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An application of the I₃ framework to rat control in New Plymouth

Prepared for: Towards Predator Free Taranaki and Taranaki Mounga Project

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An application of the I₃ framework to rat control in New Plymouth

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Summary

The potential for people in urban areas to contribute to predator control is of interest to Towards Predator Free Taranaki and Taranaki Mouna Project. 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 New Plymouth.

The results of the survey indicate widespread support for a programme of trapping to reduce rat populations in New Plymouth. This support appears to be primarily motivated by residents' concerns for the environment, 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 New Plymouth, 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. In addition, those householders with low to mild involvement in trapping do support reducing rat numbers, consequently they 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.

With respect to volunteering we found there were a variety of motivations underpinning volunteering by people in New Plymouth, and that these motivations can be satisfied by volunteering in any sphere of activity. The implication that follows from this is that Towards Predator Free Taranaki and Taranaki Mouna Project might increase participation in their volunteer programmes using promotions highlighting the ways in which volunteering with them can contribute to satisfying the various motivational needs of volunteers. This means a promotional programme should consist of several themes reflecting each of these motivational needs.

1 Introduction

The potential for people in urban areas to contribute to predator control is of interest to Towards Predator Free Taranaki and Taranaki Mouna Project. This potential can, in principle, be modified by using a range of policy instruments, including marketing, education, incentives, charges and regulations to stimulate interest, encourage participation, and modify behaviour and practice. For example, participation in an urban programme of rat trapping could be encouraged by offering incentives to households to install and monitor traps.

Choosing which policy instrument to employ depends on several factors, the likelihood of householders responding favourably 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 New Plymouth.

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:

- 1 involvement, which is a measure of motivation, with the relevant policy outcome (such as reducing rat numbers)
- 2 involvement with the policy instrument itself (trapping rats), and
- 3 attitude towards the instrument (trapping rats).

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 mean 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 1 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 1 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.

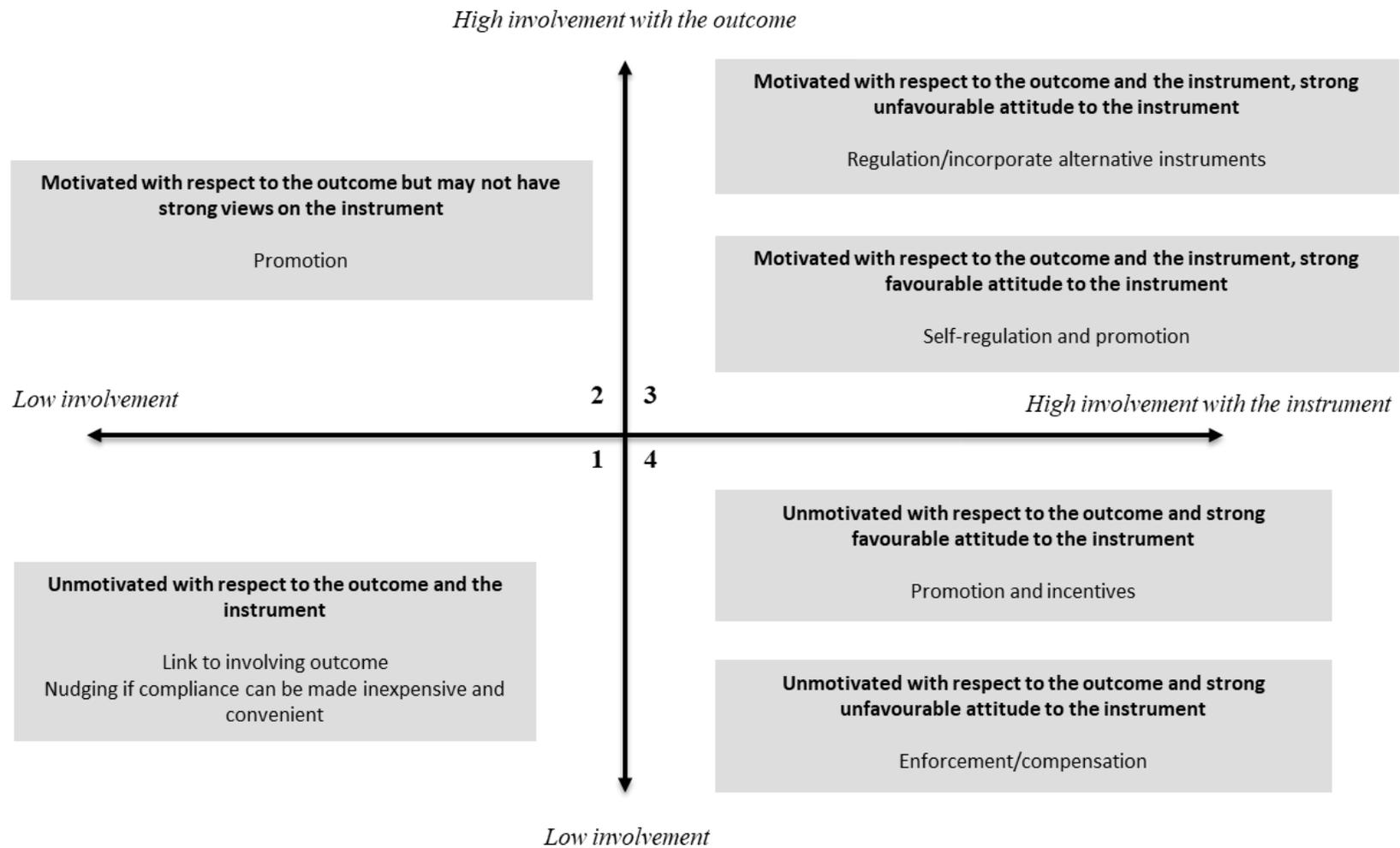


Figure 1. I₃ Response Framework.

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 2 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 2 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 3 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 3 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 4 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 4 have an unfavourable attitude towards the policy instrument, then they will only comply reluctantly, or 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

A questionnaire was developed to elicit people's involvement with reducing rat numbers, and their involvement with, and attitude towards trapping rats. Involvement was measured using a condensed version of the Laurent and Kapferer (1985) involvement scale developed by Kaine (2019) with respondents rating two statements on each of the five components of involvement.

Attitudes were measured using a simple, evaluative Likert scale.¹ The strength of respondents' attitudes with respect to rat trapping was expected to vary depending on the strength of their involvement with trapping. Consequently, respondents were also questioned about their uncertainty, or otherwise, about their attitudes towards trapping using a scale based on Olsen (1999).

A series of questions were formulated to discover respondents' beliefs about the advantages and disadvantages of reducing rat numbers, and their beliefs about the advantages and disadvantages of trapping. Information was sought on whether respondents trapped rats and their experiences if they did. Respondents who did not trap were asked about their reasons for not doing so.

Towards Predator Free Taranaki and Taranaki Mouna Project were also interested in the degree to which people's willingness to participate in urban rat trapping, and predator control generally, was associated with a willingness to engage in voluntary activities. Consequently, a series of questions were included concerning people's motivation to volunteer (Clary et al. 1998), and their participation in volunteer activities. Finally, information was sought on the demographic characteristics of respondents and whether they trapped possums or rats.

The ordering of the statements in the involvement, attitude, and belief scales was randomised to avoid bias in responses. Participation in the survey was voluntary, respondents could leave the survey at any time, and all survey questions were optional and could be skipped.

The questionnaire was administered online and by telephone by Versus Research, a market research company in Hamilton, New Zealand. Telephone respondents were randomly selected from a database of urban addresses in New Plymouth. Internet respondents were randomly selected from a database of panellists in New Plymouth. Internet respondents receive compensation for competing surveys and have greater flexibility with respect to when they participated. The survey was open for approximately 10 weeks beginning in December 2019.

¹ A Likert scale consists of a series of statements about a subject and respondents use a scoring system to rate their level of agreement or disagreement with each statement. Their scale score is the average of their ratings on all the statements.

4 Results

4.1 The sample

Approximately 61 per cent of respondents were women. The age distribution of the sample is marginally older than current census estimates for New Plymouth (see Table 1) and has a higher level of education than current census estimates for New Plymouth (see Table 2). The overwhelming majority of respondents lived in a house (71 per cent) with most of the remaining respondents living in apartments, townhouses or units (17 per cent). A small proportion of respondents lived on farmlets or lifestyle blocks (12 per cent) bordering the city.

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.² 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). This is important as it means the scales are consistent measures of respondents' involvement with reducing rat numbers and trapping.

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 1.

Inspection of Figure 2 reveals that most respondents exhibited moderate to high involvement with the idea of reducing rat numbers, and mild to moderate involvement with using traps to catch rats. Consequently, most respondents were classified into quadrant 3 (see Table 3).

The moderate to high involvement of respondents with reducing rat numbers indicates that residents of New Plymouth would support a policy to eradicate rats in urban areas (see Table 4). 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.

Almost 70 per cent of respondents had a strongly favourable attitude to trapping. Only two per cent of respondents had an unfavourable attitude towards trapping (see Table 5). Consistent with reporting only mild to moderate involvement with trapping rats, a sizeable minority of respondents, nearly 30 per cent, were unsure about or indifferent towards trapping. As we expected, those 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 6).

² Involvement scores were interpreted as low (1-2), mild (2-3), moderate (3-4) and high (4-5) involvement.

Table 1. Age profile of sample

Age category	Proportion of sample %	Proportion of New Plymouth population ¹ %
15–39	22.1	36.4
39–64	54.1	40.9
More than 64	22.9	22.7

Notes: (1) Derived from NZ Stats (2020a). The proportions are not strictly comparable as all survey respondents were over 18 and we used age decile categories in the survey.

Table 2. Education profile of sample

Education category	Proportion of sample %	Proportion of New Plymouth population ¹ %
No qualification	-	22.8
Some or all secondary school	30.5	-
Certificate (1–6)	20.4	47.6
Diploma (5–7)	13.3	10.9
Bachelor's degree	23.9	11.2
Post-graduate diploma/certificate	5.0	4.9
Post-graduate degree	6.9	2.7

Notes: (1) Derived from NZ Stats (2020b).

Table 3. I3 classification

Quadrant	Proportion of sample %
One – indifferent	6.9
Two – involved with reducing rat numbers	13.8
Three – involved with reducing rat numbers and with using traps	76.8
Four – involved with using traps	2.5

Table 4. Mean involvement by I3 quadrant

	Involvement with reducing rat numbers ¹	Involvement with using traps to reduce rat numbers ²
Quadrant 1	2.63	2.45
Quadrant 2	3.36	2.65
Quadrant 3	3.89	3.66
Quadrant 4	2.72	3.17

Notes: (1) Test for difference in means across quadrants ($F=99.8$, $p<0.01$)
(2) Test for difference in means across quadrants ($F=152.1$, $p<0.01$)

Table 5. Attitude towards trapping rats

Attitude	Proportion of sample %
Right thing to do	67.0
Doesn't matter to me	8.9
Not sure	9.6
Haven't given it much thought	12.2
Bad thing to do	2.3

