

Characteristics of ex-racing greyhounds in New Zealand and their impact on re-homing

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Abstract

A small proportion of greyhounds surplus to the racing industry are entered into specialist re-homing organisations to be re-purposed as pets. Records of 835 greyhounds, from New Zealand Greyhounds as Pets, were used to investigate whether pre-adoption characteristics (age, sex, racing record, reason entered) and management factors (temperament test result, foster and trainer effects) had a bearing on re-homing success, and comparisons were made with shelter studies. Re-homing greyhounds as pets is very successful with 85.5% ultimately successfully re-homed. Only 2.9% fail as a result of failed adoptions and 11.6% fail the initial temperament test and are therefore not considered for adoption. Greyhounds were more likely than shelter dogs to pass an initial temperament test and be adopted, and less likely to be returned after one month. However, adopted greyhounds were just as likely as shelter dogs to be returned after six months. Logistic regression revealed the youngest age group (< 25 months old) were more likely to pass the initial temperament test than older greyhounds. The re-homing success of greyhounds subsequently made available for adoption was not affected by age, but a sex effect was evident with females more likely to be successfully re-homed than males. Whether or not a dog had raced had no significant effect on the likelihood of successful re-homing. Greyhounds passing the temperament test with a basic pass were less likely to be successfully re-homed than greyhounds scoring a higher pass indicative of lower prey drive. Further investigation of the validity and reliability of the temperament test is warranted.

Keywords: age, animal welfare, dog, greyhound racing, re-homing, temperament test

Introduction

The greyhound racing industry produces substantial numbers of dogs that are not needed or suitable for racing (Colgan *et al* 2013). Acceptance of the sport is changing as concern and awareness about the scale and method of destruction of surplus animals and the risk of injury arising from the sport, grow (Atkinson & Young 2005; as reported in Colgan *et al* 2013; p 28; Madden 2010). Greyhounds have a life expectancy of 10–12 years (Fogle 2000), but an average racing career spans just 1.5 years with the average age of retirement in New Zealand being 3.37 years (Colgan *et al* 2013). This potentially allows an ex-racing greyhound to spend more than eight years in another role, and the re-homing of retired and surplus racing greyhounds as pets has increased in popularity (Lord *et al* 2007). The New Zealand Greyhounds as Pets (GAP) charity was established by Greyhound Racing New Zealand (GRNZ) in 2006 and aims to re-home greyhounds put forward by trainers and owners in the industry.

The success of greyhound adoptions through GAP programmes in Australia and New Zealand, was

evaluated by Elliott *et al* (2010) one month post-adoption. Most adoptions were successful (237/245) with a high proportion of owners (91.1%) scoring 'very satisfied' in terms of the greyhound fulfilling their expectations as a pet. A significant association between 'realistic owner expectations' and decreased likelihood a dog would be returned after adoption, has been reported for dogs re-homed from shelters (Marston *et al* 2005).

The primary reason dogs are returned to adoption agencies is reported to be problem behaviour, accounting for between 58.6 (Diesel *et al* 2008) and 89.7% (Wells & Hepper 2000) of returns to shelters. Although based on a small number of failed adoptions, Elliott *et al* (2010) similarly reported most greyhounds were returned due to behaviour-related problems.

Behavioural problems most likely to put adoptions at risk are related to aggression, separation anxiety, hyperactivity, noisiness and incompatibility with other pets (Marston & Bennett 2003; Diesel *et al* 2008; Elliott *et al* 2010). Previous studies have shown associations between the development of particular behavioural problems and a dog's

Table 1 Characteristics of greyhounds entering the New Zealand Greyhounds as Pets re-homing programme between April 2010 and March 2014 (n = 835).

