



Manaaki Whenua
Landcare Research

An application of the I₃ framework to rat control in Hawke's Bay

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Summary

The potential for people in urban areas to contribute to predator control is of interest to Hawke's Bay Regional Council. This potential can be modified by using policy instruments such as education, incentives and regulations to stimulate interest, encourage participation and change behaviour. The I₃ Framework (Kaine et al. 2010) was used to predict the likely responses of householders to a policy of using traps to reduce the population of rats in Napier and Hastings as part of a survey of 534 households in Napier and Hastings (Booth, draft).

The results of the survey indicate widespread support for a programme of trapping to reduce rat populations in Napier and Hastings. This support appears to be primarily motivated by residents' concerns for the health and safety of themselves and their families, and for the potential for rats to damage property, gardens, and equipment. Consequently, attempts to encourage participation in a programme of urban trapping should concentrate on promoting the potential of urban trapping to reduce these harms.

While there was general support for a programme of trapping to reduce rat populations in Napier and Hastings, most householders were only mildly or moderately interested in such a programme. This means many householders would be more likely to participate if the programme was easy to join, and traps were inexpensive and simple to maintain. A substantial proportion of householders would support a programme to reduce rat numbers but have little interest in undertaking trapping themselves. These householders are likely to permit the installation of traps on their properties provided they do not have to service and maintain them. The widespread but moderate interest and support among householders in reducing rat populations indicates that personal contact is likely to be the most effective, perhaps only, means of promoting and implementing a programme.

The support for a programme of trapping to reduce rat populations in Napier and Hastings did not translate to control of other predators such as possums and mustelids.

Further research using focus groups would be worthwhile to confirm the conclusions made here concerning the motivations of householders and their views on the use of traps and other control methods.

1 Introduction

The potential for people in urban areas to contribute to predator control is of interest to Hawke's Bay Regional Council. This potential can, in principle, be modified by using policy instruments such as education, incentives, and regulations to stimulate interest, encourage participation and change behaviour. For example, participation in an urban programme of trapping could be encouraged by offering incentives to households to install and monitor rat traps.

Choosing which policy instrument to employ depends on several factors; the likely response of households to an instrument being, perhaps, the most critical. For example, incentives may be popular among householders but prohibitively expensive given the trapping densities that may be required. Regulations compelling the installation of traps may have the potential to change the behaviour of all households but may be unpopular among householders and problematic to enforce. Hence, knowing the likely response of householders to any proposed policy instrument is crucial when choosing between policy instruments (and knowing when there may be merit in combining them).

In this study, we investigate the responses of urban households to a policy that would promote the use of traps to reduce the population of rats in Napier and Hastings.

2 Theory

In this study the responses of households to a policy of using traps to reduce rat numbers was predicted using the I₃ Response Framework (Murdoch et al. 2006; Kaine et al. 2010). The Framework is based on social psychology and consumer behaviour theory (Derbaix & Vanden Abeele 1985; Laurent & Kapferer 1985; Zaichkowsky 1985; Dholakia 2001; Verbeke & Vackier 2004). The premise of the Framework is that people's responses to policy instruments, such as the provision of subsidised traps for catching rats, can be inferred from their involvement (a measure of motivation) with the relevant policy outcome, such as reducing rat numbers, and also their involvement with the instrument itself, that is, the use of traps. Once responses have been predicted, strategies to promote achievement of the policy outcome may then be identified (Kaine et al. 2010)

2.1 The I₃ Framework

As described previously, involvement is a measure of motivation (Assael 1998; Verbeke & Vackier 2004). The degree of involvement an individual has in a subject is a key determinant of the effort that individual will expend in making decisions in relation to that subject and then acting on them (Celsi & Olson 1988; Poiesz & Cees 1995). Involvement arises from functional needs in relation to comfort and security, experiential needs in relation to feelings of pleasure and reward, and identity needs in relation to self-expression and belonging (Laurent & Kapferer 1985). Involvement also tends to be higher the more the subject of interest is novel, complex, and entails substantial social and financial risks (Dholakia 2001). Consequently, involvement can be characterised in terms of

functional, experiential, identity-based, risk-based, and consequence-based components (Laurent & Kapferer 1985).

A person's involvement with a subject will be greater the more they associate each of these component needs with the subject. Farmers, for example, should exhibit very high involvement with farming because it provides them with an income (functional involvement), with the opportunity to be physically active and work outdoors (experiential involvement), and to work independently of others (identity involvement). Farming is characterised by long production cycles that are sensitive to seasonal conditions, and product prices are highly variable. Consequently, production and revenue performance are inherently unpredictable (risk-based involvement) with serious consequences for business success and family income (consequence-based involvement).

High involvement with a subject is associated with greater time and effort devoted to obtaining information about the subject, the formulation of strongly held beliefs and attitudes about the subject, and greater likelihood of acting regarding the subject. In contrast, low involvement in a subject is associated with little time and effort devoted to obtaining information about the subject, the formulation of weakly held beliefs and attitudes, if any, about the subject, and a lower likelihood of acting regarding the subject.

The two dimensions of involvement with the policy outcome and involvement with the policy instrument means that the reactions of people to a policy instrument can be classified into four quadrants (Kaine et al. 2010) as shown in Figure 1.

People in quadrant one exhibit low involvement in both the policy outcome and the policy instrument. These people are likely to have little knowledge or even awareness of the policy outcome. They are likely to have limited knowledge of the policy instrument and have weak attitudes towards it, if any at all. Non-compliance with the instrument is largely unintentional (Murdoch et al. 2006).

If people in quadrant one present little risk in terms of achieving the policy outcome they can be ignored. Otherwise, their compliance may be encouraged by:

- linking the policy outcome to a subject they find more involving
- reducing the effort required to be compliant, and
- promoting awareness of the policy outcome and the policy instrument.

The last strategy is likely to be the least effective.