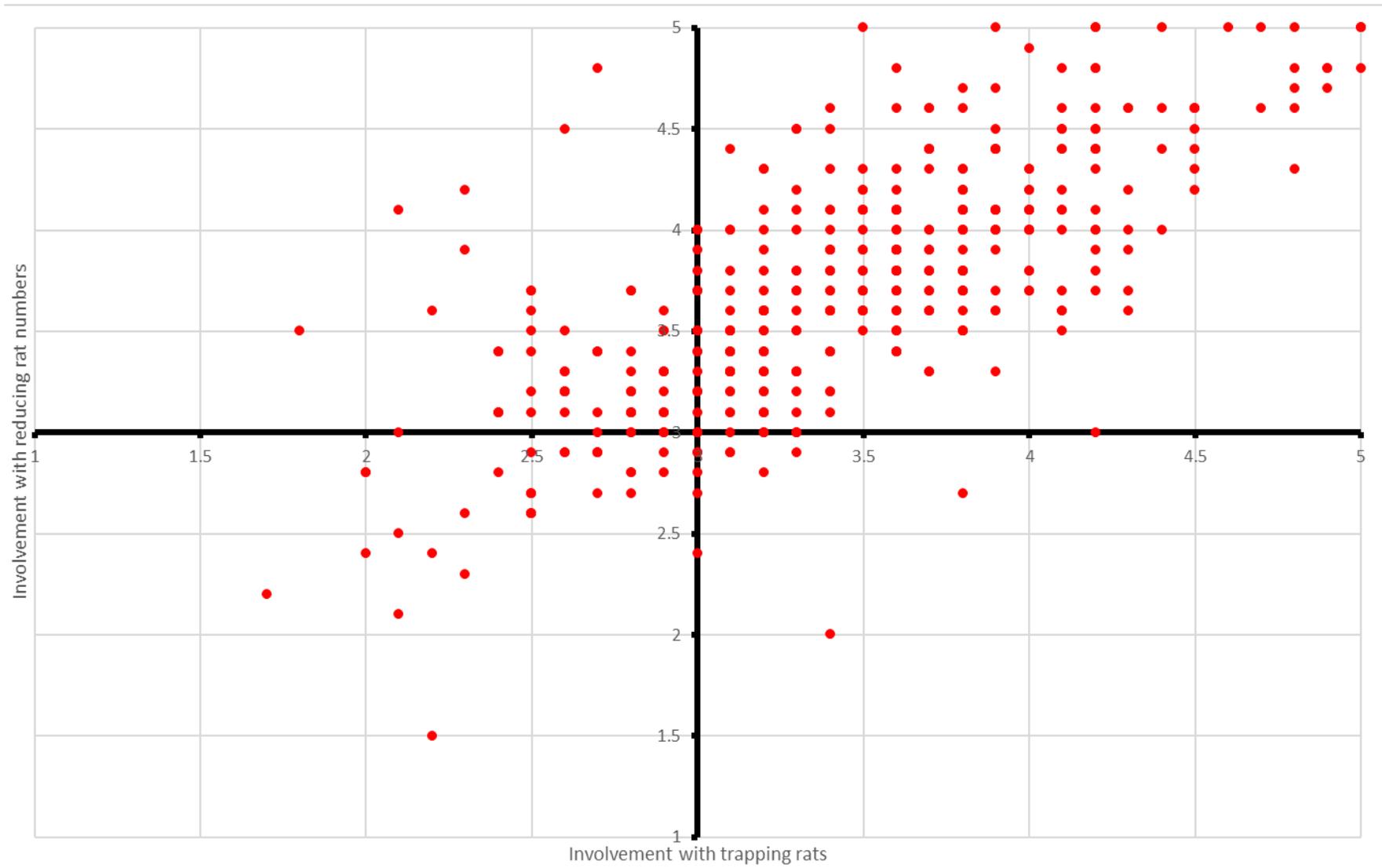


Figure 2. I_3 mapping of involvement with reducing rat numbers and using traps.

Also as expected, a relatively high proportion of respondents in quadrant 1 had not thought about, or were indifferent to, the use of traps, while a relatively high proportion of respondents in quadrant 3 had a definite and favourable attitude toward trapping (see Table 7). Note that a high proportion of respondents in quadrant 2 had not thought about or were indifferent to the use of traps, even though they had moderate to high involvement with reducing rat numbers. This is consistent with the respondents in this quadrant exhibiting low to mild involvement with trapping rats. They may be using other methods such as baiting to control rats.

The moderate to high involvement of respondents with the idea of reducing rat numbers, and their mild to moderate levels of involvement with using traps to catch rats, indicates that residents of New Plymouth are only be likely to invest a limited amount of their time and energy in trapping.

4.3 Involvement profiles

The involvement profiles of respondents in each quadrant with respect to reducing rat numbers are reported in Figure 3. 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, experiential 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 functional or material well-being and safety. These concerns could stem partly from the perceived impact of rats on biodiversity and the environment, as well as the risks they pose to human health risks and the damage they can inflict on buildings, equipment, vehicles, gardens, and so forth. Respondents in quadrants 1 and 4 primarily 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 4. 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 in quadrant 3 exhibited moderate involvement across all the components of involvement. Respondents in quadrant 4 exhibited mild involvement with most aspects of trapping rats but moderate consequence and risk involvement, suggesting they may be concerned about the dangers of trapping. Respondents in quadrants 1 and 2 primarily exhibit mild involvement with using traps to reduce rat numbers.

Table 6. Involvement and attitude towards trapping rats

Attitude	Involvement with reducing rat numbers¹	Involvement with using traps to reduce rat numbers²
Right thing to do	3.77	3.50
Doesn't matter to me	3.34	3.09
Not sure	3.58	3.24
Haven't given it much thought	3.59	3.35
Bad thing to do	3.73	3.60

Notes: (1) Test for difference in means across quadrants ($F=5.0, p<0.01$)

(2) Test for difference in means across quadrants ($F=5.7, p<0.01$)

Table 7. I₃ classification and attitude towards trapping rats

Attitude	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Right thing to do	56.7	51.7	71.0	54.5
Doesn't matter to me	20.0	13.3	7.2	9.1
Not sure	13.3	16.7	8.1	9.1
Haven't given it much thought	6.7	18.3	11.0	27.3
Bad thing to do	3.3	0.0	2.7	0.0

Note: Values are proportion of respondents in each quadrant. Test for differences in proportions across quadrants ($\chi^2=21.6, p<0.05$)

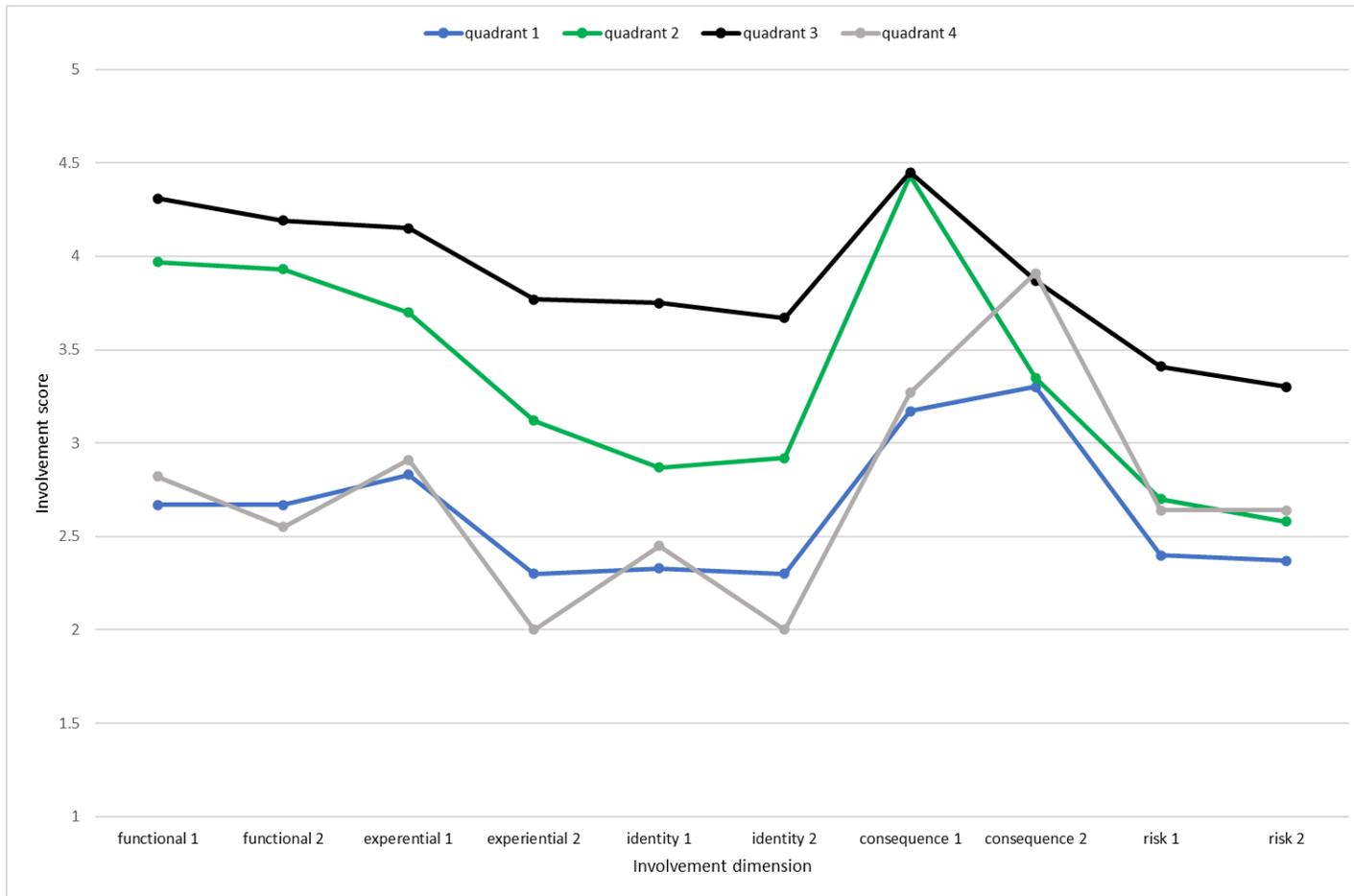


Figure 3. Involvement profiles for reducing rat numbers.

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.

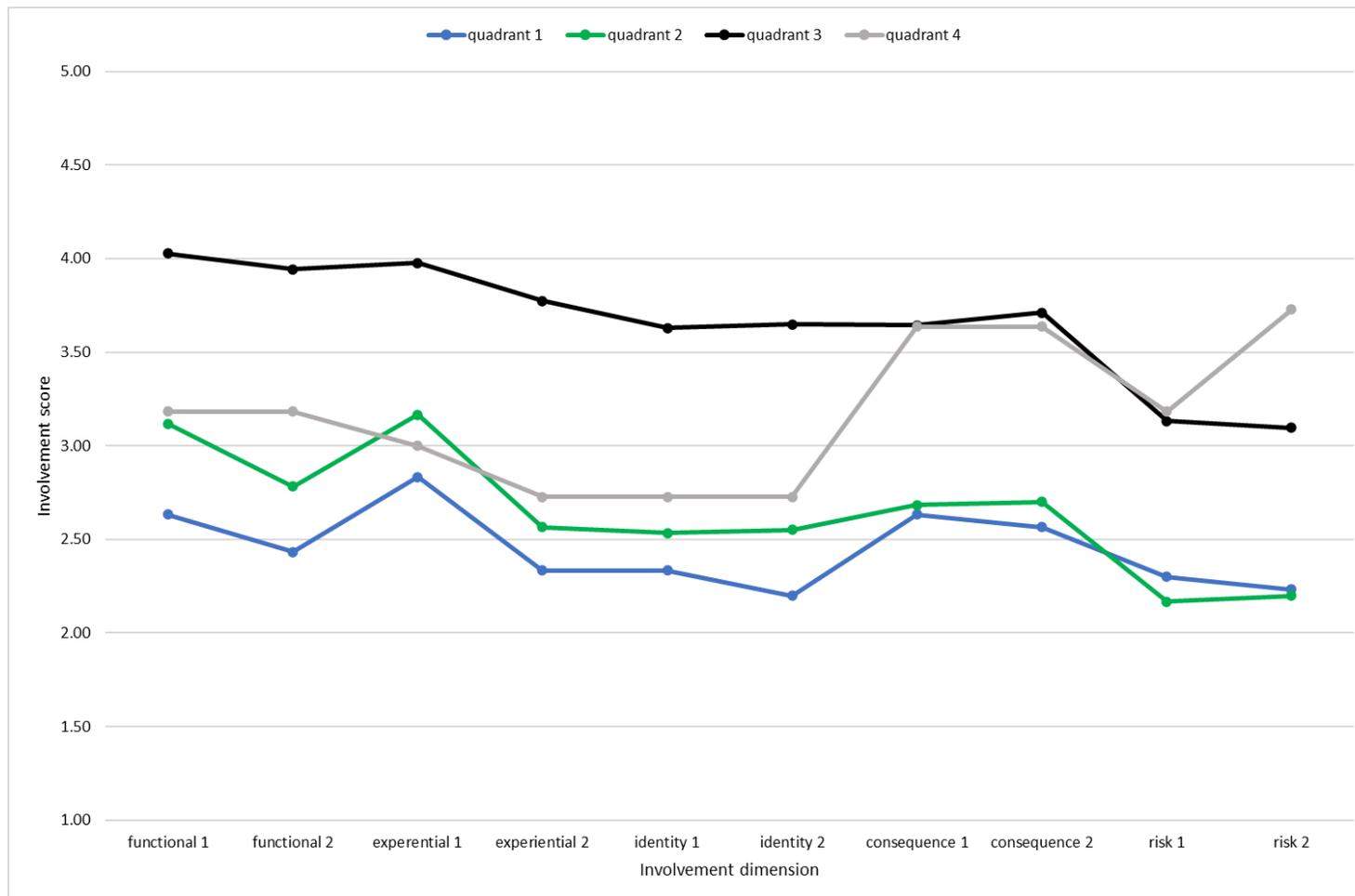


Figure 4. Involvement profiles for using traps to reduce rat numbers.