Characteristic	Category	Dogs (n)	%	Total
Age group	Young (5–24 months old)	108	12.9	835
	Adult (25–66 months old)	646	77.4	835
	Senior (67–146 months old)	81	9.7	835
Sex	Female	403	48.3	835
	Male	432	51.7	835
Entry reason (where reported)	Age, retirement, end of racing	308	41.7	738
	Injury or health factor	104	14.1	738
	Uncompetitive, too slow, not raced	199	27.0	738
	Non-chaser	83	11.2	738
	Welfare	44	6.0	738
Recorded injury and health issues upon entry	Foot and hock, eg broken, dislocated or amputated toe	42	21.4	196
	Gracilis	18	9.2	196
	Shoulder	6	3.1	196
	Tail, eg damaged, broken	6	3.1	196
	Other musculoskeletal, eg neck, hip, leg, tendon, muscle, lame	12	6.1	196
	Health, eg pannus, discoid lupus, underactive thyroid, dermatitis	15	7.7	196
	Welfare	44	22.4	196
	Other/unspecified, eg injury prone, minor injury	53	27.0	196
Racing history	Raced (raced one or more races)	683	81.8	835
	Unraced (recorded as never raced)	152	18.2	835
Number of races	Low starts (1–24 races)	161	23.6	683
	Medium starts (25–76 races)	354	51.8	683
	High starts (77–177 races)	168	24.6	683
Racing performance (podium finishes/number of race starts)	Low performance (0–24.9%)	163	23.9	683
	Medium performance (25.0–44.0%)	351	51.4	683
	High performance (44.1–100%)	169	24.7	683
Temperament test result (TTP includes suitable responses to humans and other dogs; TTP+ also involves cats)	Pass TPP+	406	48.6	835
	Pass TPP	332	39.8	835
	Fail (destroyed)	97	11.6	835
Fostered before adoption	Yes	264	35.8	738
	No	474	64.2	738
	Fostered once	218	82.6	264
	Fostered twice	37	14.0	264
	Fostered three or more times	9	3.4	264

Table 2 Outline of assessment items included in the temperament test for greyhounds entering the New Zealand Greyhounds as Pets re-homing programme.

Assessment item	Elements of assessment
Prior history	Review of reported health and behaviour on entry documentation
Observations by kennel staff during holding period	Ease of handling, behaviour when being fed, reaction to dogs in neighbouring kennels
Reaction to leash and muzzle	Responses to initial approach in kennel by assessor, fitting of collar, leash and muzzle, leash manners
Prey drive	Approach and first reaction to small dog on leash and off leash, reaction to cat
Sociability to people	Response to human approaching: in an affiliative manner, in an unusual manner and in a mildly threatening manner
Physical veterinary examination	Ease of handling, signs of pain, injury or disease
Reaction to loud noises	Response to loud noise made 5 m away
Resource guarding	Response to human contact and attempt to remove: toy, normal food, high value food item

breed (Duffy *et al* 2008), age, sex, background (Wells & Hepper 2000; McGreevey & Masters 2008) early experiences (McMillan *et al* 2011) and training methods (Blackwell *et al* 2008; Thompson *et al* 2010).

Investigating the re-homing of ex-racing greyhounds provides a unique opportunity to research factors associated with known pre-adoption histories of individuals from a single breed, not bred or held primarily as companion animals. We characterise descriptively the attributes and history of dogs entering the programme and investigate whether there is a significant association between selected pre-adoption factors (including age, sex, racing record, reason for entry, trainer and temperament test result) and the likelihood of successfully re-homing greyhounds bred specifically for racing.

Materials and methods

Details of all greyhounds entering the New Zealand GAP programme between 1 April 2010 and 31 March 2014 were used unless there was no reported outcome by 1 September 2014 (ie the dog was still waiting to be assessed or adopted).

Dogs entered the GAP programme either via a trainer or welfare admission. Greyhounds entered under a welfare admission had either been removed from the owner by GRNZ, or surrendered to, or removed by an animal welfare organisation.

Information was extracted from the New Zealand GAP database, including the reported reason for entering the dog into GAP, the dog's age, sex, health/injury status, temperament test result, racing history, foster record, and re-homing outcome. The entry reasons given were grouped into five categories, and reported injuries and health issues were attributed to one of eight categories (Table 1). Dogs were allocated to one of three age groups: 'young' (5–24 months old), 'adult' (25–66 months old), and 'senior' (67–146 months old) (Table 1).

A temperament test administered to all greyhounds entering GAP determined whether the dog was made available for adoption. The GAP New Zealand temperament test is based

on the Australian GAP Greyhound Behavioural Assessment. The test is performed no sooner than the third day after arrival at the re-homing kennels and comprises assessments of the dog's behaviour (including fearfulness, anxiety, arousal levels, affiliative/aggressive behaviours, shyness/boldness, leash manners, sociability and noisiness), in relation to eight assessment items (Table 2). Each element of the assessment item is scored out of three, one is a pass, two requires reassessment and/or time in a foster home, and three is a fail. A dog must score a one for every element of the assessment item to be considered for adoption, with the exception of the 'reaction to cat' element, whereby a score of one results in a 'pass with cats' (TTP+) and a score of two results in a basic pass (TTP). Scores for each assessment element have corresponding behaviours, for example, a score of 'one' for the 'reaction to cat' element includes 'tail relaxed or wagging, dog solicits polite interaction, dog easily distracted by handler'; a score of 'three' includes 'signs of high prey drive — shaking, trembling, fixed stare, lunges towards cat, barking, salivating, cannot be distracted despite multiple attempts'.