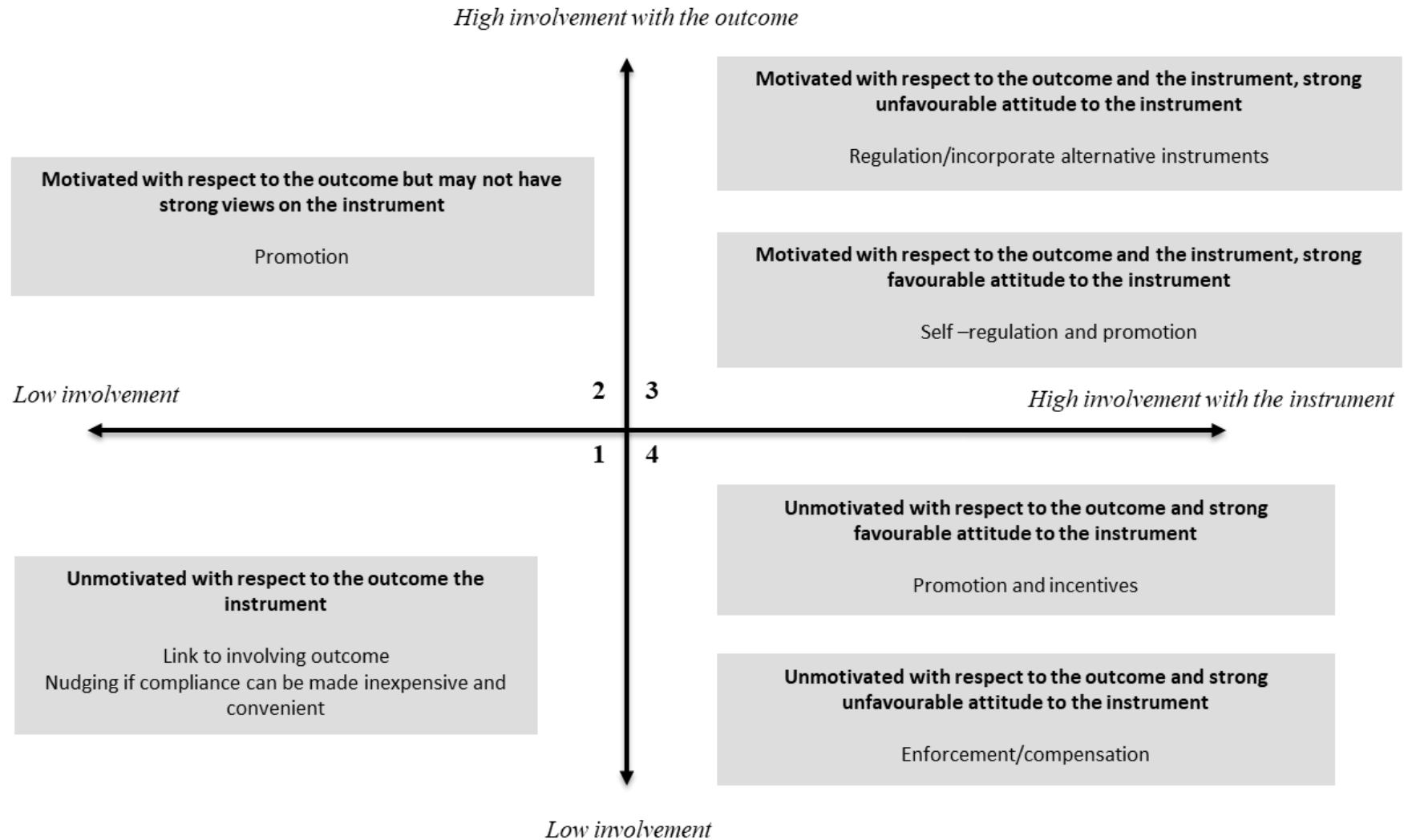


Figure 1. I₃ Response Framework.

Bold text describes the strength of motivation with respect to the policy outcome (e.g. reducing rats) and the policy instrument (e.g. subsidised traps). Plain text describes potential policy measures to promote compliance with the policy instrument. Source: Adapted from Kaine et al. (2010).

People in quadrant two exhibit high involvement with the policy outcome but low involvement with the policy instrument. These people are likely to have some knowledge about the policy outcome. They are likely to have limited knowledge of the policy instrument and may have weak or ambiguous attitudes towards it. Non-compliance with the instrument is largely unintentional (Kaine et al. 2010).

If people in quadrant two represent little risk in terms of achieving the policy outcome they can be ignored. If their compliance is important to achieving the policy outcome, then reducing the effort required for compliance (Thaler & Sunstein 2008) and promoting awareness of the policy instrument may be worthwhile.

People in quadrant three exhibit high involvement with the policy outcome and the policy instrument. These people are likely to have extensive and detailed knowledge of the policy outcome. They are also likely to have extensive knowledge of the policy instrument and strong attitudes towards it. If their attitude towards the policy instrument is favourable, then they will comply with the instrument and may even advocate for it (Murdoch et al. 2006).

If people in quadrant three have an unfavourable attitude towards the policy instrument, then they may comply, but reluctantly (Kaine et al. 2010). Non-compliance with the instrument will be intentional. Most likely they will prefer, and even advocate for, alternative instrument designs. Where practical, incorporating alternatives into the design of the policy instrument may encourage the compliance of these people. Alternatively, offering incentives to reduce compliance costs may neutralise unfavourable reactions.

People in quadrant four exhibit low involvement with the policy outcome but high involvement with the policy instrument. People in this quadrant are likely to have limited knowledge of the policy outcome. They are likely to have detailed knowledge of the policy instrument and have strong attitudes towards it. If their attitude towards the policy instrument is favourable, then they will comply with the instrument (Kaine et al. 2010).

If people in quadrant four have an unfavourable attitude towards the policy instrument, then they will only comply reluctantly, or they may intentionally refuse to comply at all. These people will regard the instrument as imposing unwarranted costs upon them. Most likely they will agitate against the policy instrument (Kaine et al. 2010). Offering incentives to offset compliance costs may neutralise unfavourable reactions.

Where non-compliance may put implementation of the policy instrument at risk then modifications to the policy instrument may be required to neutralise this risk. The specific measures required will depend on the circumstances.

3 Methods

In 2015 Manaaki Whenua Landcare Research was commissioned by the Cape-to-City programme to conduct a survey of urban households around Napier and Hastings to quantify a range of conservation behaviours (Brown 2015). Recently, Predator Free Hawke's Bay commissioned a repeat of the survey with a view to identifying any changes that had occurred since 2015 in the frequency of those behaviours (Booth, draft). Repeating the survey provided an opportunity to:

- 1 quantify the involvement of urban households with reducing rat numbers using traps
- 2 test associations between involvement with reducing rat numbers and people's trapping of rats

The survey included questions in relation to biodiversity, habitat restoration, involvement in environmental activities, reasons for becoming involved in environmental activities, reasons for not being involved in environmental activities, and sources of information and familiarity with environmental programmes (Booth, draft).

Three questions were added to the original questionnaire. Two of these additional questions were designed to elicit respondent's involvement with reducing rat numbers and their involvement with, and attitude towards, trapping. Involvement was measured using a condensed version of the scale developed by Kapferer and Laurent (1985) with respondents rating two statements on each of the five components of involvement: function, experience, identity, consequence and risk.¹ Involvement was calculated as the average of respondents scores across the five components.

The strength of peoples' attitudes with respect to trapping was expected to vary depending on the strength of their involvement with reducing rat numbers and their involvement with trapping. Consequently, in a third question using a scale based on Olsen (1999), respondents were also asked about their uncertainty regarding their attitudes towards trapping.

The survey was conducted using the computer-assisted web interviewing programme Qualtrics (Booth, draft).