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.

Involvement with reducing rat numbers and involvement with using traps to reduce rat numbers was not related to the age, gender or property type of respondents. There was a statistically significant, but inconsequential, association between level of education and involvement with trapping. There was no association between level of education and involvement with reducing rat numbers.³

Respondents who completed the questionnaire via the telephone were hypothesised to exhibit higher involvement with reducing rats and, possibly, trapping than respondents who were registered members of a market survey panel and completed an online questionnaire, as the former would be more likely to be motivated by an intrinsic interest to participate while the latter are recompensed for completing questionnaires. This hypothesis was supported with respect to involvement with reducing rat numbers.⁴

To the degree most respondents were moderately involved with the idea of using traps, they probably perceive traps as an effective and relatively safe method for catching rats, and they may well experience some sense of mastery and achievement when they successfully trap rats.

4.4 Involvement and opinions about rats

Respondents in quadrants 2 and 3, representing 91 per cent of the sample, believe rat populations should be reduced to protect and conserve native birds and wildlife, and native plants and forests. They also believe rats damage orchards and gardens as well as buildings and equipment, and that they are a risk to health (see Fig. 5). They disagree, on average, with the view that rats are as entitled to life as other animals.

We expected differences across the quadrants in respondents' opinions about rats. Specifically, we hypothesised, because of their relatively low involvement with reducing rat numbers, that respondents in quadrant 1 would be less likely than respondents in other quadrants to express definite opinions about the unfavourable effects of rats on native plants, birds and animals, and on orchards, gardens, buildings and equipment. This hypothesis was supported with respondents in quadrant 1 being less sure, on average, about the unfavourable effects of rats than respondents in quadrants 2 and 3 (see Fig. 5). On average, the opinions of respondents in quadrant 4, who also have relatively low involvement with reducing rat numbers, were like those of respondents in quadrant 1.

³ These results are available on request from the author.

⁴ For involvement with reducing rats $F=5.3$, $p=0.01$ and for involvement with using traps $F=1.4$, $p=0.24$.

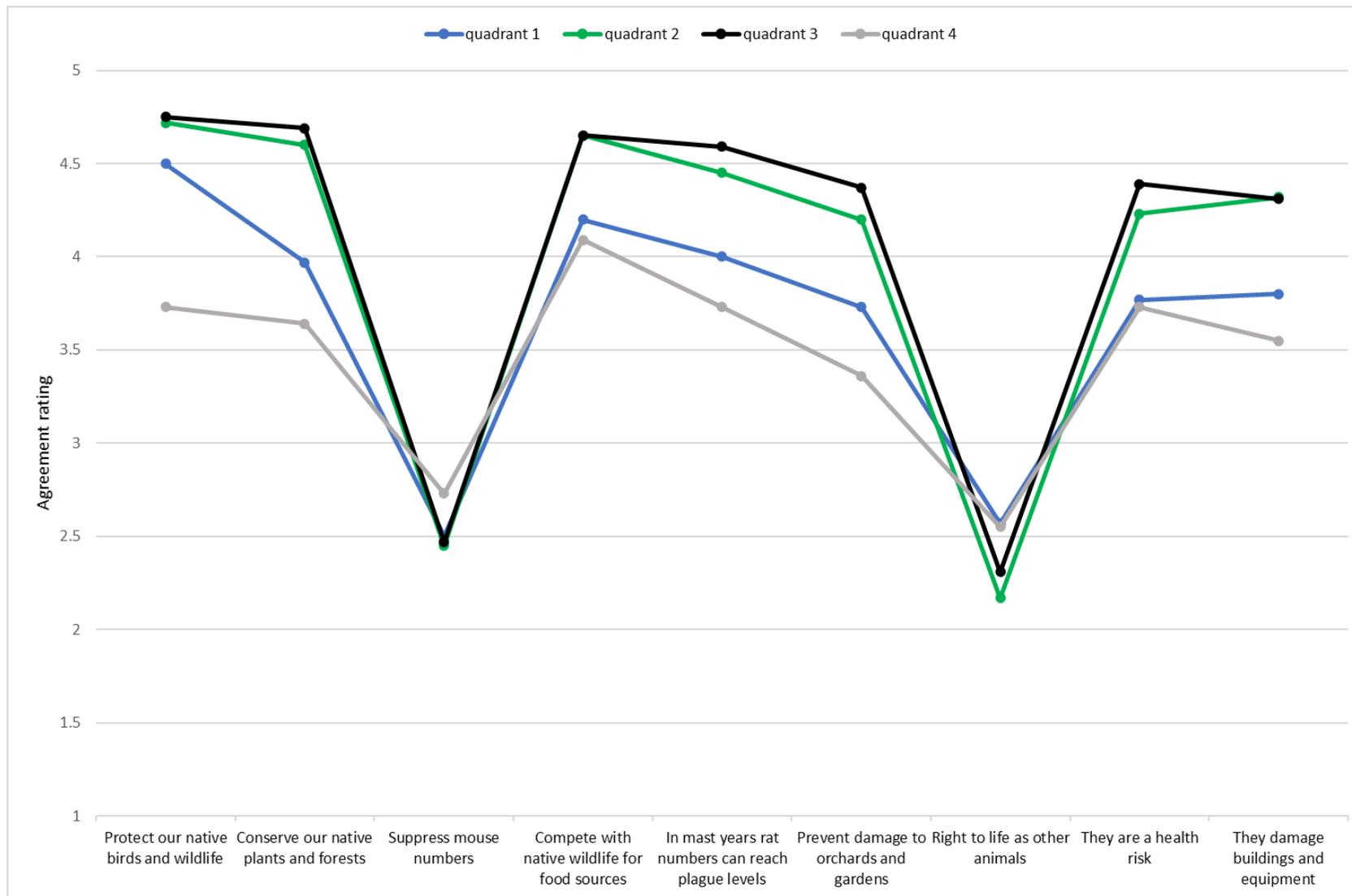


Figure 5. Beliefs about the advantages and disadvantages of reducing rat numbers.

4.5 Involvement and opinions about using traps

Measuring attitudes is an important aspect of the Framework as the interaction between involvement and attitudes determines the types of strategies that may be employed to change behaviour in each quadrant (Kaine et al. 2010). Consequently, two methods were employed to measure the strength and direction of respondent's attitudes towards trapping rats, a four-statement normative scale about trapping and a five-statement ipsative scale about trapping.⁵ Statistical testing indicated that responses to the normative scale were internally consistent meaning the scales are consistent measures of respondents' attitudes towards trapping.⁶

Responses were also consistent across the two methods, with respondents who indicated trapping was the 'right thing to do' on the ipsative scale displaying the most favourable scores, on average, on the normative scale. Correspondingly, respondents who indicated trapping was a 'bad thing to do' displayed the least favourable scores, on average, on the normative scale (see Table 8). Although respondents in all quadrants expressed a favourable attitude towards trapping, as expected respondents in quadrant three had the most favourable attitude (see Table 9).

Respondents' beliefs about the advantages and disadvantages of using traps to reduce rat numbers were similar, on average, across the quadrants (see Fig. 6). Respondents believed trapping was effective and was not a danger to children, pets, native birds, a risk to health or inhumane. They were less sure that traps were practical in all areas and were more effective than baiting.

On average, respondents in quadrant 4, unlike those in other quadrants, tended to believe the suffering of rats in traps outweighed the benefits to native birds. Surprisingly, this was the only statistically significant difference between the quadrants in respondents' beliefs about the advantages and disadvantages of trapping rats.

Overall, these results imply that there is widespread support for using traps to reduce rat numbers in New Plymouth. This is consistent with experience in predator control in Wellington (PFW 2019a) and the findings of a survey of residents in Napier and Hastings (Kaine 2019b).

⁵ With a normative scale the respondent uses a scoring scale to rate their agreement with a series of statements. With an ipsative scale (sometimes called a "forced choice" scale) respondents compare two or more desirable statements and pick the one they most prefer.

⁶ Cronbach's alpha was 0.88 (Carmines & Zeller 1979).

Table 8. Consistency in attitudes towards trapping rats

Attitude statements (ipsative scale)	Attitude towards trapping rats (normative scale)
Right thing to do	4.57
Doesn't matter to me	4.08
Not sure	3.36
Haven't given it much thought	3.73
Bad thing to do	3.07

Note: Values are mean scores of respondents on the normative scale for each ipsative attitude category
 Test for differences in means across attitude categories ($F=61.3, p<0.01$)

Table 9. I₃ classification and attitudes towards trapping rats

	Attitude towards trapping
Quadrant 1	3.98
Quadrant 2	3.96
Quadrant 3	4.37
Quadrant 4	3.66

Note: (1) Test for differences in in means across quadrants ($F=9.7, p<0.01$)

Table 10. I₃ classification and proportion of respondents that currently trap rats

	Proportion of quadrant %
Quadrant 1	26.7
Quadrant 2	25.0
Quadrant 3	43.9
Quadrant 4	27.3

Note: (1) Test for differences in proportions across quadrants ($\chi^2=10.7, p=0.01$)

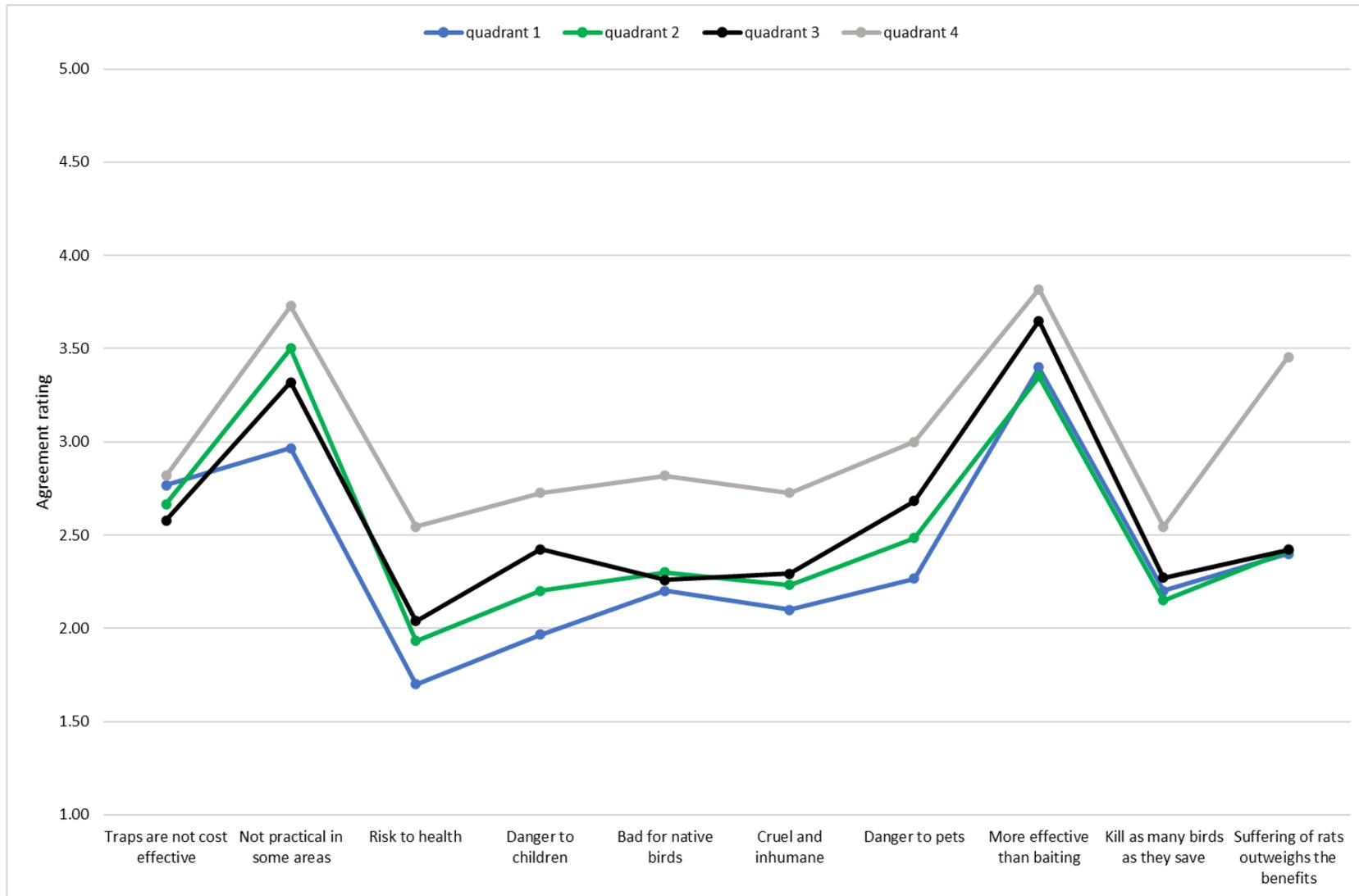


Figure 6. Beliefs about the advantages and disadvantages of using traps to reduce rat numbers.