Dogs were assessed as acceptable for homing with humans and other dogs (including small dogs) if they passed the temperament test at the basic level (TTP). Greyhounds that passed with a (TTP+) were considered potentially suitable for a home that included cats. A TTP+ was considered to be indicative of lower prey drive (ie the innate disposition of a canid to locate, chase and capture prey) relative to a TTP.

All dogs that passed the temperament test were de-sexed prior to being fostered or adopted. Some greyhounds were fostered by GAP volunteers before being adopted, allowing the organisation to further assess and prepare dogs for adoption. The duration of each foster placement was not consistently reported in the GAP database, hence only the number of foster placements (if any) was recorded for each dog. In some cases, greyhounds were recorded as being 'fostered to adopt'. This designation was used when volunteers were unsure about the suitability of a greyhound, or

Table 3 Outcome of temperament test for greyhounds entering the New Zealand Greyhounds as Pets re-homing programme according to dogs' age group, sex, racing history and year of entry. Dogs that passed were either placed into foster homes or made available for adoption. A veterinarian humanely killed dogs that failed the temperament test.

Characteristic	Category	TTP+*		TTP**		Total pass		Fail		Total
		n	%	n	%	n	%	n	%	
Temperament test result		406	48.6	332	39.8	738	88.4	97	11.6	835
Age group***	Young	88	81.5	18	16.7	106	98.1	2	1.9	108
	Adult	286	44.3	276	42.7	562	87.0	84	13.0	646
	Senior	32	39.5	38	46.9	70	86.4	11	13.6	81
Sex	Female	219	54.3	142	35.2	361	89.6	42	10.4	403
	Male	187	43.3	190	44.0	377	87.3	55	12.7	432
Racing history	Raced	293	42.9	302	44.2	595	87.1	88	12.9	683
	Unraced	113	74.3	30	19.7	143	94.1	9	5.9	152
Year of entry	2011	107	54.3	59	29.9	166	84.3	31	15.7	197
	2012	80	40.6	91	46.2	171	86.8	26	13.2	197
	2013	84	42.6	96	48.7	180	91.4	17	8.6	197
	2014	135	55.3	86	35.2	221	90.6	23	9.4	244

* Pass plus: acceptable responses to humans and other dogs plus acceptable response to cat during assessment;

** Basic pass: acceptable responses to humans and other dogs;

*** Age group: young = 5–24 months old; adult = 25–66 months old; senior = 67–146 months old.

when volunteers provided a foster home for GAP dogs with an intention of possibly adopting that dog. If the GAP database reported 'foster to adopt', and the person fostered and subsequently adopted the dog, the date of adoption was recorded as the 'foster to adopt' date. If the greyhound was returned to the GAP kennel and subsequently re-homed to a different person, the record was counted as a normal foster placement rather than a failed adoption.

Greyhounds that passed the temperament test and were adopted were considered successfully re-homed. If a dog was subsequently returned but successfully re-adopted, the re-homing was still considered 'ultimately successful'. Greyhounds could 'fail' at two stages during the re-homing process: i) prior to being made available for adoption, either as a result of the temperament test outcome, or displaying unacceptable behaviour in a foster home; or ii) if returned after being adopted. Dogs that 'failed' at stage one and those deemed unsuitable for re-adoption after being returned (stage two) were humanely killed (destroyed) by a veterinarian.

In addition to information held by GAP, racing records for individual greyhounds (ie number of race starts and podium finishes) were retrieved from the GRNZ public website (www.thedogs.co.nz). A performance score was calculated by determining the total number of podium finishes (firsts, seconds and thirds) as a percentage of the total number of race starts for each dog. We classified a greyhound as

'unraced' when recorded as unraced in the GAP database and having no racing record on the GRNZ website.