Participants were recruited through local schools. Nine schools took part and distributed the survey to students' parents via email. Parents could then distribute the survey through their social networks. Five schools were considered 'inside' the Cape to City project footprint (Huamoana School, St Matthews Primary School, Taikura Rudolf Steiner School, Te Mata School, and Waimarama School) and the remaining schools were considered

¹ The statements concerned the importance of (functional 1) and caring about (functional 2) the objective or instrument; the reward from (experiential 1) and passion about (experiential 2) the objective or the instrument; opinion about objective or instrument reflecting on you (identity 1) and others (identity 2) as a person; the seriousness (consequence 1) or importance (consequence 2) of consequences arising from making a mistake in relation to the objective or instrument; and the complexity (risk 1) or difficulty (risk 2) of making decisions about the objective or the instrument. Complete statements are available on request from the author.

outside the footprint (Napier Central School, Nelson Park School, Te Awa School, Arthur Miller School, and Bledisloe School).

Participation in the survey was voluntary, respondents could leave the survey at any time, and all survey questions were optional and could be skipped. Survey responses were anonymous, but for each of the first 1000 respondents, \$10 was donated to their affiliated school.

The survey was open for 3 weeks in August 2019. We received 572 responses, of which 534 (93%) were complete. Of the complete responses, 374 responses (70%) were affiliated with schools inside the Cape to City footprint and 160 responses (30%) were affiliated with schools outside the footprint.

4 Results

4.1 The sample

Almost 80 per cent of respondents were women with a median age of 40-44 years old (see Table 1). Most respondents had lived in Hawke's Bay for at least 10 years. See Booth (draft) for more details.

4.2 Involvement with trapping and reducing rat numbers

Respondents were mapped into the I₃ Response Framework (see Fig. 2) based on their involvement with reducing rat numbers and with trapping. A score of one indicates the minimum possible level of involvement, and a score of five indicates the highest possible level of involvement. Statistical tests indicated that the scales were reliable, that is, internally consistent in the sense that scores on each statement were highly correlated (see Table A1 in the Appendix).

Respondents were classified into quadrants based on their involvement scores relative to the scale mid-point. For example, respondents with involvement scores less than three for reducing rat numbers and using traps were classified into quadrant one.

Inspection of Figure 2 reveals that most respondents exhibited moderate to high involvement with reducing rat numbers, and mild to moderate involvement with using traps. Consequently, most respondents were classified into quadrant three with the remaining respondents classified into quadrants one and two (see Table 2).

The moderate to high involvement of respondents with reducing rat numbers indicates that residents of Napier would support a policy to eradicate rats in urban areas (see Table 3). The mild to moderate levels of residents' involvement with trapping suggests that, while they would support the use of traps, they would only be likely to invest a limited amount of their time and energy in trapping.

Table 1. Age profile of sample

Age category	Proportion of sample %
24 and under	1.7
25–34	12.6
35–44	45.5
45–54	26.5
55–64	9.4
65 and older	4.2

Table 2. I3 classification

Quadrant	Proportion of sample %
One – indifferent	19.8
Two – involved with reducing rat numbers	21.7
Three – involved with reducing rat numbers and with using traps	54.1
Four – involved with using traps	4.4

Table 3. Mean involvement by I3 quadrant

	Involvement with reducing rat numbers¹	Involvement with using traps to reduce rat numbers²
Quadrant one	2.81	2.70
Quadrant two	3.46	2.83
Quadrant three	3.73	3.48
Quadrant four	2.82	3.25

Notes: (1) Test for difference in means across quadrants ($F=203.1, p<0.01$)
(2) Test for difference in means across quadrants ($F=201.7, p<0.01$)

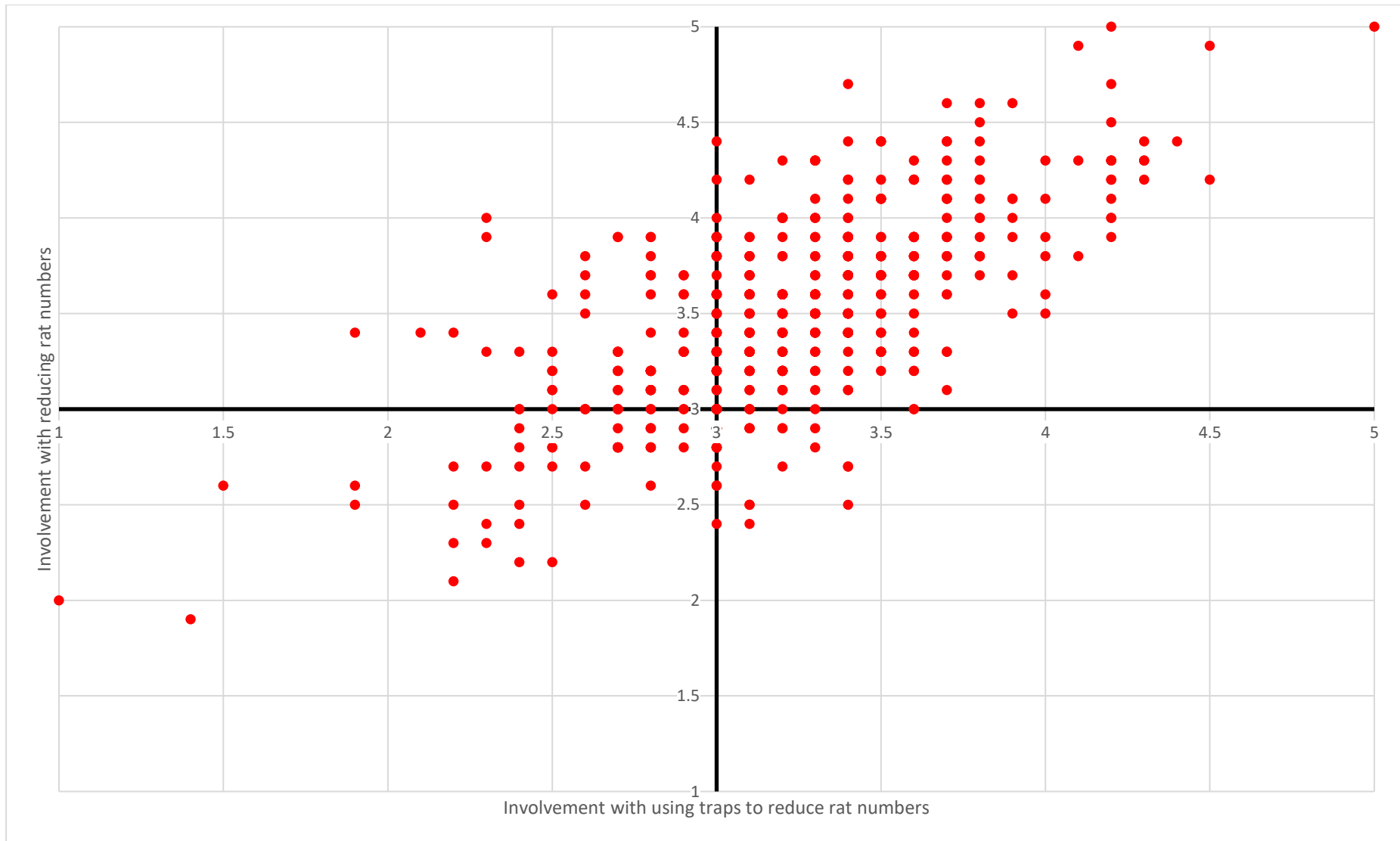


Figure 2: I₃ mapping of involvement with reducing rat numbers and using traps.