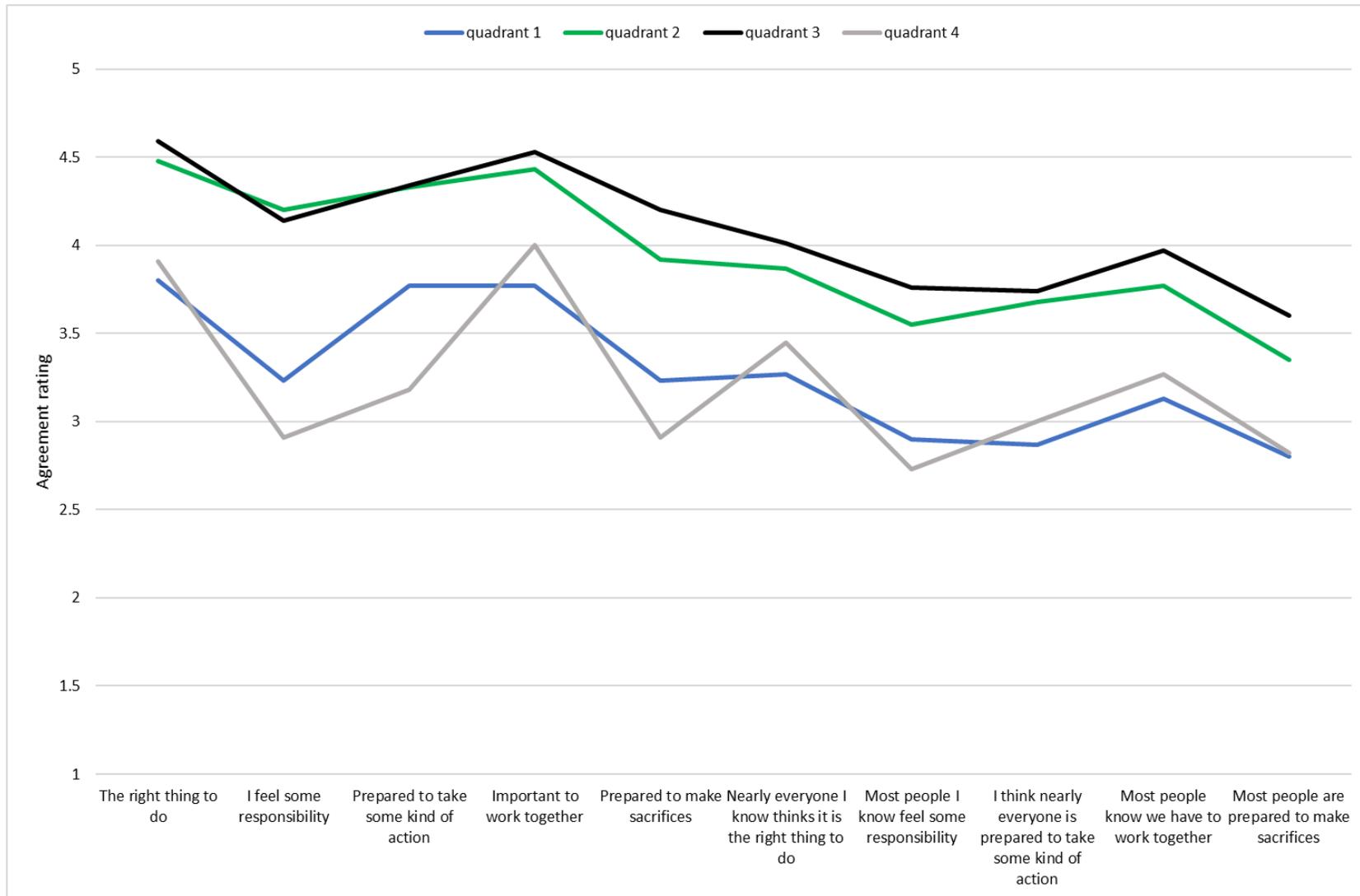


Figure 7. Beliefs about responsibility for reducing rat numbers.

4.6 Involvement and rat trapping activity

We expected differences across the quadrants in the degree to which respondents agreed they were personally responsible for reducing rat numbers. Consistent with differences in their involvement, respondents in quadrants 2 and 3 expressed stronger agreement than respondents in quadrants 1 and 4, that reducing rat numbers was the right thing to do, that reducing rat numbers was their responsibility and that they were willing to take action and make sacrifices to reduce rat numbers (See Fig. 7). These differences were also apparent in respondents' opinions about the willingness of others to take responsibility for reducing rat numbers.

We expected differences across the quadrants in the proportion of respondents who trapped rats. Specifically, we hypothesised respondents in quadrant 3 to be more likely than respondents in other quadrants to trap rats. This hypothesis was supported with significantly higher proportion of respondents in quadrant 3 reporting that they engaged in trapping (see Table 10).

Respondents who currently trap rats exhibited higher involvement, on average, with reducing rat numbers and trapping (see Table 11). Furthermore, respondents who were indifferent to, or unsure about, trapping were much less likely to be trapping than respondents who with definite opinions about trapping (see Table 12). These results indicate that differences in motivation, as measured by involvement, are an important factor influencing trapping.

With one exception, there were no significant differences between respondents who were trapping, and those who were not trapping, regarding the advantages and disadvantages of reducing rat numbers. The exception was with respect to the need to reduce rat numbers to avoid plagues in past years.⁷ We found significant differences between respondents who were trapping rats, and those who did not, regarding their beliefs about the advantages and disadvantages of trapping (see Fig. 8). Basically, those who were currently trapping had more favourable opinions of trapping regarding its effectiveness, safety and humaneness than those that were not. The latter were, on average, less certain about these qualities.

These results indicate that the propensity to trap is moderately influenced by involvement with reducing rat numbers and with trapping. Beliefs about the advantages and disadvantages of reducing numbers of rats have little influence on the propensity to trap; however, beliefs about the advantages of trapping do have an important influence on whether respondents trapped rats.

⁷ Mean agreement rating for respondents that trap was 4.71 compared to a mean agreement rating of 4.44 for those that weren't trapping ($F=5.3$, $p=0.01$).

Table 11. Involvement and trapping

	Currently trap rats	Don't trap
Involvement with reducing rats ¹	3.81	3.62
Involvement with trapping ²	3.54	3.35

Note: (1) Test for differences in in means $F=10.8$, $p<0.01$

(2) Test for differences in in means $F=10.0$, $p<0.01$

Table 12. Attitude and proportion of respondents that currently trap rats

Attitude	Proportion %
Right thing to do	48.6
Doesn't matter to me	25.6
Not sure	19.0
Haven't given it much thought	13.2
Bad thing to do	-

Note: (1) Test for differences in proportions across quadrants ($\chi^2=37.7$, $p<0.01$)



Figure 8. Trapping and beliefs about the advantages and disadvantages of using traps.

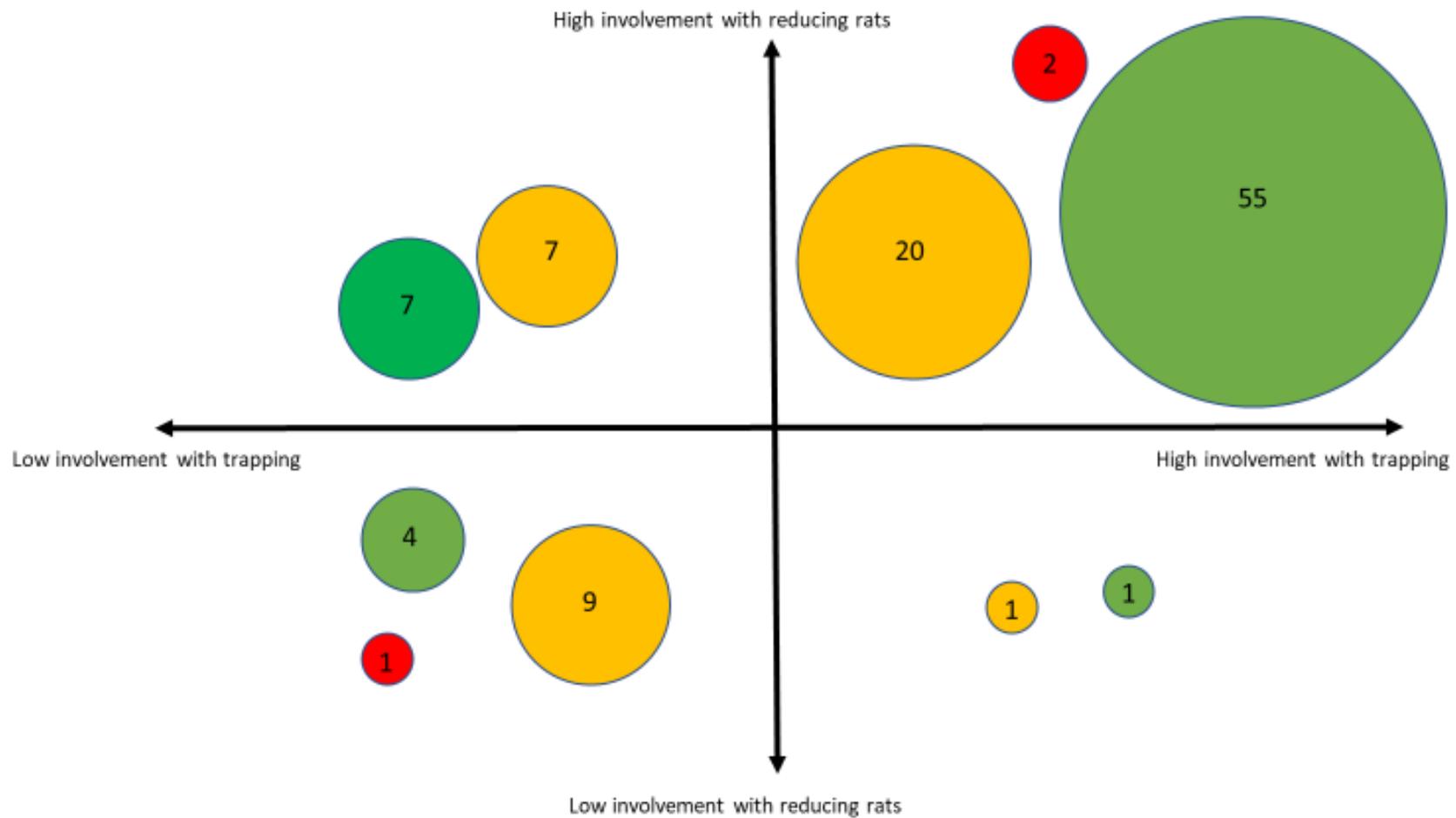


Figure 9. Graphical summary of involvement and attitudes.

Note: Green indicates favourable, yellow indicates unsure, and red indicates unfavourable. Values are percentage of sample and the size of circles is proportional to the relevant percentage of the sample.