We used binary logistic regression to examine the main effects of year of entry, age group, sex, entry reason, racing history (raced or unraced) on whether dogs passed or failed the temperament test and therefore whether they were considered for adoption. This analysis was completed on all 825 dogs entering the GAP programme. All analyses were performed using a backward step-wise elimination of non-significant independent variables. To manage the number of independent factors or variables in our logistic analysis (and because no significant difference was found between raced and unraced dogs in *Results* below), we did not consider specific racing performance or number of races, possible trainer or foster effects or the specific injury or health issues associated with particular dogs in this analysis. These data are presented descriptively.

We then completed a similar analysis for dogs that initially passed the temperament test ($n = 738$). This allowed us to explore the possible effect of temperament test (either basic pass [TTP] or 'pass with cats' [TTP+]), along with year of entry, sex, entry reason, and racing history (raced or unraced), on ultimate adoption success. We repeated this analysis on a slightly smaller group that excluded nine dogs ($n = 729$ dogs) that passed the temperament test, but were

Table 4 Re-homing outcome for ex-racing greyhounds, that passed an initial temperament test and were made available for adoption through the New Zealand Greyhounds as Pets re-homing programme, according to specified pre-adoption characteristics.

Characteristic	Category	Successfully re-homed at first adoption		Returned from 1st adoption		Ultimately successfully re-homed (including 2nd or subsequent adoptions)		Total* n
		n	% (of total)	n	% (of total)	n	% (of total)	
Adopted dogs		605	83.0	124	17.0	714	97.9	729
Age group**	Young	91	86.7	14	13.3	105	100	105
	Adult	455	81.8	101	18.2	542	97.5	556
	Senior	59	86.8	9	13.2	67	98.5	68
Sex	Female	305	85.4	52	14.6	355	99.4	357
	Male	300	80.6	72	19.4	359	96.5	372
Racing history	Raced	486	82.8	101	17.2	574	97.8	587
	Unraced	119	83.8	23	16.2	140	98.6	142
Number of races***	Low starts	117	81.3	27	18.8	141	97.9	144
	Medium starts	252	84.0	48	16.0	293	97.7	300
	High starts	117	81.8	26	18.2	140	97.9	143
Racing performance****	Low	114	80.9	27	19.1	140	99.3	141
	Medium	256	84.8	46	15.2	295	97.7	302
	High	116	80.6	28	19.4	139	96.5	144
Temperament test	TTP+†	349	86.4	55	13.6	399	98.8	404
	TTP‡	256	78.8	69	21.2	315	96.9	325
Fostered before adoption	Yes	226	85.6	38	14.4	250	94.7	264
	No	388	81.9	86	18.1	464	97.9	474
Year of entry	2011	140	84.8	25	15.2	163	98.8	165
	2012	136	79.5	35	20.5	170	99.4	171
	2013	146	83.0	30	17.0	169	96.0	176
	2014	183	84.3	34	15.7	203	93.5	217

* Excludes nine fostered dogs destroyed before being made available for adoption.
 ** Age group: Young = 5–24 months old; Adult = 25–66 months old; Senior = 67–146 months old.
 *** Number of races: Low = 1–24 races; Medium = 25–76 races; High = 77–177 races.
 **** Performance (number of podium finishes as a % of race starts): Low = 0–24.9%; Medium = 25–44%; High = 44.1–100%.
 † Pass plus: Acceptable responses to humans and other dogs plus acceptable response to cat during assessment.
 ‡ Basic pass: Acceptable responses to humans and other dogs.

initially fostered but then not put up for adoption because of unresolved behavioural issues. We followed this by exploring the same main effects, but in regard of whether dogs were successfully adopted at the first attempt at re-homing or not. As previously we ran these analyses for all dogs that initially passed the temperament test (n = 738) or the slightly smaller group (n = 729) (see above).

We also conducted a binomial logistic regression to explore the possible association of trainer, age group, sex, racing history and year of entry, on temperament test outcome (fail or pass). A total of 144 different trainers entered dogs into GAP, so to manage the numbers of trainer groups to facilitate analysis, we restricted our analysis to those dogs from trainers that entered 25 dogs or more into the GAP programme.

Results

Descriptive statistics

The annual number of greyhounds entering GAP New Zealand increased by 24% between 2011 ($n = 197$) and 2014 ($n = 244$). A total of 835 greyhounds entered the GAP programme between April 2010 and March 2014, of which 714 (85.5%) were successfully re-homed. Of these, 605 (72.5%) were successful the first time they were adopted and a further 109 (13.0%) were successfully re-adopted after being returned. Of the 14.5% (121/835) of dogs that ultimately failed to be re-homed, 11.6% (97/835) failed the initial temperament test, and 2.9% (24/835) were destroyed following return from adoption or foster.