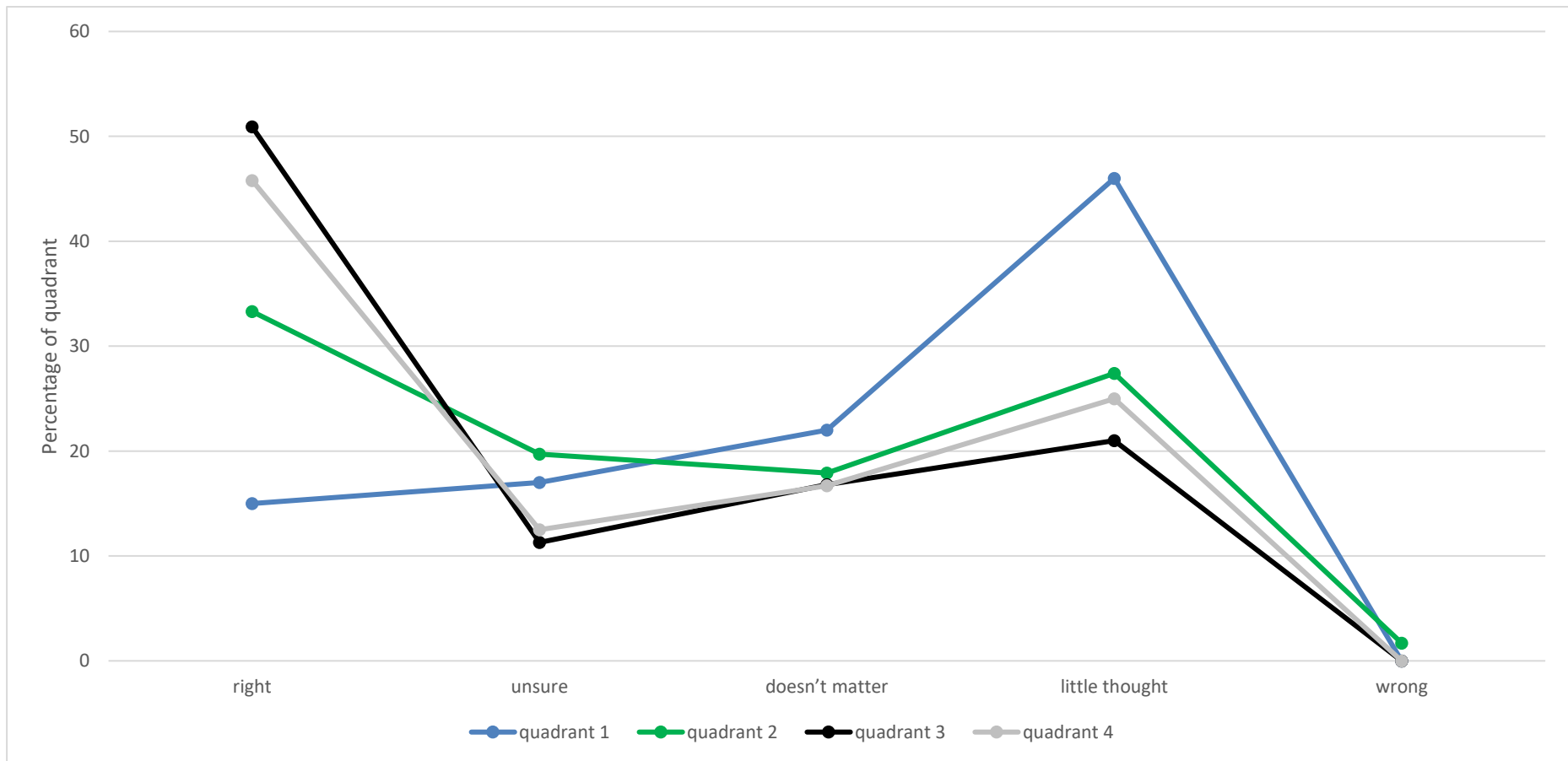


Figure 3. Attitudes towards using traps to reduce rat numbers.

Approximately 40 per cent of respondents had a strongly favourable attitude to trapping. Consistent with reporting only mild to moderate involvement with trapping rats, a high proportion of respondents were unsure about or indifferent towards trapping. Less than one percent of respondents had an unfavourable attitude towards trapping (see Table 4).

As expected, respondents exhibiting indifference about trapping, or uncertainty in their attitude towards trapping, had lower levels of involvement than respondents who had a definite favourable attitude towards trapping (see Table 5). Also as expected, a relatively high proportion of respondents in quadrant one hadn't thought about or were indifferent to the use of traps, while a relatively high proportion of respondents in quadrant three had a definitive (and favourable) attitude toward trapping (see Fig. 3 and Table 6).

4.3 Involvement profiles

The involvement profiles of respondents in each quadrant with respect to reducing rat numbers are reported in Figure 4. The profiles represent the average score, for each of the involvement statements, of the respondents in each quadrant. On average, respondents exhibited higher involvement with reducing numbers of rats than with using traps to catch rats (see Table A2 in the Appendix).

On average, respondents in quadrants 2 and 3 exhibit moderate functional and consequence involvement, and mild identity and risk involvement, with reducing rat numbers. This implies that, to the degree these respondents were involved with the idea of reducing rat numbers, their involvement stems from concerns about the potentially unfavourable impact rats can have on their material well-being and safety. These concerns could stem partly from the perceived impact of rats on biodiversity and the environment, as well as from the damage rats can inflict on buildings, equipment, vehicles, gardens, and so forth. Respondents in quadrants 1 and 4 exhibit mild involvement with reducing rat numbers.

The involvement profiles of respondents in each quadrant with respect to using traps to reduce rat numbers are reported in Figure 5. Again, the profiles represent the average score, for each of the involvement statements, of the respondents in each quadrant. On average, with respect to using traps to reduce rat numbers, respondents exhibited mild to moderate involvement across all the components of involvement.

This implies that, to the degree respondents were involved with the idea of using traps, they perceive traps as an effective and safe method for catching rats, and they experience feelings of mastery and achievement when they successfully trap rats.