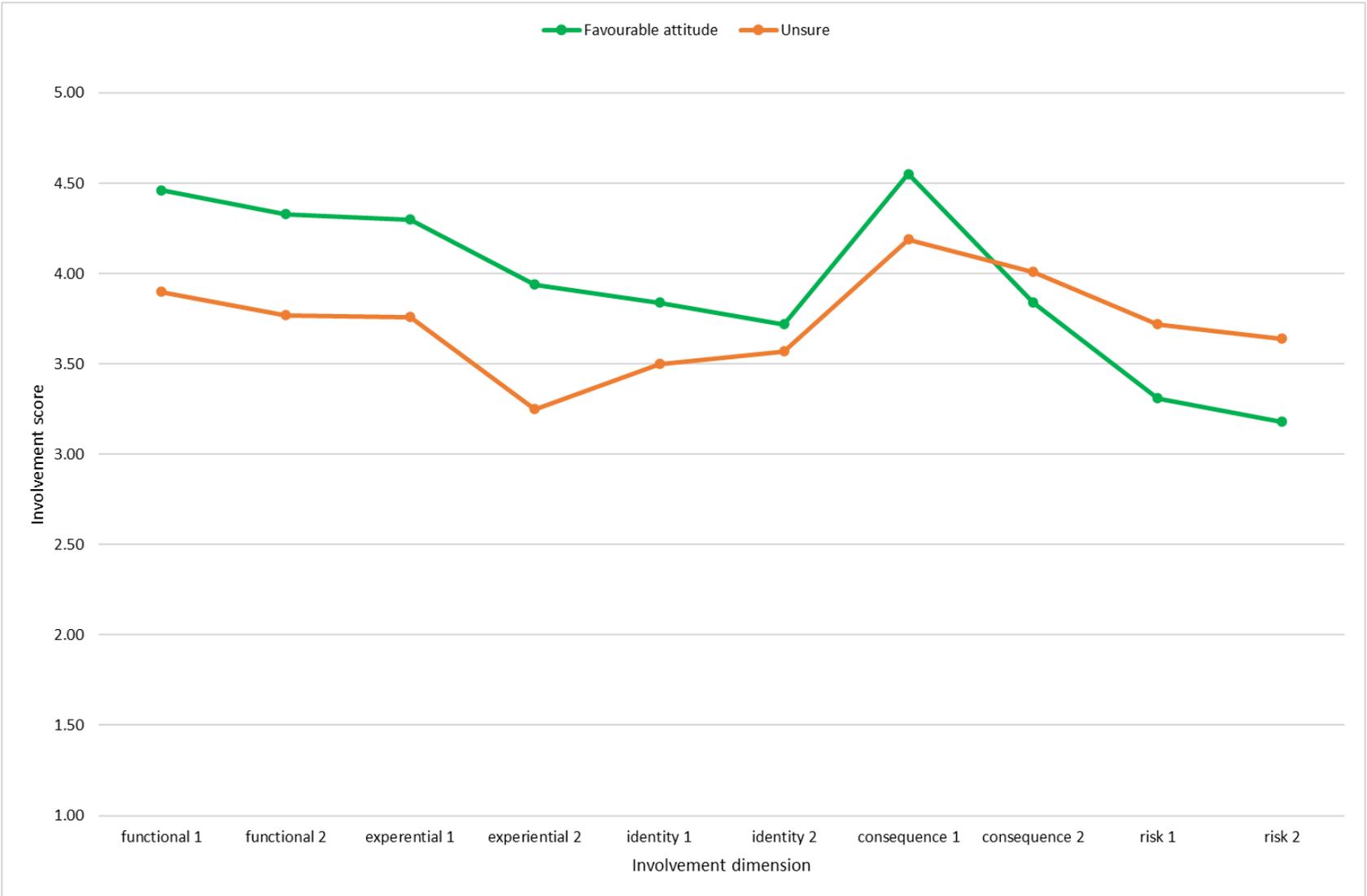


Figure 10. Attitude and involvement with reducing rats (quadrant 3).

The proportion of respondents in each quadrant who were in favour of, unsure about, or against trapping rats is summarised in Figure 9. Comparing the two largest groups of respondents (those in quadrant 3 who favoured trapping, and those who were unsure about trapping) confirms the importance of interest in the idea of reducing rat numbers and in using traps, together with attitudes towards using traps, have on the propensity to trap. Fifty-two per cent of those in this quadrant that favoured trapping, did in fact trap, compared with only 21 per cent of those that were unsure.⁸

Those respondents in quadrant 3 who were unsure about trapping exhibited significantly lower functional, experiential, identity, and consequence involvement with reducing rat numbers, and significantly higher risk involvement with reducing rat numbers, than respondents who favoured trapping (see Fig. 10). This means, compared to those in this quadrant that favoured trapping, respondents in this quadrant who were unsure about trapping were not as certain of the importance of reducing rat numbers and thought there was a greater chance of mistakes being made in trying to reduce rat numbers.

Respondents in quadrant 3 who were unsure about trapping also exhibited significantly lower functional, experiential and identity involvement with reducing rat numbers, and significantly higher consequence and risk involvement with using traps, than respondents who favoured trapping (see Fig. 11). This means, compared to those in this quadrant that favoured trapping, respondents in this quadrant who were uncertain about trapping were not as sure of the importance of using traps to reduce rat numbers and thought there was a greater chance of mistakes being made in using traps to reduce rat numbers.

Finally, respondents in quadrant 3 who were unsure about trapping were less sure of the advantages of trapping, and less confident about the safety and welfare aspects of trapping, than respondents who favoured trapping (see Fig. 12).⁹

4.7 Experiences with using rat traps

Respondents who were currently trapping rats were questioned about their experiences of trapping. Respondents who were not trapping were questioned about why they did not trap rats, and their opinions about what they imagined the experience of trapping would be like. Respondents were questioned about the emotional (affective) aspects of their experiences, real or imagined, and the reasoned (cognitive) aspects of their experiences, real or imagined.¹⁰ The results are summarised in Table 13 and Figures 13 and 14.

⁸ Test for differences in proportions ($\chi^2=22.5$, $p<0.01$)

⁹ Classical eta and eta-squared statistics on effect size (Kirk 2007; Richardson 2011) are available on request from the authors.

¹⁰ Cronbach's alpha was 0.65 for affective aspects and 0.82 for cognitive aspects respectively, indicating consistent responses (Carmines & Zeller 1979).

Table 13. Real and imagined experience with trapping

Statement	Currently trap rats	Don't trap
Affective:		
Trapping is rewarding	4.14	-
Trapping is inspiring*	4.37	3.75
Catching rats is exciting*	3.80	2.90
Catching rats is encouraging*	4.37	3.69
Trapping makes a difference*	4.37	2.67
Wish checking traps was easier*	2.94	2.47
Boring when you don't catch rats*	2.97	2.43
Dislike disposing of dead rats*	3.02	3.42
Cognitive:		
Trapping is useful*	4.46	3.94
Trapping is practical*	4.48	3.83
Trapping is helpful*	4.46	3.98
Set a good example for family and friends*	4.14	3.46
Set a good example for people around me*	4.1	3.51
Naïve or simplistic to think trapping makes a difference*	2.08	2.89
Safety:		
Scared of hurting myself	-	2.73
Traps might injure children	-	2.65
Traps might accidentally catch pets	-	3.07
Preference:		
Oppose using traps	-	2.06
I prefer baits	-	2.67
Just not interested	-	2.73

Notes: (1) * indicates F-test for difference in means across quadrants was significant ($p < 0.01$).

(2) – indicates statement was not included in the questionnaire for respondents in this category.

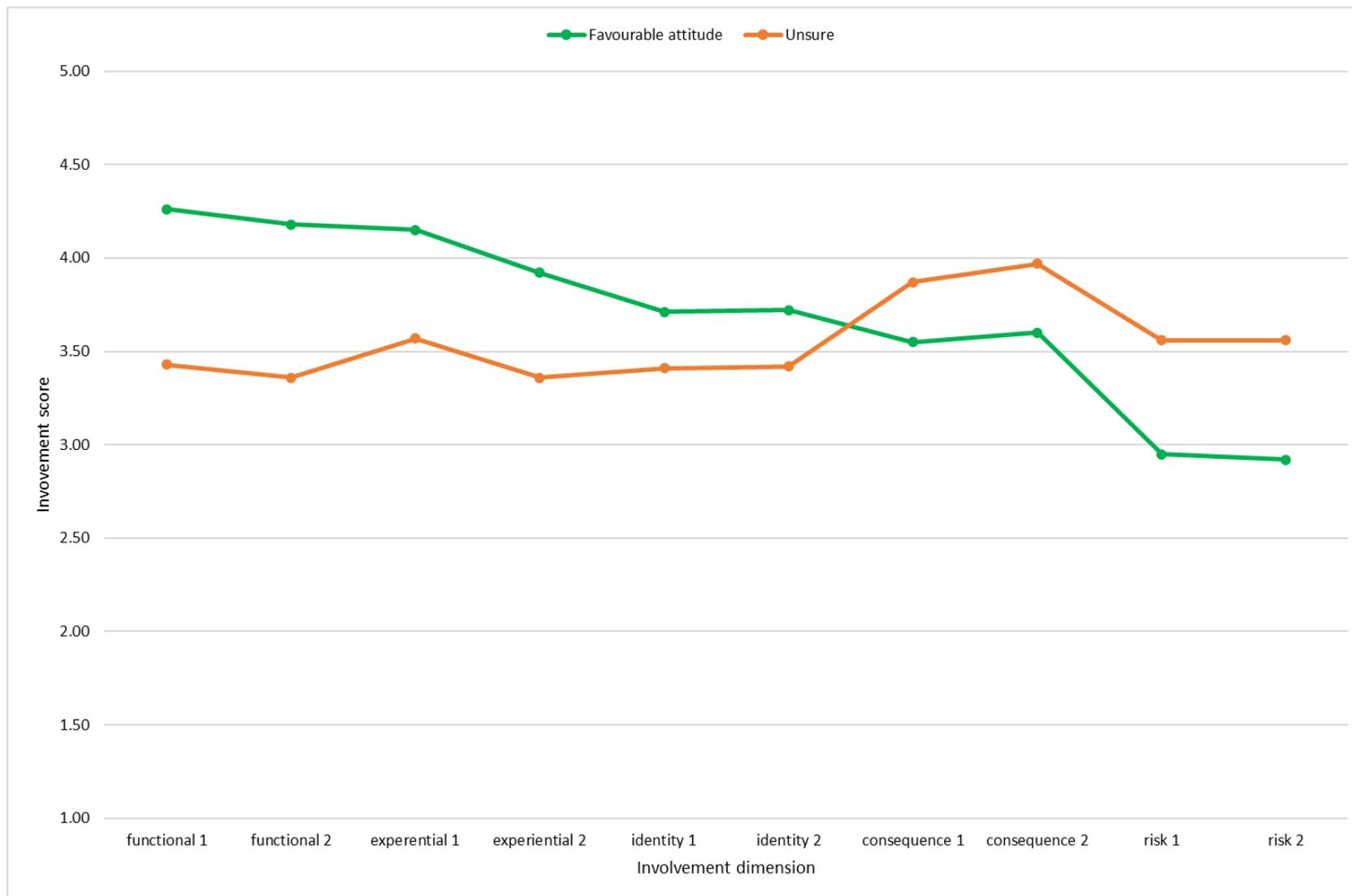


Figure 11. Attitude and involvement with using traps (quadrant 3).

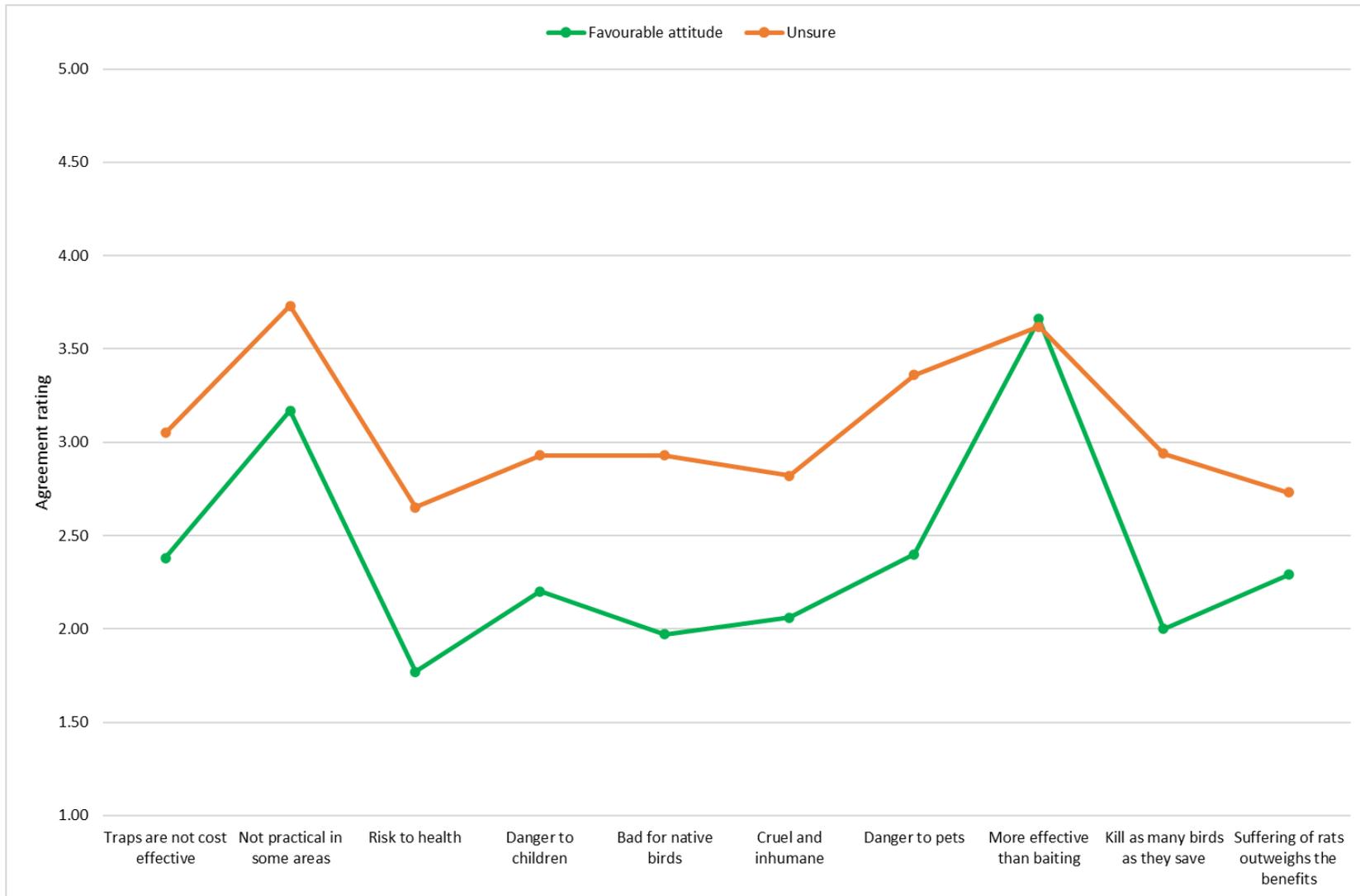


Figure 12. Attitudes and beliefs about the advantages and disadvantages of using traps (quadrant 3).

