	3	1.5
46+	5	2.5
(blank)	1	0.5
Gender		
Man	36	17.9
Woman	158	78.6
Gender diverse	7	3.5
Length of Residence in NZ		
Less than 1 year	1	0.5
1-4 years	13	6.5
5-10 years	14	7.0
10-15 years	17	8.5
15+ years	13	6.5
Since birth	142	70.7
(blank)	1	0.5
Currently own dog		
No	104	51.7
Yes	97	48.3
Grew up with dog		
No	81	40.3
Yes	120	59.7
Would like to own dog		
No	34	16.9
Yes	167	83.1

Table 5

Average scale results (On next page).

	Lexington Attachment to Pets Scale (LAPS)			LAPS Subscales			New Ecological Paradigm Scale (NEP)			NEP Subscales				
	Mean Total Score	Min	Max	General Attachment	People Substitution	Animal Welfare	Mean Total Score	Min	Max	Limits to Growth	Anti-anthropocentrism	Nature's Balance	Rejection of Exemptionalism	Ecocrisis
Age														
17-20	46.7	15.0	69.0	23.6	12.2	10.8	53.1	30.0	72.0	9.2	9.3	10.9	10.3	11.9
21-25	45.0	0.0	65.0	23.0	11.9	10.2	52.4	35.0	70.0	9.1	9.6	10.8	10.2	11.5
26-30	41.4	24.0	58.0	21.8	10.2	9.4	50.0	0.0	62.0	8.7	9.0	10.9	9.9	9.9
31-35	38.4	0.0	64.0	20.8	8.2	9.4	48.0	0.0	73.0	8.4	8.4	10.0	9.4	10.6
36-40	44.3	30.0	63.0	24.0	10.6	9.7	**56.9**	44.0	70.0	10.0	9.7	**12.0**	**11.6**	12.4
41-45	**56.0**	40.0	65.0	**29.0**	**15.0**	12.0	56.3	53.0	61.0	10.3	9.7	10.0	10.0	13.7
46+	52.0	36.0	62.0	26.8	12.6	**12.6**	50.6	43.0	56.0	**10.4**	9.0	11.4	8.6	10.4
(blank)	0.0	_	_	_	_	_	0.0	_	_	_	_	_	_	_
Gender														
Gender diverse	44.6	39.0	48.0	22.6	12.0	10.0	**57.8**	50.0	68.0	9.0	9.6	11.8	11.4	**14.0**
Man	39.2	15.0	62.0	20.6	9.1	9.5	49.7	0.0	67.0	8.6	9.0	10.4	10.2	10.7
Woman	**47.6**	0.0	69.0	24.1	12.5	10.8	53.3	0.0	73.0	9.3	9.4	11.0	10.2	11.8
Residence														
Less than 1 year	40.0	40.0	40.0	21.0	10.0	9.0	47.0	47.0	47.0	4.0	**11.0**	12.0	11.0	11.0
1-4 years	50.1	29.0	69.0	24.8	14.2	11.0	52.5	43.0	70.0	9.8	10.0	10.5	9.7	11.0
5-10 years	**51.3**	15.0	65.0	25.8	14.1	11.5	52.2	38.0	70.0	8.7	9.1	11.2	10.0	11.4
10-15 years	43.3	25.0	63.0	22.3	10.8	10.1	**54.9**	45.0	62.0	9.2	9.1	11.4	10.9	12.1
15+ years	43.3	19.0	65.0	22.5	10.8	10.0	49.3	0.0	68.0	8.7	9.0	9.8	9.7	10.8
Since birth	45.6	0.0	66.0	23.3	11.7	10.6	52.9	0.0	73.0	9.2	9.4	10.9	10.2	11.8
Did you grow up with a dog?														
Yes	**47.7**	0.0	69.0	24.1	12.6	11.0	**53.9**	0.0	73.0	9.4	9.4	11.0	10.4	12.0
No	43.3	0.0	66.0	22.5	10.9	9.9	51.1	0.0	70.0	8.8	9.2	10.7	9.9	11.1
Do you currently own a dog?														
Yes	**50.7**	24.0	69.0	25.6	13.6	11.6	**54.7**	33.0	73.0	9.6	9.7	11.1	10.6	12.0
No	41.5	0.0	66.0	21.4	10.3	9.6	50.8	0.0	72.0	8.8	9.0	10.7	9.8	11.3
Would you like to own a dog?														
Yes	**48.0**	0.0	69.0	24.4	12.6	11.0	52.8	0.0	73.0	9.2	9.3	10.8	10.3	11.6
No	35.5	0.0	66.0	18.8	8.0	8.5	52.4	37.0	72.0	8.9	9.3	11.2	9.9	11.6
Do you think your dog would ever chase a kiwi?														
Definitely not	45.7	0.0	65.0	23.2	12.1	10.3	50.3	30.0	69.0	8.9	9.4	10.5	9.5	11.2
Probably not	45.7	31.0	69.0	23.6	11.8	10.4	51.1	35.0	70.0	8.5	9.2	11.0	10.0	11.2
Maybe yes maybe not	45.2	15.0	64.0	22.9	11.8	10.5	52.5	0.0	70.0	9.2	9.3	10.8	10.4	11.5
Probably yes	**48.2**	6.0	66.0	24.5	12.7	10.9	**55.0**	39.0	73.0	9.6	9.4	11.2	10.5	12.0
Definitely yes	40.0	0.0	60.0	21.0	8.8	10.2	50.1	0.0	67.0	8.7	9.5	10.2	9.3	11.9
Total averages	43.3	16.0	63.5	23.3	11.5	10.4	50.1	22.6	68.0	9.0	9.4	10.9	10.2	11.6