4.4 Involvement and opinions about rats

We expected differences across the quadrants in respondent's opinions about rats. Specifically, we hypothesised respondents in quadrant one to be less likely than respondents in other quadrants to express opinions about the impact of rats on biodiversity, habitat for native plants and animals, and farm production. This hypothesis

Table 4. Attitude towards trapping rats

Attitude	Proportion of sample %
Right thing to do	39.5
Doesn't matter to me	17.9
Not sure	14.8
Haven't given it much thought	27.4
Bad thing to do	0.4

Table 5. Involvement and attitude towards trapping rats

Attitude	Involvement with reducing rat numbers ¹	Involvement with using traps to reduce rat numbers ²
Right thing to do	3.64	3.38
Doesn't matter to me	3.40	3.11
Not sure	3.45	3.08
Haven't given it much thought	3.27	3.03
Bad thing to do	-	-

Notes: (1) Test for difference in means across quadrants ($F=14.1, p<0.01$)
(2) Test for difference in means across quadrants ($F=16.2, p<0.01$)

Table 6. I₃ classification and attitude towards trapping rats

Attitude	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Right thing to do	15.0	33.3	50.9	45.8
Doesn't matter to me	22.0	17.9	16.8	16.7
Not sure	17.0	19.7	11.3	12.5
Haven't given it much thought	46.0	27.4	21.0	25.0
Bad thing to do	0.0	1.7	0.0	0.0

Note: Values are proportion of respondents in each quadrant. Test for differences in proportions across quadrants ($\chi^2 = 55.8, p<0.01$)

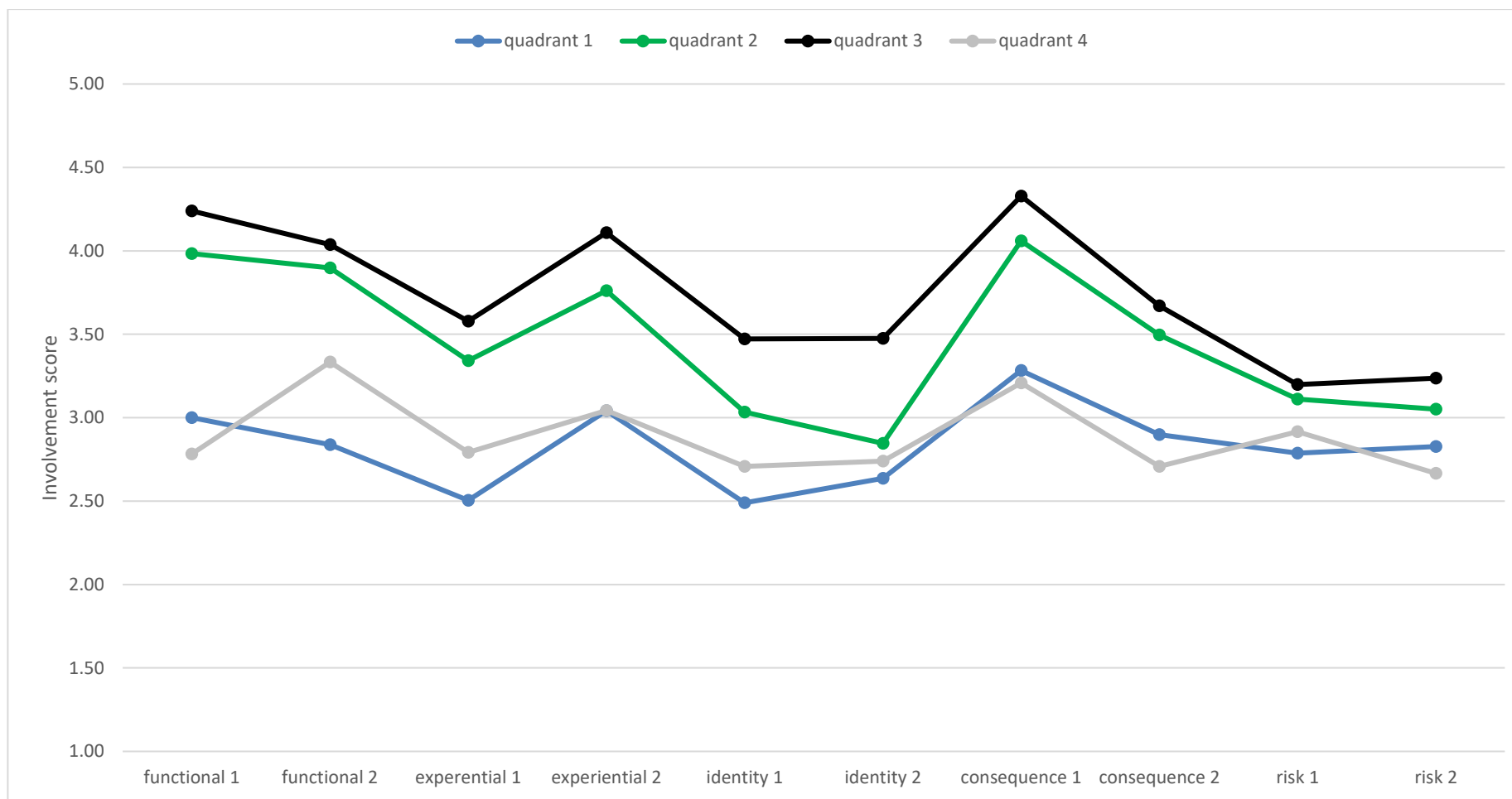


Figure 4. Involvement profiles for reducing rat numbers.

Note: The statements concerned the importance of (functional 1) and caring about (functional 2) reducing rat numbers; the reward from (experiential 1) and passion about (experiential 2) reducing rat numbers; opinion about reducing rat numbers reflecting on you (identity 1) and others (identity 2) as a person; the seriousness (consequence 1) or importance (consequence 2) of consequences arising from making a mistake in relation to reducing rat numbers; and the complexity (risk 1) or difficulty (risk 2) of making decisions about reducing rat numbers. Complete statements are available on request from the author.