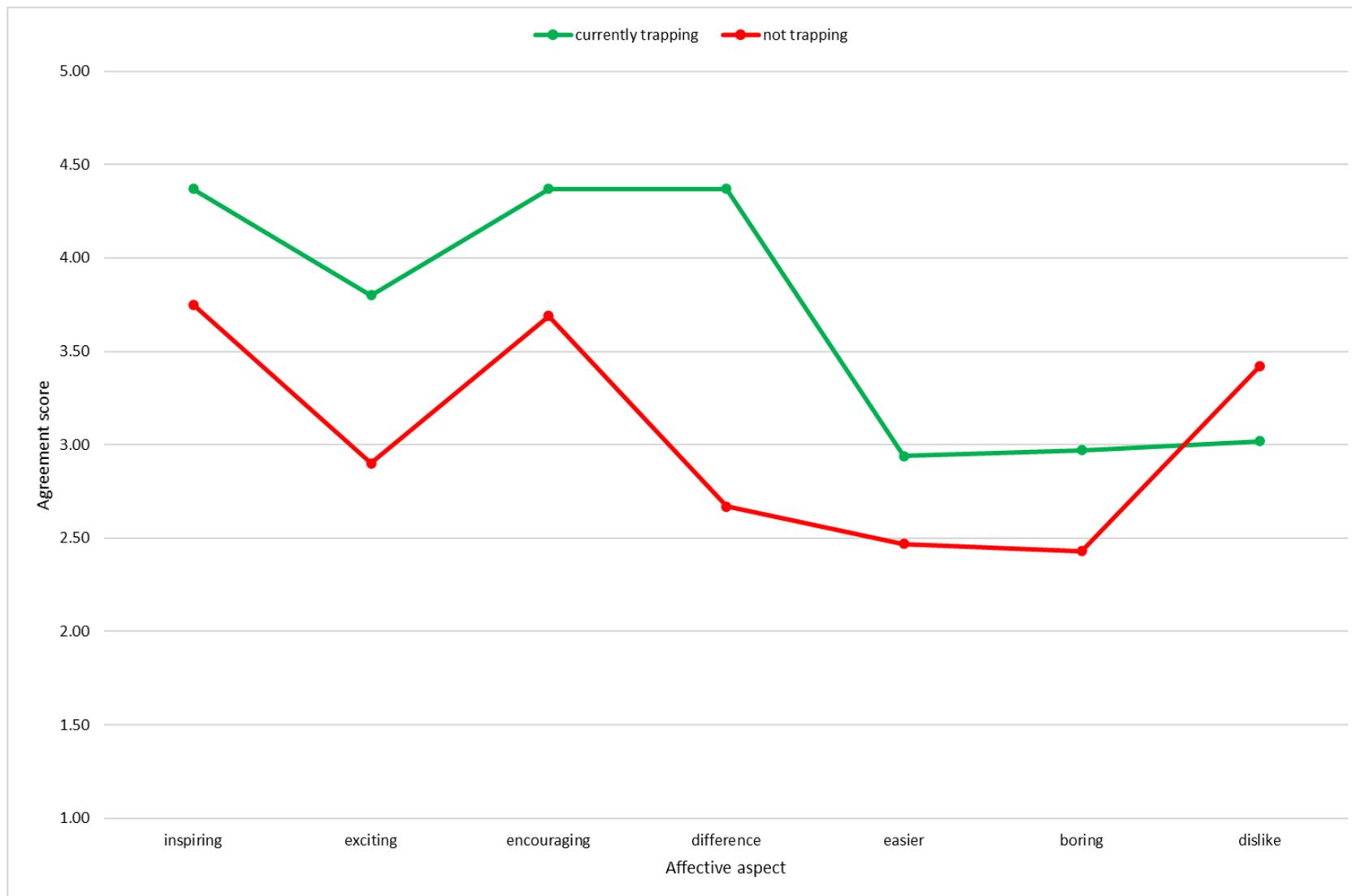


Figure 13. Real and imagined experience with trapping rats – affective aspects.

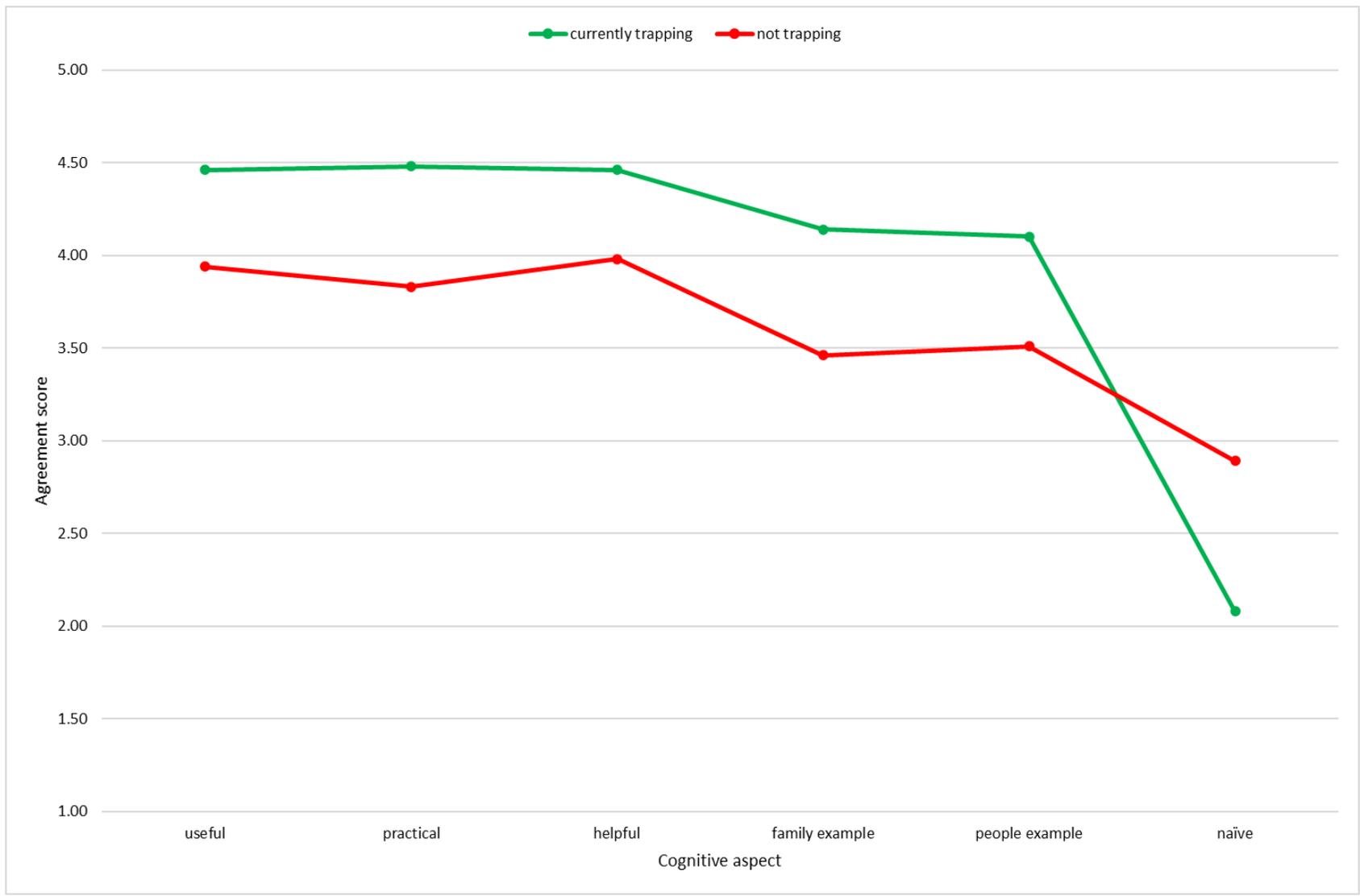


Figure 14. Real and imagined experience with trapping rats – cognitive aspects.

Respondents who were trapping strongly agreed that catching rats was inspiring, that they were encouraged and excited when they caught a rat and that they felt that they were making a difference. They were not particularly concerned about the time taken to check traps and dispose of dead rats, or about getting bored if they did not catch a rat (see Fig. 14).

Respondents who were not trapping expressed only moderate agreement with the proposition that catching rats would be inspiring and that they would be encouraged and excited when they caught a rat and were less likely to agree they would be making a difference. While they appeared unconcerned about the time taken to check traps and getting bored if they did not catch a rat, they were more likely to be concerned about disposing of dead rats (see Fig. 13 and Table 13).

Respondents who were trapping strongly agreed that catching rats was useful, practical, helpful, set a good example for family, friends and others, and made a difference. They were not particularly concerned about the time taken to check traps and dispose of dead rats, or about getting bored if they did not catch a rat (see Fig. 14).

Respondents who were not trapping expressed only moderate agreement with the proposition that catching rats was useful, practical, helpful, set a good example for family, friends and others, and made a difference (see Fig. 14 and Table 13). These respondents did not appear to be particularly concerned about the safety of traps, did not prefer baiting to trapping, and were not opposed to trapping (see Table 13).

This suggests, first, that most respondents who did not trap would support (and not oppose) an urban trapping programme; and second, that many of these respondents would participate in such a programme, provided participation was inexpensive and required little effort; bearing in mind that a proportion of these respondents may already control rats by other means such as baiting.

Overall, these results confirm there is likely to be almost universal support among residents for reducing rat numbers in New Plymouth. This support was motivated by concern about the environmental damage rats cause, as well as concerns for personal safety and material well-being. There is also likely to be widespread support and participation in an urban program of rat trapping.

4.8 Involvement and engagement with Towards Predator Free Taranaki

We expected differences across the quadrants in the proportion of respondents that were participants in the rat trapping programme conducted by Towards Predator Free Taranaki. Specifically, we hypothesised respondents in quadrant 3 to be more likely than respondents in the other quadrants to be participants in the programme. This hypothesis was supported with a significantly higher proportion of respondents in quadrant 3 indicating participation in the programme than in other quadrants (see Tables 14 and 15).

Table 14. Quadrant membership and participation in Towards Predator Free Taranaki urban trapping

	Proportion %
Quadrant 1	13.3
Quadrant 2	16.7
Quadrant 3	24.8
Quadrant 4	9.1

Note: (1) Test for differences in proportions between quadrant three and the other quadrants as a single group ($\chi^2=4.4$, $p<0.05$)

Table 15. Involvement and participation in Towards Predator Free Taranaki urban trapping

	Participants	Non-participants
Involvement with reducing rats ¹	3.83	3.59
Involvement with trapping ²	3.66	3.38

Note: (1) Test for differences in means $F=6.3$, $p<0.01$

(2) Test for differences in means $F=9.1$, $p<0.01$

These results confirm that the higher the motivation of householders in New Plymouth to reduce rat numbers and to use traps, the more likely they are to participate in the urban trapping programme.

4.9 Volunteering

Towards Predator Free Taranaki and Taranaki Mounga Project were interested in the degree to which people's willingness to participate in urban rat trapping, and predator control generally, was associated with a willingness to engage in voluntary activities. As a first step in understanding this association, we investigated whether there were fundamental differences in the motivations of people who voluntarily participate in urban rat trapping and predator control compared with people who participate in other voluntary activities.