Note: Four participants results have been omitted from the table due to scale responses not being answered.

Discussion

The current study investigated whether the viewing of posters conveying kiwi conservation or dog safety messaging would influence behaviour change in the form of reasons given to leash their dog: would participants leash their dog more for concerns about dog safety and welfare, or more for concerns related to kiwi conservation. The results showed that both Poster A (kiwi conservation message) and Poster B (dog welfare message) had a significant effect on how participants answered the post survey "how likely are you to leash your dog in the bush?" with participants choosing both the kiwi conservation message and the dog welfare message more frequently post survey than they did pre survey. However, the 1080 poster and the dog welfare message it contained had a greater impact on post survey leashing responses than the kiwi conservation poster. In other words, participants were more likely to adhere to a dog leashing message if this kept their dogs safe from 1080 poison rather than leashing them for the safety of kiwi.

This finding supports research by Macdonald (2015), who found that when surveyed, people were more likely to contain cats inside at night and adhere to a message conveying cat safety (less mortality as a result of cars, less fights with other cats) rather than a bird conservation message (containing cats at night leads to less predation). The current research also supports the findings of Macaskill et al. (2025) who found that people are more likely to report wandering dogs for the primary benefit of keeping dogs safe, rather than keeping kiwi safe and the findings of Jorgensen and Brown (2017) who found that people were more likely to leash their dogs to ensure their dogs safety rather than to minimise their dogs impact on the environment. This study also supports findings by Walsh (2021) who found that both the kiwi conservation message and the dog welfare message were effective at producing behaviour change, but that the dog welfare message was more effective. The current study's findings can be potentially associated with dogs being a more salient stimulus to people because of the

direct interaction that typically occurs with the dog and the close observation of their safety. Whereas kiwi are a stimulus which are frequently not encountered by many people outside of zoos and wildlife centres, and so are unable to be interacted with, making them a less salient stimulus. Their safety is implied rather than observed, therefore behaviour change to ensure kiwi welfare may be less likely to occur due to the lack of direct connection with the animal and a lack of tangible reinforcement (i.e., lack of direct access to a physical stimulus or item).

Jacobs et al. (2023) suggested that signage designed to amplify biophilic responses by highlighting the emotional capacity of animals may be more effective at eliciting behaviour change, especially if the biophilic element is paired with a conservation message that uses positive or non-threatening language to create a conditioned stimulus and response. Viewed from a classical conditioning perspective, this means that conservation signage addressing leashing dogs to protect kiwi may be more likely to be effective at eliciting the targeted behaviour change (leashing of dogs) if the message targets dog welfare or emphasises the emotional welfare of dogs, rather than highlighting the needs of kiwi because of the elicited feelings of love experienced towards our dogs. The findings of this study and that of Jorgensen and Brown (2017), Macdonald (2015), and Macaskill et al. (2025) are suggestive that altering the conservation messaging to relate to owner's emotions and attachment to their pets may be the more efficient method to achieve conservation goals by conveying a conservation message in a way which is more effective at eliciting behaviour change.