Of the 738 (88.4%) dogs that passed the initial temperament test 264 (35.8%) were initially fostered, after which nine dogs failed, leaving 729 dogs available for adoption. A total of 349 (47.9%) of these dogs were homed between one and two months of entering GAP and 659 (90.4%) within four months. Median length of stay in re-homing kennels (between entry and first adoption) was 27 days (range 0 to 378 days). A total of 124 (17%) dogs were returned after their first adoption, mostly (70 dogs; 56.5%) within four months of initial adoption. The median number of days between adoption and return was 89 days (range 0 to 1,137 days).

Median age at entry to the GAP programme was 44 months (range 5–146 months, 25th–75th percentile: 31–54 months, respectively). A total of 77.4% of dogs were classified as adults of 25 to 66 months of age (Table 1). There was a suggestion that young dogs (< 25 months old) were more likely to pass the temperament test than adults and/or seniors (Table 3) (see analysis below).

The number of male and female greyhounds entering GAP was similar (Table 1). However, slightly more female dogs (88.1%) were successfully adopted compared with males (83.1%) (Table 4). Entry reasons were recorded for 738 of 835 (88.4%) admissions. The most prevalent reason for entering a dog into the GAP programme was the category 'age, retirement, end of racing career' (41.7 %; Table 1). Although dogs were uniquely allocated to an entry reason category, classifications were not mutually exclusive. A total of 14.1% of admissions were reported as being due to injury or health concerns. However, this is an underestimate as dogs from other 'entry reason' categories (eg welfare) also had injuries and health issues. Records of the actual nature of injuries indicated 196 of 835 (23.5%) greyhounds entering the GAP programme had health and/or injury issues (Table 1). The most prevalent identified injuries were to the foot and hock followed by gracilis injuries (Table 1).

A minority (18.2%) of greyhounds entering GAP were unraced (Table 1). There was a suggestion that unraced dogs were more likely to pass the temperament test than raced dogs (Table 3) but this effect was not significant (see regression analysis below). A total of 81.8% ($n = 683$) of greyhounds entering GAP had raced one or more times (median: 47 starts per dog, range 1–177 race starts, 25th and 75th percentiles, 25 and 76 starts, respectively; Table 1). The median performance

of raced greyhounds, expressed as the percentage of podium finishes to total number of race starts was 35.6% (range 0–100%, 25th–75th percentile: 25–44%; Table 1).

A total of 88.4% (Table 3) of greyhounds passed the initial temperament test with more dogs passing with a TTP+ result (55%) than a TTP (45%). A total of 98.8% of TTP+ dogs were ultimately successfully re-homed compared with 96.9% of dogs with TTP, and fewer TTP+ dogs were returned after their first adoption than dogs with a TTP result (13.6 and 21.2%, respectively; Table 4).

Of the dogs that passed their initial temperament test 35.8% ($n = 264$) were fostered at least once before being adopted the first time (Table 1). A total of 46.8% ($n = 58$) of returned dogs were fostered before being re-homed a second time. The percentage of fostered dogs that were not made available for a first or second adoption was 3.4% for both situations ($n = 9$ first adoptions and $n = 2$ for second). Of the dogs that were not fostered, 18.1% (86/474) were returned after their first adoption and, of these, 2.1% were not re-adopted (ie were destroyed). Of the dogs that were fostered, 14.4% (38/264) were returned after their first adoption and 2.0% of these were destroyed. A total of 56.1% (148/264) of fostered dogs had passed the temperament test with a TTP result compared with 38.8% (184/474) of dogs that were not fostered. Overall, 94.7% of greyhounds fostered before their first adoption were successfully re-homed, compared with 97.9% of dogs that were not fostered first (Table 4).

Five of 144 trainers (3.5%) entered 25 dogs or more into the GAP programme (range: 1–61 dogs per trainer, median: three dogs per trainer). Two of these trainers entered substantially more younger dogs than the other three (39.3 and 60.0% compared with 5.1, 2.4 and 0%, respectively). The sex, racing history and entry reason profiles of dogs entered, also varied among trainers. For example, the percentage of females entered per trainer was between 46.2 and 84.0%, and the percentage of dogs entered for injury/health reasons per trainer was between 6.7 and 36%. The two trainers that entered more younger dogs, both had 3.3% of their dogs fail the temperament test. The other three trainers had, respectively, 12.8, 19.5 and 24% of their dogs fail the temperament test, but these differences were not significant (see below).