Clary et al. (1998) demonstrated there were six fundamental reasons or motivations for volunteering. These were that volunteering provides opportunities (Clary et al. 1998, 1517–1519):

- To express values related to altruistic and humanitarian concerns for others (values)
- For new learning experiences and to exercise knowledge, skills, and abilities that might otherwise go unpracticed (understanding)
- To be with one's friends or to engage in an activity viewed favourably by important others (social)
- To improve and enhance career prospects (career)
- To protect oneself from dislike of features of oneself, to reduce guilt over being more fortunate than others, and to address one's own personal problems (protection)
- For personal development, personal growth, and increasing self-esteem (enhancement).

Clary et al. (1998) developed scales that reliably measure each of these fundamental motivations. They demonstrated that the scales could be employed in the design of more effective promotional material by matching the promotional message to the specific motivations of individuals. They also showed that, where the experience of a volunteer activity matched the fundamental motivations of individuals, those individuals derived greater satisfaction from that activity and were more likely to continue as a volunteer in that activity in the short and long-term.

We included the scales formulated by Clary et al. (1998), with some adaptation, in our questionnaire together with questions to gather information on respondents' volunteering

behaviour.¹¹ Statistical testing indicated that responses to the revised scales were highly internally consistent.¹²

We found that volunteering was strongly related to each of the fundamental motivations (see Table 16 and Fig. 15). We did not find any significant differences in motivations for volunteering with respect to age or education, but we did find that women exhibited slightly higher scores, on average, across all the motivations than men.

With a couple of exceptions, we did not find significant differences in the fundamental motivations for volunteering across the various spheres of voluntary activities (social services, environmental groups, cultural group, sports group, school or education group, health services).¹³ Importantly, we did not find any significant differences in motivation between respondents who were:

- urban trappers with Towards Predator Free Taranaki and other volunteers
- volunteers with Towards Predator Free Taranaki and other volunteers
- volunteers with Taranaki Mouna Project and other volunteers
- volunteers with an environmental group and other volunteers.

This result confirms that a variety of motivations underpin volunteering by people in New Plymouth, and that these motivations can be satisfied by volunteering in any sphere of activity. This suggests that the sphere of activity within which people choose to volunteer can be influenced and that services that seek volunteers must compete to influence people's choices about the kind of volunteer activities they undertake.

The implication from the survey results is that Towards Predator Free Taranaki and Taranaki Mouna Project might increase participation in their programmes using promotions highlighting the ways in which volunteering with them can contribute to satisfying the motivational needs of volunteers. For example, by promoting messages demonstrating how volunteering with Towards Predator Free Taranaki and Taranaki Mouna Project creates opportunities for the expression of values pertaining to the environment and helping others (values), to learn new skills and to exercise knowledge, skills and abilities that might otherwise go unused (understanding), to building a career in environmental and natural resource management (career), promote personal development, and meet new, like-minded people (enhancement).

¹¹ Clary et al. (1998) only surveyed people who were volunteers. Consequently, the phrasing of statements in the scales needed revision to be relevant to respondents who were not volunteers as well as those that were. We also reduced the total number of statements in the scales from 30 to 22 to restrict the length of the questionnaire. The revised statement is available on request from the authors.

¹² Cronbach's alpha (Carmines & Zeller 1979) was 0.80 for values, 0.88 for understanding, 0.75 for social, 0.82 for career, 0.84 for protection and 0.83 for enhancement.

¹³ The exceptions were that the social motivation of volunteers in the social services and health services were significantly higher than the social motivation of volunteers in other spheres.

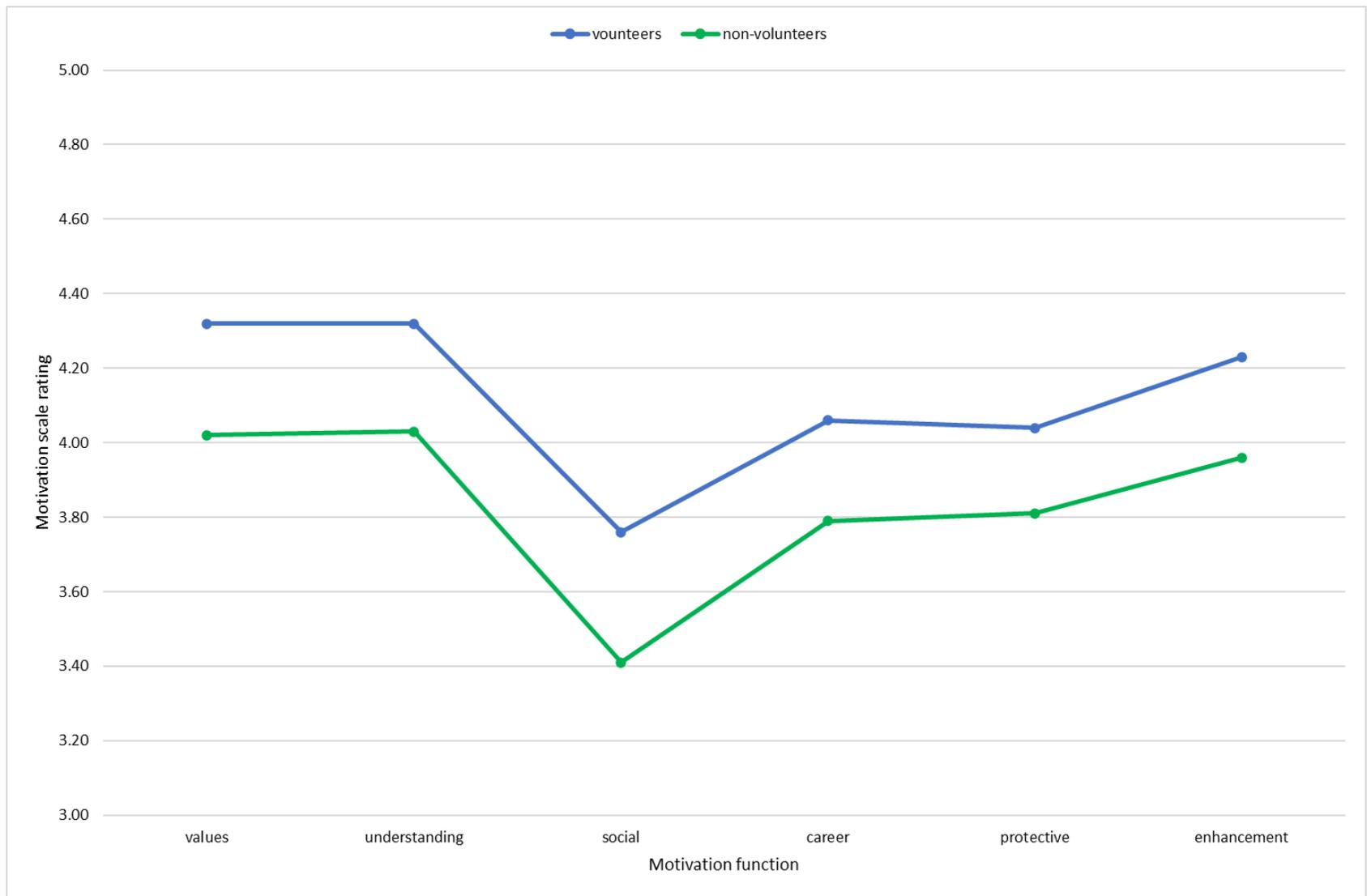


Figure 15. Motivation and volunteering

Table 16. Motivation to volunteer

	Volunteers	Non-volunteers
Values ¹	4.32	4.02
Understanding ²	4.32	4.03
Social ³	3.76	3.41
Career ⁴	4.06	3.79
Protective ⁵	4.04	3.81
Enhancement ⁶	4.23	3.96

Note: (1) Test for differences in in means $F=294.5$, $p<0.01$
(2) Test for differences in in means $F=275.5$, $p<0.01$
(3) Test for differences in in means $F=141.6$, $p<0.01$
(4) Test for differences in in means $F=169.1$, $p<0.01$
(5) Test for differences in in means $F=248.9$, $p<0.01$
(6) Test for differences in in means $F=266.2$, $p<0.01$

Table 17. Motivation to volunteer by I₃ quadrant

	Quadrant one	Quadrant two	Quadrant three	Quadrant four
Values ¹	4.02	4.09	4.31	4.15
Understanding ²	4.16	4.07	4.31	4.34
Social ³	3.22	3.49	3.78	3.57
Career ⁴	3.66	3.78	4.07	4.27
Protective ⁵	3.55	3.73	4.08	4.05
Enhancement ⁶	3.93	3.98	4.23	4.23

Note: (1) Test for differences in in means $F=4.4$, $p<0.01$
(2) Test for differences in in means $F=3.2$, $p<0.02$
(3) Test for differences in in means $F=8.1$, $p<0.01$
(4) Test for differences in in means $F=6.1$, $p<0.01$
(5) Test for differences in in means $F=9.2$, $p<0.01$
(6) Test for differences in in means $F=5.6$, $p<0.01$

Table 18. Motivation to volunteer by survey method

	Internet	Telephone
Values ¹	4.09	4.41
Understanding ²	4.15	4.34
Social	3.71	3.68
Career	3.96	4.04
Protective ³	3.93	4.08
Enhancement ⁴	4.04	4.27

Note: (1) Test for differences in in means $F=16.5$, $p<0.01$
(2) Test for differences in in means $F=5.2$, $p<0.01$
(3) Test for differences in in means $F=5.3$, $p<0.01$
(4) Test for differences in in means $F=8.7$, $p<0.01$

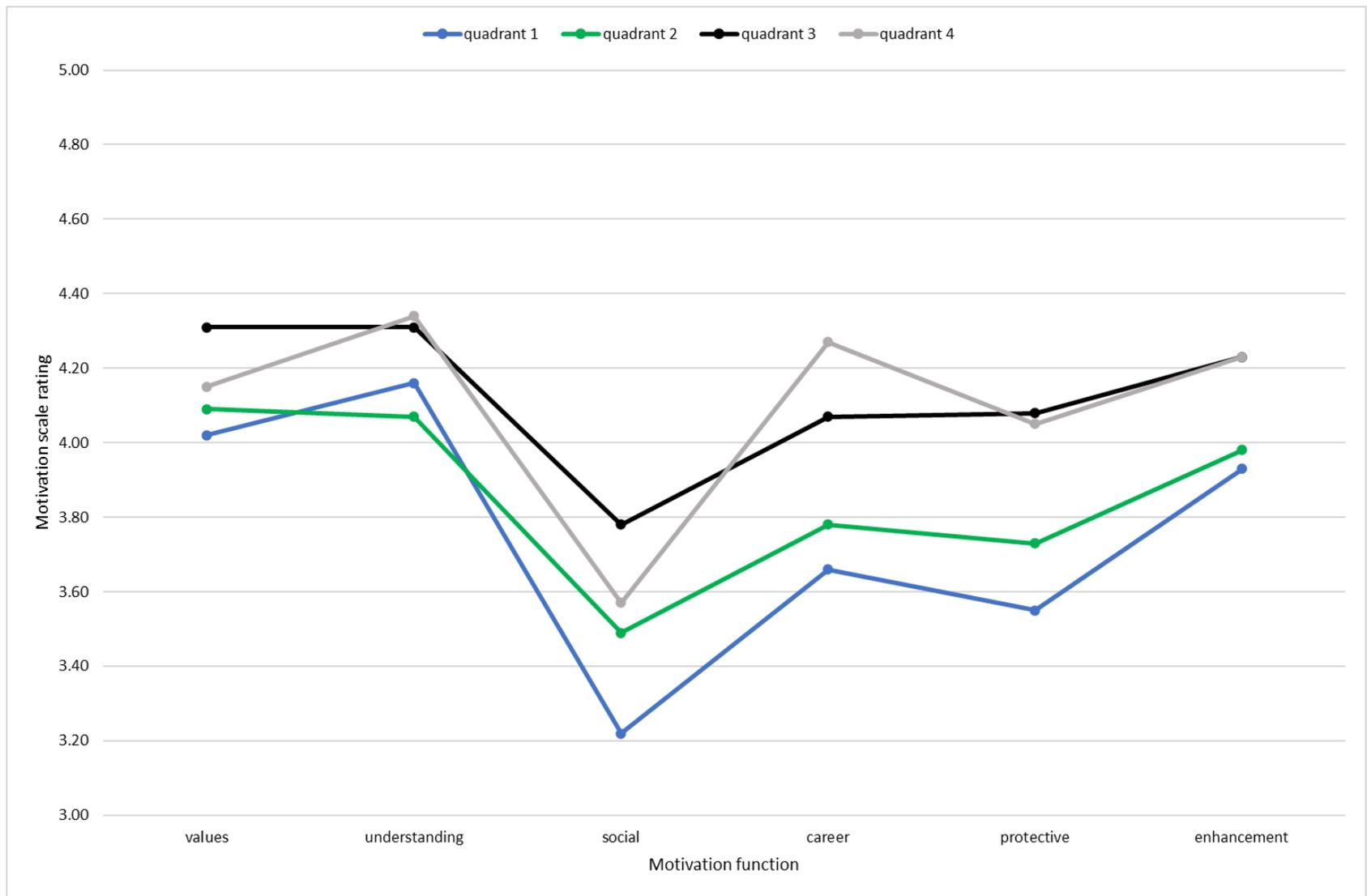


Figure 16. Volunteering motivation by I_3 quadrant.