Analysis of the LAPS indicated that women had statistically higher attachment towards pets when compared to men but there was no significant relationship between men and gender diverse participants or women and gender diverse participants. This suggests that women are more likely to demonstrate higher attachment to pets, placing them at a central point in their lives, and have stronger animal welfare tendencies. This is consistent with

findings discussed by Johnson et al. (1992) and Egaña-Marcos et al. (2025) who also found that females display higher levels of attachment towards pets. Another interesting observation is that there were significant associations between participants who grew up with a dog and their scores on the *People Substitution* and *Animal Welfare* subscales but not for the *General Attachment* or total scale score. This finding is also consistent with those of Johnson et al. (1992) who found only a borderline significant association between growing up with a pet and pet attachment. Curiously, participants who currently owned a dog were the only group to consistently demonstrate significant associations with their LAPS total scores and all LAPS subscales, suggesting that dog owners experienced stronger attachment. To contrast, there were significant associations between participants who would like to own a dog and their scores on the individual LAPS subscales but no significant association with their total LAPS scores, suggesting participants who would like to own a dog may display lower levels of attachment than those who currently own a dog. It is possible that current dog ownership results in stronger attachment scores compared to having the intention to own a dog. Barklam and Felisberti (2026) found that pet attachment stemmed more from a person's present pet ownership status, with current owners displaying higher attachment than previous or intended owners, a difference even more pronounced for dog owners. The authors proposed a potential reason being that people who currently own a pet tend to experience increased levels of empathy towards animals, resulting in a higher likelihood of them already owning and forming attachments to pets (Barklam & Felisberti, 2026).

It would have been interesting to compare attachment scores of dog owners with cat owners or other pet owners. Prior research indicates that cat owners tend to display lower attachment scores than dog owners (Johnson et al., 1992), however this was unable to be confirmed with the current dataset. Cat owners are also likely to display higher attachment scores than non-pet owners (Johnson et al., 1992). However, in the current dataset cat owners

were placed in the non-dog owner group by default (unless they owned both cats and dogs) meaning that the non-dog owner group may have displayed higher attachment scores as it was assumed throughout the process that non-dog owner equated to non-pet owner when in reality some of these participants may have owned a different type of pet that was not a dog. If this research were to be conducted again, it would be prudent to separate participants by type of pet they own, e.g., dog, cat, bird, no pet, in order to evaluate attachment more precisely. Additionally, using other attachment scales such as the Pet Attachment and Life-Impact scale (Cromer & Barlow, 2013) or the Comfort from Companion Animals scale (Zasloff, 1996) would further strengthen analysis of attachment and allow for greater depth of comparison to poster effects.

Analysis of the NEP scores showed no significant age effect, which contradicts the findings of Dunlap et al. (2000). Interestingly, Dunlap et al. (2000) showed that higher NEP scores were negatively related with age, however analysis of the current data did not show any relation between total NEP scores and age. This is potentially due to a bias in the sample population as 89.5% of the participants were between the age of 17 and 30. There was also no significant effect between Gender and total NEP scores which was unexpected. Research indicates that women display greater environmental concern than men, therefore the expectation was to find a similar result with this dataset (Gyurián Nagy, 2025; Wibowo, 2023). However, as the current dataset was biased towards young females, it is possible that the male sample was too small to yield any truly significant differences between males and females. Of particular interest, participants who owned a dog demonstrated significantly higher total NEP scores and subscale scores than those who did not own a dog, indicating that owning a dog may increase pro-ecological views. There is minimal research into the effect that pet ownership has on ecological attitudes, however Jacobs et al., (2023) found that highlighting pets' emotional capacity increased pro-ecological attitudes and motivation to

improve the environment among pet owners. Jacobs et al. (2023) suggested that this was less about the general anthropomorphism of pets (e.g., attributing the ability to think or plan to pets), but more about the ability for pets to have emotional experiences that influenced owners' commitment to nature. Although there is a lack of other research on the effect pet ownership may have on pro-ecological behaviour, current research including this study suggests that pet owners are likely to be more pro-environmental than non-pet owners. This effect can be magnified by highlighting the emotional abilities of pets, particularly their ability to experience pain or pleasure which is associated with biophilia and an increased connectedness or love an owner feels towards their pet.