Factors affecting temperament test pass or fail

Our binary logistic regression performed to ascertain the main effects of year of entry, age group, sex, entry reason and racing history (raced or unraced), on whether dogs passed the temperament test and were considered for adoption, was statistically significant ($\chi^2 = 23.468$, $df = 5$; $P < 0.001$). Of the five independent variables, only age proved statistically significant (Wald $\chi^2 = 8.559$, $df = 2$; $P = 0.014$). Indicated by an odds ratio of less than 1, adult (odds ratio: 0.122, 95% CI: 0.030–0.505, Wald $\chi^2 = 8.427$, $df = 1$; $P = 0.004$) and senior dogs (odds ratio: 0.114, 95% CI: 0.024–0.531, Wald $\chi^2 = 7.646$, $df = 1$; $P = 0.006$) were both significantly less likely to pass the temperament test compared to young dogs.

The binomial logistic regression performed to ascertain the main effects of trainer (with 25 dogs or more entered into GAP programme), age group, sex, racing history (raced or unraced) and year of entry on temperament test outcome, showed no significant main effects.

Factors affecting ultimate adoption success

The analysis to ascertain the main effects of temperament test, year of entry, age group, sex, entry reason and racing history (raced or unraced), on ultimate adoption success was also statistically significant ($\chi^2 = 27.523$, $df = 5$; $P < 0.001$). Temperament test pass type, sex of dog and year of entry proved to be significant main effects. Dogs passing at the basic level temperament test (TTP) were less likely to successfully re-home than those passing the higher test (TTP+) (odds ratio: 0.328, 95% CI: 0.131–0.820, Wald $\chi^2 = 5.690$, $df = 1$; $P = 0.017$), females were more likely to be successfully adopted than males (odds ratio: 2.895, 95% CI: 1.117–7.503, Wald $\chi^2 = 4.785$, $df = 1$; $P = 0.029$), dogs entering the programme in 2014 were less likely to be successfully re-homed than dogs entering in 2011 (odds ratio: 0.328, 95% CI: 0.031–0.820, Wald $\chi^2 = 5.690$, $df = 1$; $P = 0.017$). When we repeated the analysis on our slightly smaller group of dogs that were considered for adoption ($n = 729$ after nine dogs destroyed following their initial foster placement were removed) the model remained significant ($\chi^2 = 20.069$, $df = 4$; $P < 0.001$), with sex ($P = 0.01$) and year of entry ($P = 0.028$) effects remaining, however the effect of temperament test pass disappeared.

Factors affecting success at first adoption

Models based on the sample of 738 dogs that passed the initial temperament test ($\chi^2 = 9.644$, $df = 1$; $P = 0.002$) or 729 dogs (after nine dogs destroyed following their initial foster placement were removed) ($\chi^2 = 7.359$, $df = 1$; $P = 0.007$) were significant. Success at first adoption was related only to the outcome of the temperament test, and this was consistent for both the model utilising 738 dogs (Wald $\chi^2 = 9.529$, $df = 1$; $P = 0.002$) and that based on the slightly smaller sample ($n = 29$ dogs; $P = 0.007$).

Discussion

Most greyhounds (87.3%) entering the GAP programme pass an initial temperament test and are re-homed. Shelter studies, which also include an initial temperament test, generally report a much lower initial re-homing rate (eg 21.3%; Marston *et al* 2004; 27%; Mornement *et al* 2010). This is even when these figures are corrected for animals reclaimed by owners, euthanased for health or welfare reasons or destroyed as a ‘prohibited breed type’ (eg 49.4% calculated from Marston *et al* [2004]). This relatively high success rate of the GAP programme is carried over into re-adoption success of greyhounds returned to the programme after an initial failed adoption. Only 12.1% of returned greyhounds were destroyed, compared to between 40 (Marston *et al* 2004) and 50% (Patronek *et al* 1995) of returned shelter dogs.