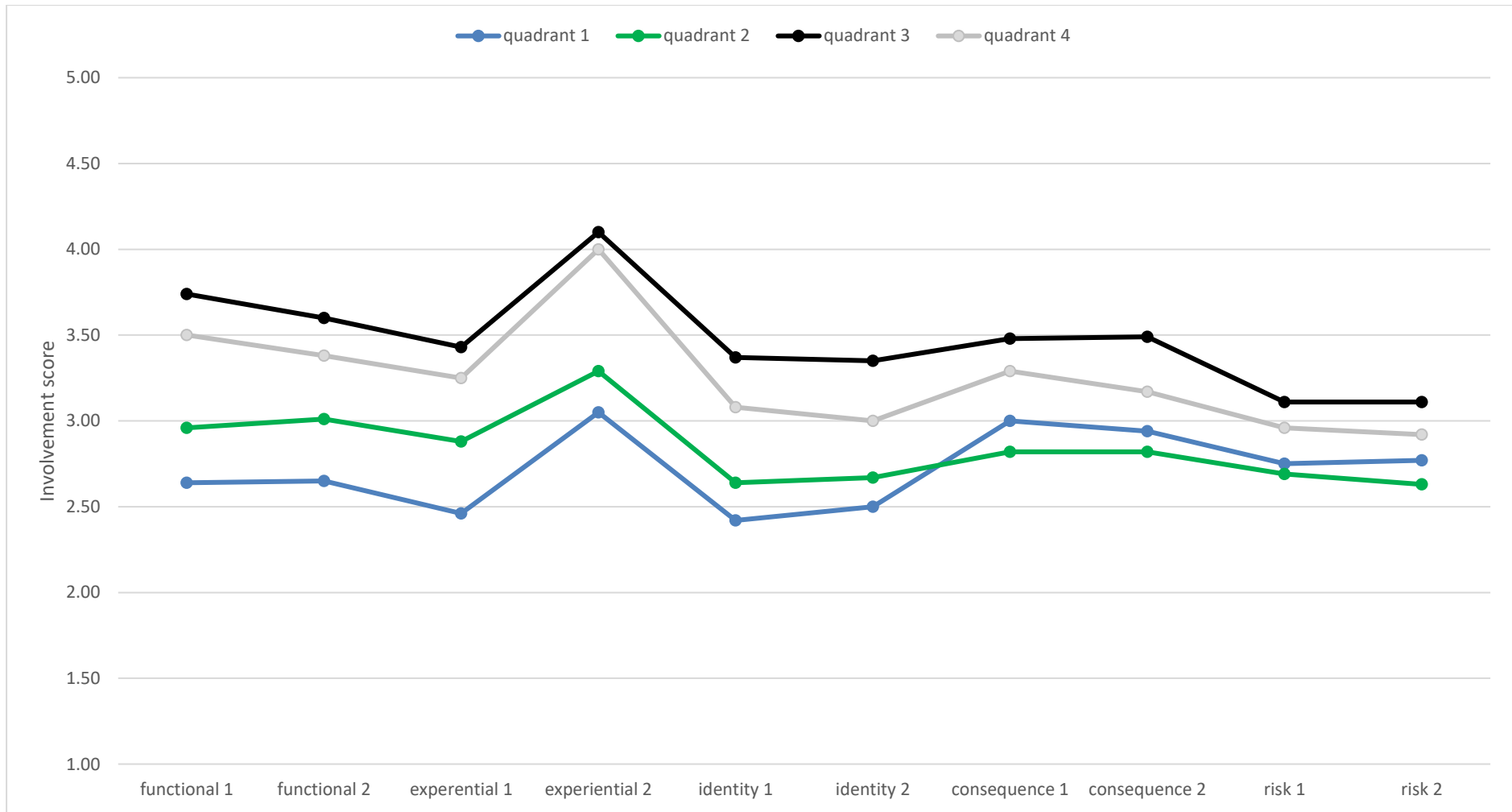


Figure 5. Involvement profiles for using traps to reduce rat numbers.

Note: The statements concerned the importance of (functional 1) and caring about (functional 2) using traps; the reward from (experiential 1) and passion about (experiential 2) using traps; opinion about using traps reflecting on you (identity 1) and others (identity 2) as a person; the seriousness (consequence 1) or importance (consequence 2) of consequences arising from making a mistake in relation to using traps; and the complexity (risk 1) or difficulty (risk 2) of making decisions about using traps. Complete statements are available on request from the author.

was supported with a significantly smaller proportion of respondents in quadrant one indicating that they believed rats had a negative effect on biodiversity, habitat for native plants and animals, and farm production (see Table 7). A similar result was found with respect to the effect of mice on biodiversity, habitat for native plants and animals, and farm production suggesting that respondents perceived rats and mice as having similar effects on the environment.

The same pattern was observed across the quadrants with respect to the effects of hedgehogs and cats but not of possums, mustelids or rabbits.² This suggests people do discriminate among pests in terms of their effects on the environment and farm production; which implies individuals will exhibit different levels of involvement with different pests.

4.5 Involvement and predator control activity

We expected differences across the quadrants in the proportion of respondent's undertaking control activities for rats. Specifically, we hypothesised respondents in quadrant one to be less likely than respondents in other quadrants to trap rats. This hypothesis was supported with significantly smaller proportion of respondents in quadrant one indicating that they engaged in pest control activities, though the extent to which these activities targeted rats was unclear (see Table 8).

No relationship was found between quadrant membership and participation in other activities such as permanently setting aside land to protect native plants and animals, bird watching, lizard spotting, donating to environmental causes and planting native trees in gardens.³ This is consistent with the argument made previously that peoples' involvement with using traps to catch rats is motivated by factors such as safety and material wellbeing rather than being conservation minded.

The reasons respondents use traps to catch predators are reported in Figure 6 and Table 9. The most commonly reported reasons for trapping predators were to protect the future, personal interest and children's interest. Compared to quadrant one, a greater proportion of respondents in quadrants two and three who trapped predators were likely to report concern for the future as a reason for trapping predators. Personal interest was the main factor driving trapping by respondents in quadrant four.

The main reasons given by participants for not undertaking predator control were that they were too busy and there was a lack of information (Booth, draft). No relationship was found between quadrant membership and reasons for not undertaking predator control.

² These results are available on request from the author.

³ These results are available on request from the author.

Table 7. Proportion of respondents believing rats and mice have damaging effects

	Rats¹	Mice²
Quadrant one	65.3	46.5
Quadrant two	89.7	57.3
Quadrant three	88.7	64.0
Quadrant four	79.2	62.5

Notes: (1) Test for differences in proportions across quadrants ($\chi^2 = 34.4, p < 0.01$)
(2) Test for differences in proportions across quadrants ($\chi^2 = 9.8, p < 0.05$)

Table 8. Proportion of respondents that have undertaken pest control in the past year

	Proportion of quadrant %
Quadrant one	22.8
Quadrant two	39.3
Quadrant three	40.1
Quadrant four	45.8

Note: (1) Test for differences in proportions across quadrants ($\chi^2 = 11.0, p < 0.01$)

Table 9. Reasons for undertaking pest control in the past year

	Children's interest¹	Personal interest²	Protect the future³
Quadrant one	17.4	43.5	26.1
Quadrant two	13.0	67.4	52.2
Quadrant three	30.8	65.8	56.4
Quadrant four	18.2	81.8	36.4

Note: values are proportion of respondents in each quadrant that trap mammalian pests.
(1) Test for differences in proportions across quadrants ($\chi^2 = 6.6, p < 0.10$)
(2) Test for differences in proportions across quadrants ($\chi^2 = 6.1, p < 0.10$)
(3) Test for differences in proportions across quadrants ($\chi^2 = 8.0, p < 0.05$)

Table 10. Involvement and familiarity with C2C and PFHB

	C2C	PFHB
Quadrant one	27.7	28.3
Quadrant two	35.9	54.7
Quadrant three	39.2	51.9
Quadrant four	16.7	20.8

Note: Values are proportion of respondents in each quadrant.
(1) Test for differences in proportions across quadrants ($\chi^2 = 8.1, p < 0.05$)
(2) Test for differences in proportions across quadrants ($\chi^2 = 26.1, p < 0.01$)