Messages which evoke a positive emotional response for the purpose of influencing behaviour are effectively utilised in areas outside conservation, such as retail or advertising. Classical conditioning through emotional messaging has been used to increase the likelihood of returning to an advertised shop (Dennis et al., 2010) and has increased favourability and intention to purchase goods (Zhang et al., 2014). Emotional messaging has also been used to promote driver safety, where messaging appealing to family reduced texting whilst driving in young adults (Hoseinzadeh-Nooshabadi et al., 2023). However, there are questions regarding the effectiveness of utilising emotional messaging on signage. For example, Vigolo et al. (2019) found that signage with negative emotional language significantly decreased patient satisfaction in a healthcare setting, whilst Ward et al. (2021) found persuasive messages targeting risky driving behaviours were ineffective when the message was perceived as a threat. Similarly, Borawska et al. (2020) found that a risky driving style results in less attention paid to persuasive (threatening) messages about driving safety, reducing the effectiveness of targeted messaging. These findings suggest that emotional messaging in classical conditioning may be more effective at altering behaviour when positive language or

language designed to elicit feelings of empathy or love are used, rather than using language which could be perceived as threatening.

Alongside classical conditioning, there appears to be an element of operant conditioning occurring. Operant conditioning is where behaviour is evoked by an antecedent, in this case a poster, behaviour occurs (either leashing or not leashing) and then is moderated by either a reinforcing or punishing consequence (Edwards, 2021). Reinforcement serves to strengthen or increase the likelihood of behaviour whilst punishment decreases the likelihood of behaviour. From a behavioural perspective, messages can signal the availability of reinforcement or punishment which can be accessed through compliance or non-compliance with the message. In the context of the current study, Poster B contained the message, "leashes save lives, 1080 is fatal to dogs", which is both an antecedent and a US that highlights the risk of dog death which is likely to be a salient punisher for most dog owners. The phrase, "please leash your dog", is a CS and an antecedent which signals the availability of negative reinforcement by avoiding the punishing contingency of potential poisoning; leashing a dog limits how much a dog can interact with the environment, removing the threat of 1080 (removing stimulus = negative) keeping the dog alive (reinforcement = increases the likelihood of the behaviour occurring). Poster A contained a similar antecedent, a US, "Dogs are the leading cause of death for adult kiwi", which highlighted kiwi death, and had the same CS, "please leash your dog". However, results demonstrated that kiwi death is potentially less punishing than dog death to dog owners. Another way of looking at these results is that dog welfare is more reinforcing than kiwi welfare, a position supported by Macdonald (2015) who found that cat welfare messages were more reinforcing than native bird welfare messages when it came to keeping cats indoors overnight. Macdonald (2015) found that cat welfare was a tangible reinforcing stimulus, where contingencies could be experienced fairly immediately through a reduction in cat fights/car strike. Meanwhile, Jorgensen and Brown

(2017) also found that dog welfare reinforced dog leashing more effectively than threats of fines or wildlife endangerment. Bird welfare could be considered an abstract reinforcing stimulus, accessed only through the assumption that the behaviour of keeping the cat indoors may have a positive impact on birds but without any direct confirmation or tangible benefit (Edwards, 2021). This links to the current research suggesting that leashing dogs may not be reinforcing for owners when viewed from the perspective of keeping kiwi safe as there is no direct benefit for the owner, they will likely never see a wild kiwi, in fact leashing could be punishing for the owner if their dog is reactive or not leash trained. However, leashing could be reinforcing for owners when viewed from the perspective of ensuring continued dog welfare as owners directly benefit from keeping their dogs safe.

This study was impacted by several limitations. First, participants were not asked to rate or provide feedback regarding poster design at any point, so it cannot be determined if any design elements made the posters more or less salient to participants. However, this limitation was considered during the planning of the study, so confounds were mitigated by designing the posters to share many of the same features to appear as similar to each other as possible. Both posters had the same background colour, identical text font and colour, similar cartoon themed images, and the same request to participants, “Please leash your dog”. The only differences between the posters were the two targeted statements (kiwi conservation vs dog welfare) and the different images used (see Figures 2 and 3). It is possible that there were elements present on both intervention posters that were unrelated to the targeted message which influenced the significant post-survey findings for both interventions. Future research should explore elements of poster design to investigate possible confounds. For example, presenting multiple posters containing the same message but with different graphic design elements (Jorgensen & Brown, 2017; Rice et al., 2023).