Although greyhounds have a similar average length of stay in re-homing kennels prior to adoption (median 27 days)

compared to shelter dogs (eg 28 days; Diesel *et al* 2007; 23 days; Žák *et al* 2015), most companion dogs will not have previously spent extensive periods in a high-density kennel environment (Wells 2004; Taylor & Mills 2007). Greyhounds on the other hand, have generally spent all their pre-adoption lives in kennels. High-density kennel housing of dogs has the potential to cause considerable stress, and contribute to the development of behavioural problems (Marston *et al* 2004; Wells 2004; Taylor & Mills 2007; Diesel *et al* 2008) before and after adoption. Dogs that are pre-conditioned to kennelling show decreased physiological signs of stress compared with dogs that have not had prior habituation to a kennelled environment (Rooney *et al* 2007). The fact that most greyhounds have been pre-conditioned to kennelling, might contribute to their relatively high re-homing success compared with dogs from shelters.

Pet dogs relinquished to shelters are also likely to have existing behavioural problems (Wells & Hepper 2000; Marston *et al* 2004; Diesel *et al* 2008), whereas greyhounds entered into the GAP re-homing programme are potentially pre-selected for desirable attributes. Only a small proportion (15.5% calculated from Colgan *et al* 2013) of surplus racing industry greyhounds are entered into the GAP programme. Although the precise criteria used by trainers to select dogs to enter the programme is unknown and appears to vary among trainers, greyhound trainers pay a fee to enter dogs into the re-homing programme and may elect not to submit dogs displaying undesirable behaviours that would result in dogs failing the initial temperament test.

Consistent with this view, considerably fewer greyhounds failed the initial temperament test (11.6% [97/835]) compared with pet dogs entering re-homing shelters (29.3% [calculated from Marston *et al* 2004]). However, differences may also be explained in part by the different criteria used to evaluate temperament between the different studies.

Generally, a key purpose of temperament tests is to identify dogs that display unacceptable behaviour, such as aggression towards humans or other animals (Elliott *et al* 2010; Bennett *et al* 2012) and thus make them unsuitable for re-homing. Breeding selection for greyhounds obviously includes racing aptitude, but it is likely that aggression towards humans or other dogs is selected against. Research into breed differences in aggression found that greyhounds were within the group least likely to show aggression towards humans and other dogs (Duffy *et al* 2008).

There were a variety of reasons given for entering dogs into the GAP programme and a considerable age range. However, the most prevalent entry reason category was related to ‘retirement from racing’, explaining at least in part the age profile of dogs entered. The median age of dogs entered (3.7 years) was consistent with the reported average age of retirement (Colgan *et al* 2013).

Many temperament tests, implemented by a range of organisations, have been developed without a systematic scientific approach and have not been tested for reliability and specific aspects of validity (Taylor & Mills 2006; Bennett *et al* 2012). Due to our study being an investigation of

historical data, we were not able to examine the validity, repeatability or inter-rater reliability of the GAP temperament test. However, there was no significant effect of year of entry detected for temperament test outcome (pass/fail), which might suggest the GAP temperament test has been relatively consistent over time.

In this study, only dogs that passed the temperament test were actually placed for potential adoption. Accordingly, the assessment of the impact of temperament testing on adoption rates could only be assessed for dogs that passed the temperament test, either as a TTP or TTP+. The emphasis on prey-drive in the GAP two-tier temperament test reflects the unique concerns associated with repurposing ex-racing greyhounds that have been trained to strengthen the 'chase' component of the predatory hunting sequence. Dogs that passed the temperament test with TTP+, purportedly indicative of lower prey drive relative to TTP, were more likely to be successfully re-homed (ultimately). Further, greyhounds that achieved a TTP were more likely to be returned after being adopted (21.2% returned) than those that achieved TTP+ (13.6% returned). Although we cannot confirm the validity of the temperament test's ability to determine the level of prey drive, our results support the suggestion that higher prey drive might be associated with increased risk of re-homing failure (Elliott *et al* 2010). However, given the lack of evidence to confirm temperament tests accurately predict stable behaviour over time (Bennett *et al* 2012), and the fact that 80% of greyhounds that fail to be successfully re-homed fail at the initial temperament test stage, it would be interesting to investigate the validity and reliability of the GAP temperament test.

For those dogs that passed the temperament test, there was a year of entry effect on ultimate re-homing success. Dogs returned in 2011, after their first adoption, were more likely to be successfully re-adopted (only 1.2% failed) than dogs returned in 2014 (6.5% failed). The reason(s) the GAP programme was less likely to successfully re-adopt dogs in 2014, than it did in 2011 is not known. It could be associated with limited funding and an increased target for the number of greyhounds re-homed each year (GAP 2014), effectively reducing resources (eg kennel space and time) able to be allocated to re-adoption of returned greyhounds.