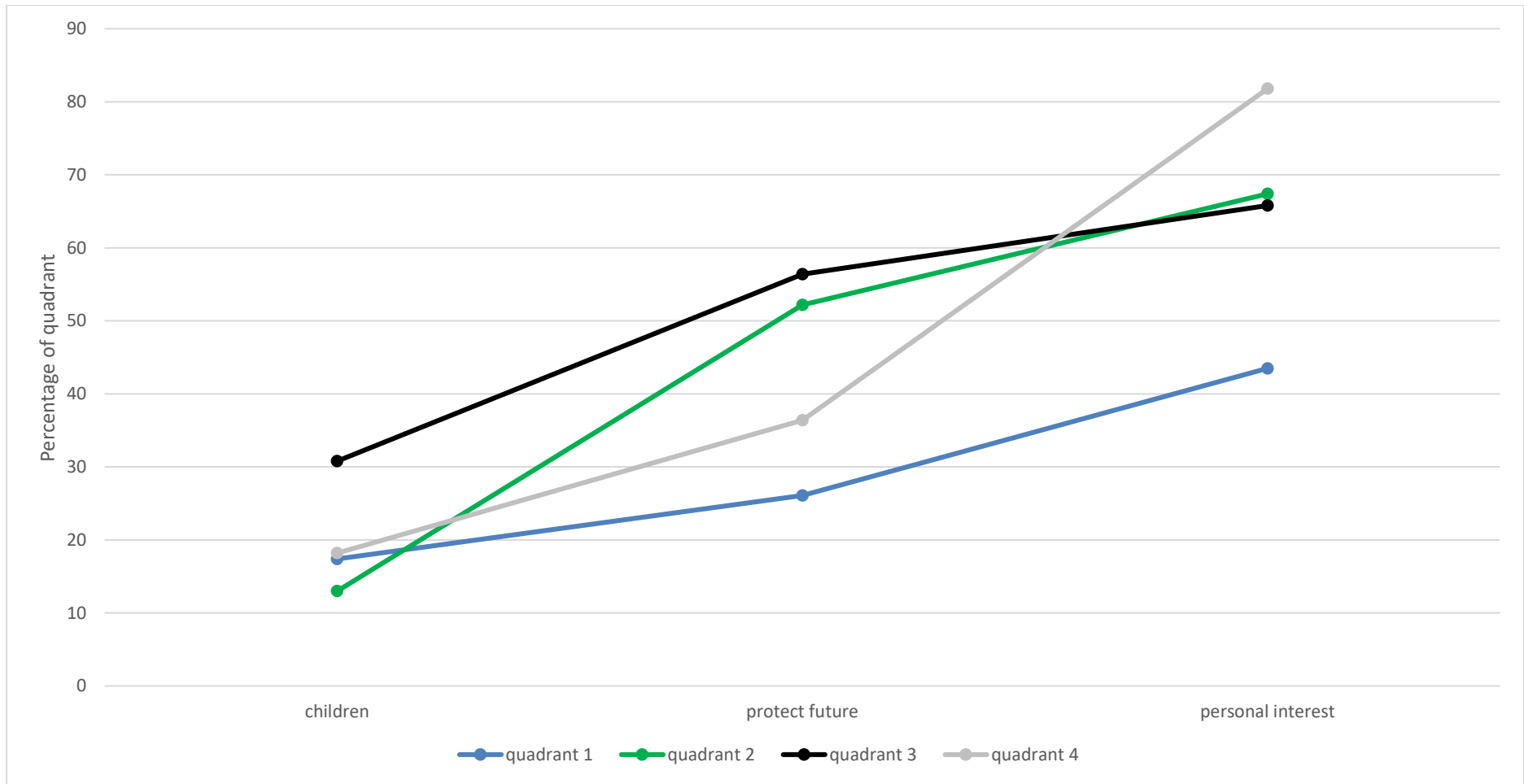


Figure 6. Reasons for using traps to catch mammalian predators.

4.6 Involvement and familiarity with predator-free activities

We expected differences across the quadrants in the proportion of respondents that were familiar with predator-free activities. Because predator-free activities include controlling rats, we thought it was reasonable to suppose there would be an association between involvement with reducing rat numbers and familiarity with Predator Free Hawke's Bay and Cape-to-City. Specifically, we hypothesised respondents in quadrant one and four to be less likely than respondents in quadrants two and three to be familiar with Predator Free Hawke's Bay and Cape-to-City.

The hypothesis was supported with a significantly smaller proportion of respondents in quadrant one indicating familiarity than in quadrants two and three (see Table 10). The relatively small proportion of respondents in quadrant four that reported familiarity with Predator Free Hawke's Bay and Cape-to-City is consistent with the high involvement of participants in quadrant four with trapping being primarily motivated by considerations of safety and material wellbeing rather than being conservation.

No association was found between quadrant membership and familiarity with Poutiri Ao ō Tāne and Whakatipu Mahia.

5 Discussion

Bearing in mind the respondents were from ten specific districts in Napier and Hastings, these results have several implications for designing strategies to encourage acceptance of, and participation in, a programme to control rats in Napier and Hastings. The first implication arises from the nature of respondents' involvement with reducing rat numbers and trapping.

The primary sources of involvement with reducing the number of rats were functional and consequential rather than experiential. This suggests residents' desire to reduce rat populations in Napier and Hastings is primarily motivated by concerns for the health and safety of themselves and their families, and the potential for rats to damage property, gardens, and equipment, rather than concern for biodiversity and the environment. Consequently, attempts to encourage participation in a programme of urban trapping should concentrate on promoting the potential of urban trapping to reduce these harms.

Self-identity was not a key source of involvement with reducing the number of rats or with trapping. This suggests attempts to encourage participation in a programme of urban trapping by promoting the participation of neighbours or friends are unlikely to be particularly successful. This implication is consistent with only a small proportion of respondents reporting friends and neighbours as a factor in undertaking pest control (Booth, draft).

The primary sources of involvement with trapping were functional and experiential. This suggests that participation in a programme of urban trapping could also be encouraged

by a campaign emphasising the effectiveness and safety of traps and the sense of achievement that accompanies success.

Several implications arise from the distribution of respondents in the I₃ framework as follows:

Quadrant one

Respondents in quadrant one exhibited low to mild involvement with reducing the number of rats and with trapping (20% of respondents). Most of these respondents did not have an attitude about trapping. These respondents may have encountered few, if any, problems with rats. They probably view rats, and the problems they create, as personally irrelevant and are largely indifferent to the need, and methods used, to control rats.

Residents in Napier and Hastings who have characteristics of respondents in quadrant one would tolerate a programme of trapping for rats in an urban area. However, they are unlikely to engage with any media communications about such a programme. Consequently, personal contact is likely to be the most effective, and perhaps only, means of promoting a control programme to residents with these characteristics. They are likely to allow the installation of traps on their properties provided the traps are serviced and maintained by others.