Second, the data was gathered from a primarily first-year, female university student population resulting in 60.2% of participants being between the ages of 17 and 20. This means that any age effects have likely been masked due to the strong age bias in the sample. There was also a potential a gender bias with 78.6% of participants identifying as women. Thus, any conclusions regarding significant effects found with respect to gender should be interpreted with caution and may not be valid. Third, the study included a small sample size of 201 participants, which resulted in insufficient power to accurately calculate effect size. Unfortunately, time did not allow for the recruitment of further participants to correct this. Fourth, due to the online nature of the survey, it was not possible to verify how long participants looked at the intervention posters or indeed whether they engaged with them in any meaningful capacity beyond confirming that the poster had been viewed. Behaviour change post-survey can also not be verified. Ultimately, this means that although it appears that the posters had a significant effect on behaviour due to a change in pre and post-survey response for leashing your dog, whether the posters would continue to encourage participants to leash their dog cannot be measured. Finally, the survey focused on behaviour change regarding dog leashing, however, less than half of the sample currently owned a dog. This suggests that more than half of the sample would be unlikely to engage in any meaningful behaviour change as there is no reason to leash a dog if one is not owned. If the current study were to be repeated, a more diverse, larger sample would be beneficial.

Conclusion

This study holds significance for animal and environmental advocacy projects/organisations. Many advocacy groups rely on signs or posters to communicate public messages; however, these messages are not always conveyed effectively (Packer et al., 2025), particularly when behaviour change is a primary goal. In order to elicit behaviour change, organisations such as DOC may find greater levels of compliance if their persuasive message targets the welfare of animals that the majority of people care about the most; our pets (Macdonald, 2015). The welfare of pets represents a strong positive reinforcer due to the direct interaction between people and their pets' wellbeing i.e., people directly benefit from their pets' safety (Macaskill, 2025; McConnell et al., 2019). Conversely, the welfare of wild animals may be a weaker reinforcer as there is no direct interaction between a persons' actions and their impact on the respective animal i.e., we cannot immediately see or have direct contact with the positive impact of adhering to a conservation message (Overcast, 2025). This study suggests that dog leashing behaviour – a key kiwi conservation message – could be improved by incorporating classical conditioning theory and drawing on the effects of biophilia and pet attachment, where pet welfare can become a conditioned reinforcer for complying with a conservation message in order to achieve the targeted outcome: the conservation of kiwi.

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Appendix A

Study information sheet

Kiwi Messages Project

You have been invited to participate in this research study investigating Kiwi Advocacy. This research project is being supervised by Dr Tania Blackmore, Lecturer in Psychology at the University of Waikato, New Zealand and carried out by Ashleigh Smith. The findings will be published in peer-reviewed journals and a master's thesis.

For further information If you have any questions related to the research project, please email the researcher: acjs1@students.waikato.ac.nz.

Participants' role

You will be asked to complete a series of questionnaires, then shown a poster, and then asked several related questions. The total time for completing is estimated to be less than 10 minutes. This is not a test, so there are no right or wrong answers and there are no risks involved in taking part in this research. Please be as honest as you can.

Confidentiality and participants' rights

All data are anonymised meaning no personal information can be linked between yourself and the data that have been given. You can withdraw from the study at any time without giving a reason by simply closing your browser window.

Storage of data

Data will be stored for a minimum of 5 years after completion of this research project. The data will be stored securely by Dr Tania Blackmore and the research investigators of this project will have access to this data. If required for paper publication, anonymised data may be shared in public repositories.

Funding

There is no external funding for this project.

Ethics approval

This research project has been approved by the Human Research Ethics Committee of the Division of Arts, Law, Psychology and Social Sciences at the University of Waikato.

Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee, Email: alpss-ethics@waikato.ac.nz Postal address: Division of Arts, Law, Psychology and Social Sciences, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240.

Consent

By proceeding with the online survey, you are agreeing that:

(1) you have read and understood this information

(2) questions about your participation in this study have been answered satisfactorily

(3) you are aware of the potential risks

(4) you are taking part in this research study voluntarily

(5) anonymised data may be shared in public research repositories.

Do you consent to participate in this survey?

○ Yes (1)

○ No (0)

Appendix B

Survey

For the purpose of this survey, "bush" refers to native forest areas of New Zealand and includes National Parks, tramping trails, and walking tracks.