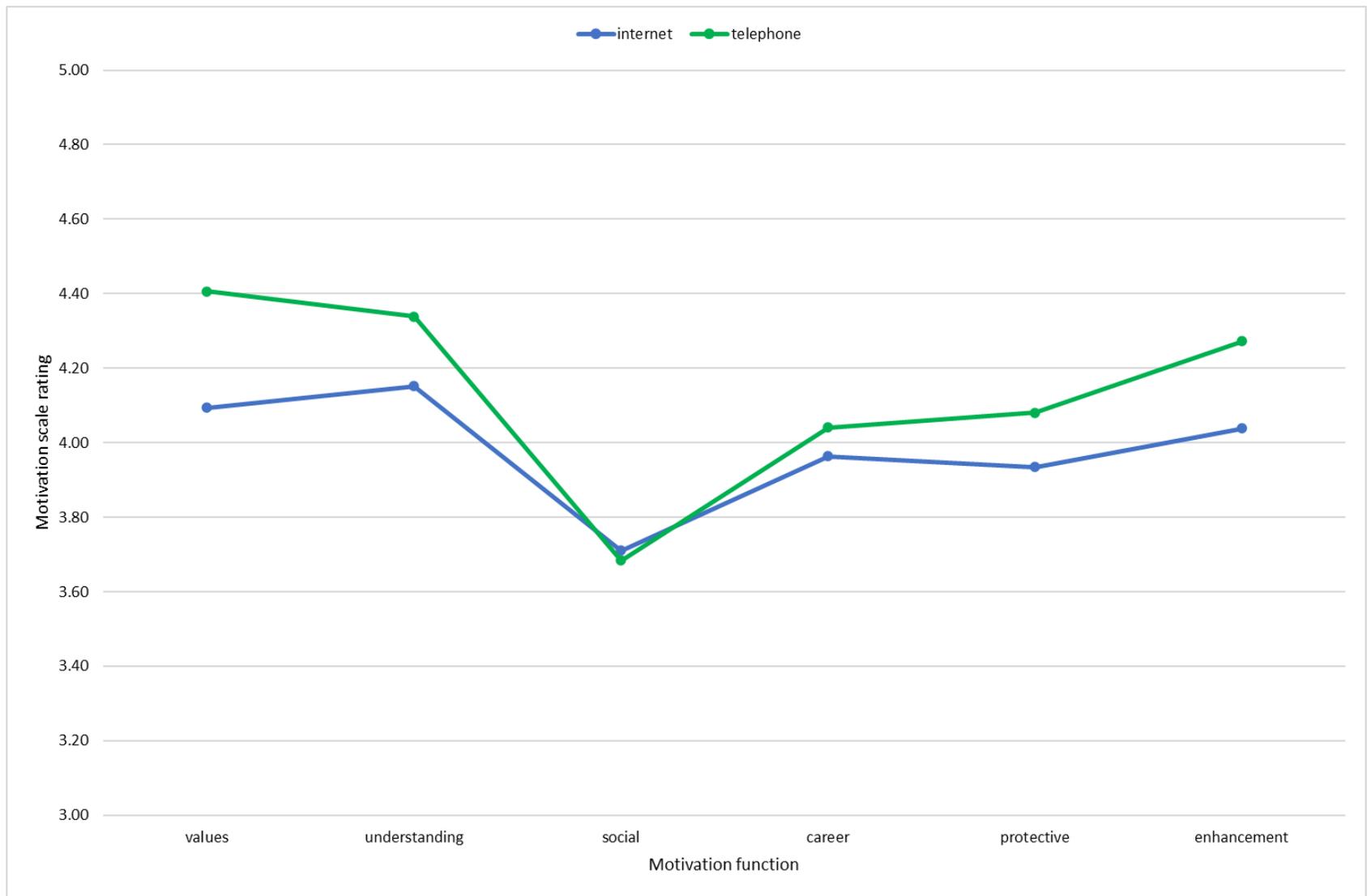


Figure 17. Volunteering motivation by survey method.

We did find significant differences in motivation to volunteer among respondents in the I₃ quadrants (see Table 17 and Fig. 16). The most interesting is the higher motivation, on average, exhibited by respondents in quadrant 3 compared with respondents in quadrants 1 and 2.¹⁴ A possible explanation for this result is that people with a greater propensity to volunteer may be more likely, on average, to agree to participate in surveys. If this is this case, then the propensity to volunteer should be higher for telephone respondents compared with internet respondents because the latter receive compensation for their participation and have greater flexibility with respect to when they participate.

We did find the propensity to volunteer, as measured by average rating of the motivation for volunteering, was significantly higher for telephone respondents compared to internet respondents (see Table 18 and Fig. 17).

5 Discussion

As expected, we found moderate to high involvement with reducing rat numbers and trapping were associated with a greater likelihood to express a definite, usually favourable, attitude towards using traps to catch rats. We also found higher levels of involvement with the idea of reducing rat numbers, and with using traps to catch rats, were associated with a greater likelihood of believing rats had damaging effects. Higher levels of involvement with reducing rat numbers and trapping were also associated with a greater sense of responsibility for reducing rat numbers and a greater likelihood of trapping.

The results reported here have several implications for designing strategies to encourage acceptance of, and participation in, a programme to control rats in New Plymouth. Most importantly, the results indicate there is widespread support among residents of New Plymouth for reducing rat numbers in the city and for using traps. Most respondents exhibited moderate involvement with reducing rat numbers and mild to moderate involvement with using traps.¹⁵ Most respondents also exhibited favourable attitudes towards reducing rats and using traps.

This means most households in New Plymouth would participate in an urban programme for trapping rats, either by installing and managing traps themselves or by permitting the installation of traps on their properties which could be serviced by programme volunteers. Given most respondents exhibited only mild to moderate involvement with trapping, participation in the programme should be made as simple and easy as possible.

The results confirmed there is a strong association between respondents' propensity to trap rats and their involvement with the idea of reducing rat numbers and using traps, and their attitude towards trapping. This means respondents' willingness to trap rats is not just

¹⁴ We did not consider the results for quadrant 4, given the very small proportion of respondents in this quadrant.

¹⁵ Recall, involvement scores were interpreted as low (1-2), mild (2-3), moderate (3-4) and high (4-5) involvement.

matter of their attitude towards trapping. Their willingness to trap rats also depends on how strongly motivated they are to reduce rat numbers.

Knowing the primary reasons for respondents' desire to reduce rat numbers, that is, the sources of their involvement with the idea of reducing rat numbers and with trapping rats, provides a foundation for influencing their willingness to participate in a rat trapping programme.

We found the primary sources of respondents' involvement with the idea of reducing the number of rats were functional, experiential, and consequential. Functional involvement arises from concerns about comfort and safety (e.g. health). Experiential involvement comes from the feelings and emotions that are the result of an experience or activity (e.g. satisfaction or excitement). Consequential involvement arises from the seriousness of the consequences of mistakes (e.g. loss of native species).

This finding suggests residents' desire to reduce rat populations in New Plymouth is primarily motivated by concerns for biodiversity and the environment, the health and safety of themselves and their families, and the potential for rats to damage property, gardens, and equipment. Consequently, to promote trapping and participation in a trapping programme we suggest attempts to encourage participation 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.

A substantial proportion of respondents (20%) were moderately interested in the idea of reducing rats and with trapping but were unsure of their attitude towards trapping. These respondents were less convinced of the benefits of trapping and were uncertain about the safety and welfare aspects of traps. Consequently, to promote trapping and participation in a trapping programme among this group we suggest attempts to encourage their participation should emphasise the safe design of traps, and the speed and efficacy with which they function.

These results indicated that respondents who did not trap were simply less interested in the problem of rats and with trapping, compared to those that did. Although those that did not trap were aware of the advantages of reducing rat numbers, they were just less enthusiastic about the benefits they might experience from trapping than those that did trap. This provides additional support for the conclusion that most householders who do not trap would support (and not oppose) an urban trapping programme; and that many of these householders would participate in such a programme, provide participation was inexpensive and required little effort on their part (for example, traps were supplied and delivered to households for free). This is consistent with experience in predator control in Wellington (PFW 2019b).

We suggest increasing engagement in rat trapping in New Plymouth by concentrating on promoting trapping among households with the characteristics of quadrant 3. Most of the respondents were classified into this quadrant (72% of respondents), most of whom had a

favourable attitude toward using traps. We expect that a high proportion of residents who are like those in quadrant 3 would, if not trapping independently, participate in the programme provided it was easy to join, and traps were inexpensive and easy to maintain.

We found there were a variety of motivations underpinning volunteering by people in New Plymouth, and that these motivations can be satisfied by volunteering in any sphere of activity. The implication is that Towards Predator Free Taranaki and Taranaki Mounga Project might increase participation in their volunteer programmes using promotions highlighting the ways in which volunteering with them can contribute to satisfying the motivational needs of volunteers. This means a promotional programme should consist of several themes reflecting each of these motivational needs. For example, promotional messages demonstrating how volunteering with the programmes creates opportunities:

- for the expression of values pertaining to the environment and helping others (values);
- to learn new skills and to exercise knowledge, skills, and abilities that might otherwise go unused (understanding);
- to building a career in environmental and natural resource management (career);
- promote personal development and meet new, like-minded people (enhancement).

How to mobilise volunteers, keep them interested and involved over the long term, and how that involvement spills over into other conservation activities, is of interest for Taranaki Mounga Project and Towards Predator Free Taranaki. Understanding values and motivations is an important first step towards this goal, but it only addresses one piece of the puzzle. However, it is increasingly being recognised that understanding the values and motivations of people alone will not necessarily lead to behaviour change (Hargreaves 2011; Spurling et al. 2013). People's actions do not always match their values and beliefs, other factors (such as their knowledge of what volunteering opportunities are available or lack of time due to other commitments such as childcare) can constrain, deflect or deter action (Shove 2010; Shove et al. 2012; Spurling et al. 2013).

Further research is required to evaluate the effectiveness with which volunteer programmes run by Towards Predator Free Taranaki and Taranaki Mounga Project satisfy not only the motivational needs of volunteers, but also address the additional enablers and constraints that determine their continuing commitment and participation.

6 Conclusion

The results of the survey indicate widespread support for a programme of trapping to reduce rat populations in New Plymouth. Support for reducing rat populations was primarily motivated by residents' concerns for the environment, 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 rat control programme in New Plymouth, most householders were only mildly or moderately interested in such a programme. This widespread but moderate interest and support among householders indicates that householders would be more likely to participate if the programme was easy to join and traps were inexpensive and simple to maintain, and that personal contact is likely to be the most effective means of promoting and implementing a programme.

With respect to volunteering, we found there were a variety of motivations underpinning volunteering by people in New Plymouth. This implies that Towards Predator Free Taranaki and Taranaki Mouna Project might increase participation in their volunteer programmes using promotions that highlight the ways in which volunteering meets the motivational needs of volunteers. This means a promotional programme should consist of several themes reflecting each of these motivational needs.

7 Acknowledgements

We would like to express our thanks to the survey respondents, who kindly gave their time. We would like to extend a special thanks to Nick Kirk and Grant Norbury for reviewing the document.

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Appendix

Table A1. Reliability of involvement scales

	Mean involvement score	Reliability coefficient
Involvement with reducing numbers of rats	3.69	0.79
Involvement with using traps	3.42	0.78

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	4.16	3.78 ^a
Functional 2	4.00	3.66 ^a
Experiential 1	3.96	3.76 ^a
Experiential 2	3.54	3.48
Identity 1	3.50	3.37 ^a
Identity 2	3.43	3.37
Consequence 1	4.33	3.44 ^a
Consequence 2	3.76	3.49 ^a
Risk 1	3.22	2.94 ^a
Risk 2	3.12	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).