Quadrant two

Respondents in quadrant two exhibited moderate to high involvement with reducing the number of rats but low involvement with trapping (22% of respondents). While most of these respondents had not formed an attitude towards trapping, nearly all those that had were in favour of it. There are two explanations for the low involvement of these residents with trapping. One is that they have not encountered rats on their properties. The other is that they prefer to use a professional pest control service should they encounter rats on their properties.

Residents in Napier and Hastings who have characteristics of respondents in quadrant two would welcome a programme of trapping for rats in urban areas. They are more likely to participate in a programme if it is easy to join, and traps are inexpensive and maintained by others.

Quadrant three

Slightly more than half of the respondents were classified into quadrant three (54% of respondents). These respondents exhibited moderate to high involvement with reducing the number of rats with trapping. More than half the respondents in this quadrant had a favourable attitude toward using traps. None indicated they had an unfavourable attitude towards using traps. From these results we can infer that the majority of residents in Napier and Hastings would support, and advocate for, a programme to trap for rats in urban areas, and a high proportion of these residents would participate in the programme provided it was easy to join, and traps were inexpensive and easy to maintain.

Quadrant four

A small proportion of respondents were classified into quadrant four (4% of respondents). These respondents exhibited mild involvement with reducing the number of rats and with trapping. Most of these respondents had a favourable attitude toward using traps and a majority were trapping predators including rats. None indicated they had an unfavourable attitude towards using traps. From these results we can infer that these respondents would support and participate in a trapping programme.

Overall, the results provided empirical evidence supporting the theory underpinning the I₃ Framework. First, as expected, moderate to high involvement with reducing rat numbers and trapping were associated with a greater likelihood to express a favourable attitude towards using traps to catch rats, while low to mild involvement was associated with greater uncertainty in attitudes about, or indifference towards, using traps.

Second, as hypothesised, we found higher levels of involvement with reducing rat numbers and using traps were associated with a greater likelihood of believing rats had a damaging effect on biodiversity, habitat for native plants and animals, and farm production. Third, higher levels of involvement with reducing rat numbers and trapping were also associated with a greater likelihood of undertaking predator control activities. Fourth, as hypothesised, respondents in quadrants one and four were less likely than respondents in quadrants two and three to be familiar with Predator Free Hawke's Bay and Cape-to-City.

High involvement with reducing rat numbers and using traps was not strongly associated with beliefs about other predators, apart from mice (section 4.4). This suggests people do discriminate among pests in terms of their effects on the environment and farm production and implies individuals will exhibit different levels of involvement with different pests. Consequently, agencies cannot assume successes or failures with public acceptance of, and participation in, control programmes for one predator will necessarily be repeated with other predators.

High involvement with reducing rat numbers and using traps was not associated with participation in activities such as permanently setting aside land to protect native plants and animals, bird watching, lizard spotting, donating to environmental causes, recycling, and planting native trees in gardens (section 4.5). This is consistent with people's involvement with reducing rat numbers and using traps being motivated by concerns about health, safety, and material well-being rather than reflecting a general enthusiasm for environmental conservation. This implies pest control is not generally considered to be a conservation activity, which means urban participation in a programme to control rats in Napier and Hastings is unlikely to influence participation in conservation activities such as donating to environmental causes, planting native trees in gardens, and recycling.

6 Conclusion

The potential for people in urban areas to contribute to predator control is of interest to Hawke's Bay Regional Council. This potential can, in principle, be modified by using policy

instruments such as education, incentives, and regulations to stimulate interest, encourage participation, and change behaviour. The potential responses of householders to a policy of using traps to reduce the population of rats in Napier and Hastings was investigated using survey questions (Booth, draft) based on the I₃ Framework (Kaine et al. 2010).

The results of the survey indicate widespread support for a programme of trapping to reduce rat populations in Napier and Hastings. This is consistent with experience in predator control in Wellington (PFW 2019a). Support for reducing rat populations was primarily motivated by residents' concerns for the health and safety of themselves and their families, and for the potential for rats to damage property, gardens, and equipment. Consequently, attempts to encourage participation in a programme of urban trapping should concentrate on promoting the potential of urban trapping to reduce these harms.

While there was general support for a programme of trapping to reduce rat populations in Napier and Hastings, most householders were only mildly or moderately interested in such a programme. This means householders would be more likely to participate if the programme was easy to join, and traps were inexpensive and simple to maintain. A substantial proportion of householders would support a programme to reduce rat numbers but have little interest in undertaking trapping themselves. These householders are likely to permit the installation of traps on their properties, provided they do not have to service and maintain them. The widespread but moderate interest and support among householders in reducing rat populations indicates that personal contact is likely to be the most effective, perhaps only, means of promoting and implementing a programme. This is consistent with experience in predator control in Wellington (PFW 2019b).

Self-identity was not a key motivation for survey respondents to reduce the number of rats or to use traps. This suggests that attempts to encourage participation in a programme of urban trapping by promoting the participation of neighbours or friends are unlikely to be particularly successful.

The support for a programme of trapping to reduce rat populations in Napier and Hastings did not appear to translate to control of other predators such as possums and mustelids.

Several results provided empirical support for the theory underpinning the I₃ Framework. First, as expected, moderate to high involvement with reducing rat numbers and trapping were associated with a greater likelihood to express a definite attitude towards using traps to catch rats. Second, as hypothesised, we found higher levels of involvement with reducing rat numbers and trapping were associated with a greater likelihood of believing rats had a damaging effect on biodiversity, habitat for native plants and animals, and farm production. Third, higher levels of involvement with reducing rat numbers and trapping were also associated with a greater likelihood of undertaking predator control activities. Fourth, as hypothesised, higher levels of involvement were associated with greater awareness of Predator Free Hawke's Bay and Cape-to-City programmes.

Further research using focus groups would be worthwhile to confirm the conclusions we have made concerning the motivations of householders and their views on the use of traps and other control methods for rats and other pests.

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Appendix

Table A1. Reliability of involvement scales

	Involvement score	Reliability coefficient
Involvement with reducing numbers of rats	3.47	0.73
Involvement with using traps	3.10	0.75

Notes: Involvement scores is sample mean. These were significantly different ($p \leq 0.01$) using paired-sample t-test (Cooksey 1997).
Reliability coefficient is Cronbach's alpha (Carmines & Zeller 1979)

Table A2. Involvement profiles for reducing numbers of rats and using traps

Involvement component:	Reducing numbers of rats	Using traps
Functional 1	3.88	3.36 ^a
Functional 2	3.74	3.29 ^a
Experiential 1	3.79	3.72
Experiential 2	3.29	3.12 ^a
Identity 1	3.16	3.02 ^a
Identity 2	3.15	3.03 ^a
Consequence 1	4.02	3.24 ^a
Consequence 2	3.44	3.23 ^a
Risk 1	3.10	2.95 ^a
Risk 2	3.10	2.93 ^a

Notes: Values are sample means.

^a Denotes statistically significantly difference in means ($p \leq 0.01$) using paired-sample t-test (Cooksey 1997).