Q1, How likely are you to leash a dog in the bush?

Extremely unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Extremely likely
1	2	3	4	5

Q2, Of the options below, which reason is most likely to result in you leashing your dog?

- ○ Dog / dog aggression (e.g. dog fights) (1)
- ○ Dog wandering and getting lost (2)
- ○ Dog attacking other humans (3)
- ○ Dog being poisoned from eating 1080 (4)
- ○ Dog chasing/attacking kiwi (5)
- ○ Dogs do not need to be leashed in the bush (6)

Q3, We would now like to ask you a series of questions about how you feel about pets.

Please answer the following questions about your current pet. If you do not currently have a pet, please answer about a past pet, or an imaginary pet.

Strongly disagree = 0, Slightly disagree = 1, Slightly agree = 2, Strongly agree = 3

1. My pet means more to me than any of my friends 

2. Quite often I confide in my pet 

3. I believe that pets should have the same rights and privileges as family members 

4. I believe that my pet is my best friend 

5. Quite often, my feelings towards people are affected by how they react to my pet 

6. I love my pet because he/she is more loyal to me than most of the people in my life 

7. I enjoy showing other people pictures of my pet 

8. I think my pet is just a pet 

9. I love my pet because it never judges me 

10. My pet knows when I am feeling bad 

11. I often talk to other people about my pet 

12. My pet understands me 

13. I believe that loving my pet helps me stay healthy 

14. Pets deserve as much respect as humans do 

15. My pet and I have a very close relationship

16. I would do almost anything to take care of my pet

17. I play with my pet quite often

18. I consider my pet to be a great companion

19. My pet makes me feel happy

20. I feel that my pet is a part of my family

21. I am not very attached to my pet

22. Owning a pet adds to my happiness

23. I consider my pet to be a friend

Q4, We would now like to ask you some questions about conservation and the environment. Please answer the following questions honestly.

	Strongly disagree	Mildly disagree	Unsure	Mildly agree	Strongly agree
	1	2	3	4	5
1. We are approaching the limit of the number of people the earth can support					
2. Humans have the right to modify the natural environment to suit their needs					
3. When humans interfere with nature, it often produces disastrous consequences					
4. Human ingenuity will ensure that we do NOT make the earth unliveable					

5. Humans are severely abusing the environment

6. The earth has plenty of natural resources if we just learn how to develop them

7. Plants and animals have as much right as humans to exist

8. The balance of nature is strong enough to cope with the impacts of modern industrial nations

9. Despite our special abilities humans are still subject to the laws of nature

10. The so-called "ecological crisis" facing humankind has been greatly exaggerated

11. The earth is like a spaceship with very limited room and resources

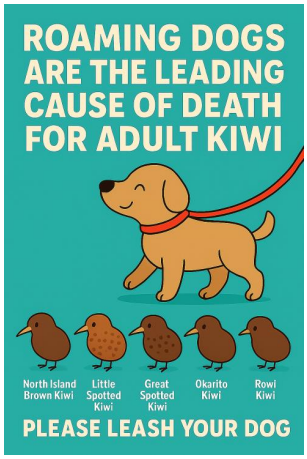
12. Humans were meant to rule over the rest of nature

13. The balance of nature is very delicate and easily upset

14. Humans will eventually learn enough about how nature works to be able to control it

15. If things continue on their present course, we will soon experience a major ecological catastrophe

Q5, **A.** Please observe this poster



Q6, **A.** Please confirm you observed the poster

- I have observed the poster (1)
- I cannot see the poster (2)

Q5, **B.** Please observe this poster

Q6, **B.** Please confirm you observed the poster

- I have observed the poster (1)
- I cannot see the poster (2)

Q7, Do you currently own a dog either personally or as a family pet?

- ○ Yes (1)
- ○ No (2)

Q8, Did you grow up with a dog?

- ○ Yes (1)
- ○ No (0)

Q9, Would you like to own a dog one day?

- ○ Yes (1)
- ○ No (0)

Q10, Do you have a pet that is not a dog? E.g. Your own or a family pet. If so, what kind?

- ☐ Cat (1)
- ☐ Rabbit (2)
- ☐ Fish (3)
- ☐ Birds (4)
- ☐ Mice/Rat (5)

☐ I do not live with any animals (6)

☐ Other (7) _____

If you do not currently have a dog, please answer as if you are thinking about a past dog or an imaginary dog for all further questions

Q11, Do you think your dog would ever chase a kiwi?

○ Definitely not (1)

○ Probably not (2)

○ May or may not (3)

○ Probably yes (4)

○ Definitely yes (5)

Q12, Are you aware of any rules about leashing dogs in public? (e.g. warnings, fines etc)

○ No (0)

○ Yes (1)

Q13, Have you seen any signage about leashing dogs in public?

○ Yes (1)

○ No (0)

Q14, If yes, where?

- [ ] Bush tracks (1)
- [ ] Parks/fields (2)
- [ ] Beach (3)
- [ ] Around the city (4)
- [ ] River path (5)

Q15, If you see other dogs off leash in a public space, how likely are you to leash your dog?

	Extremely unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Extremely likely
	1	2	3	4	5
At the beach					
At the park					
Around the city					
In the bush					
On river paths					

Q16, Where do you think Kiwi are in New Zealand?

- [ ] Zoos/wildlife centres (1)

- [ ] In remote parts of New Zealand untouched by humans (2)
- [ ] Cities (3)
- [ ] Off-shore islands (4)
- [ ] National parks (5)
- [ ] Farmland (6)
- [ ] There are no wild kiwi left (7)

Q17, How many species of kiwi are there?

- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)

Q18, Have you heard of 1080 poison?

- ○ Yes (1)
- ○ No (0)

Q19, Where do you think 1080 is found?

- [ ] Cities (1)
- [ ] Bushland (2)
- [ ] Parks (3)
- [ ] River paths (4)
- [ ] Beaches (5)

Q20, Do you support the leashing of dogs in public urban spaces (excluding designated off-leash spaces e.g. fully fenced parks)?

- ○ No (0)
- ○ Yes (1)

Q21, If you would like to share your reasoning, please write it here

_____

Q22, Do you support the leashing of dogs in public rural spaces? E.g. out in nature, bushland, forest walks; NOT private farmland.

- ○ No (0)
- ○ Yes (1)

Q23, If you would like to share your reasoning, please write it here

_____

Q24, What is your age in years?

▼ 16 ... 95

Q25, What is your gender?

- ○ Man (1)
- ○ Woman (2)
- ○ Gender diverse (3)
- ○ Prefer not to say (4)
- ○ Other - please specify (5) _____

Q26, How long have you lived in New Zealand?

- ○ Less than 1 year (1)
- ○ 1-4 years (2)
- ○ 5-10 years (3)
- ○ 10-15 years (4)
- ○ 15+ years (5)
- ○ Since birth (6)

Having viewed the poster, we would like to ask your opinion on these two questions again.

Q27, How likely are you to leash your dog in the bush?

Extremely unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Extremely likely
1	2	3	4	5

Q28, Of the options below, which reason is most likely to result in you leashing your dog?

- ○ Dog on dog aggression (e.g. dog fights) (1)
- ○ Dog wandering and getting lost (2)
- ○ Dog attacking other humans (3)
- ○ Dog being poisoned from eating 1080 (4)
- ○ Dog chasing/attacking kiwi (5)
- ○ Dogs do not need to be leashed in the bush (6)

Q29, If you are interested in receiving a copy of the research outcomes, please enter your email address below

_____

Appendix C

Study debrief sheet

Dear participant,

We greatly appreciate you taking the time to participate in our research.

The questions were all designed to measure attitudes towards dog walking and conservation of native species, specifically Kiwi. Your answers provide us with knowledge about your:

- Conservation behaviours
- Environmental attitudes

This study is based on work by Jorgensen and Brown (2017), Macdonald (2015) and Rice et al. (2023). Our goal is to determine whether viewing signage with targeted messaging is effective at changing a person's behaviour. The specific behaviour we are targeting is leashing your dog in native bush/reserve areas.

You were all randomly divided into two groups.

Group A viewed a sign which stated that 1080 poison is fatal to dogs.

Group B viewed an intervention sign which stated that roaming dogs are the leading cause of death among adult Kiwi.

If you would like to learn more about the research or you have any concerns/queries, please feel free to contact Ashleigh (acjs1@students.waikato.ac.nz)

Thank you again for your participation.

Sincerely, Dr Tania Blackmore and Ashleigh Smith

Appendix D

Recruitment flyer