The proportion of greyhounds returned at one month post-adoption (2.7%) was similar to that reported by Elliott *et al* (2010) (3.3%), but somewhat less than shelter studies (6.5% in Northern Ireland; Wells & Hepper 2000; 12.9% in Melbourne shelters; Marston *et al* 2005). Diesel *et al* (2008) reported a six-month post-adoption return rate of 14.7% (662/4500) in the UK, which is similar to the 11.7% (85/729) of greyhounds returned within six months. This appears to suggest greyhounds are less likely to be returned within one month than dogs re-homed from a shelter, but that greyhounds have a similar six-month post-adoption return rate to shelter dogs. Whilst examination of post-adoption factors associated with failed adoptions is outside the scope of this paper, it would be interesting to investigate the reasons associated with greyhound returns, and how this might change over time.

Dog characteristics associated with re-homing success

Our data show young greyhounds are more likely to pass the temperament test than adult or senior dogs. When we considered the dogs that were potentially available for adoption (ie had passed the temperament test) there was no detectable age effect on re-homing success, either at first adoption, or ultimately (at second or subsequent adoptions).

It would appear that although young greyhounds are less likely to fail the temperament test, they are no less likely to be returned following adoption than older dogs. Since the GAP temperament test has not been scientifically tested for validity and reliability, we cannot rule out the possibility the detected age effect is a result of bias within the temperament test design or application. Although other studies have shown an association between age, and the type and prevalence of problem behaviours in re-homed dogs (Wells & Hepper 2000), there appears to be no association between age and increased risk of failed adoption (Wells & Hepper 2000; Diesel *et al* 2008; Elliott *et al* 2010).

The literature suggests that younger dogs tend to show a greater number of problematic behaviours than older dogs (Blackwell *et al* 2008), but the types of problems are significantly different (Wells & Hepper 2000; Blackwell *et al* 2008). Younger dogs are more likely to have control problems and display separation-related and attention-seeking behaviours, but are less likely than older dogs to show undesirable behaviours associated with aggression, reactions to other dogs and unfamiliar people (Wells & Hepper 2000; Blackwell *et al* 2008). Demonstrating aggressive reactions to other dogs or unfamiliar people would cause a dog to fail the temperament test but attention-seeking- or separation-related behaviours may not. However, all of these behavioural problems are associated with increased risk of failed adoptions (Wells & Hepper 2000; Diesel *et al* 2008; Elliott *et al* 2010), supporting our loss of an age effect post-adoption.

The other detectable influence on ultimate re-homing success was sex of dog, with male dogs being less likely than females to be successfully re-homed. Although more females passed the temperament test with a TTP+ than males, females were no more likely to be successfully adopted at first adoption (ie no less likely to be returned) than males. Although Wells and Hepper (2000) reported male dogs were more likely to demonstrate behavioural problems associated with increased risk of failed adoption, most of the dogs in their study were entire and it was suggested the reported behavioural problems (aggression towards other dogs, sexual behaviours and straying) were likely to be under hormonal control. In contrast, all greyhounds are de-sexed prior to re-homing. Elliott *et al* (2010) identified differences in the type of behavioural problems likely to be displayed by recently adopted male greyhounds compared with females (ie males more likely to show aggression towards small dogs, cats and when approached on bed of females more likely to show destructiveness in the yard), but, consistent with our study, did not find sex a risk factor associated with post-adoption return. Other studies

have found no association between sex and risk of return, and either the type or prevalence of behavioural problems in re-homed dogs (Blackwell *et al* 2008; Diesel *et al* 2008).

The reasons greyhounds are fostered prior to adoption vary, but generally it is to evaluate the dog's ability to transition to pet life whilst providing them with support to overcome challenges often associated with socialisation deficits and long-term kennelling (Elliott *et al* 2010). These challenges include fear of unfamiliar environments, sounds, people and animals. There is no standardised foster period or process, but just over one-third of greyhounds entering GAP are fostered prior to adoption. Although there is no documented criteria for selecting dogs to foster, there is a suggestion dogs displaying borderline behaviours upon entering GAP, or during their temperament assessment, are more likely to be fostered. For example, the temperament test (see *Materials and methods*) suggests dogs not reaching the adoption standard should be fostered where their behaviour is borderline and, further, 56.1% of fostered dogs had passed the temperament test with a basic TTP compared with 38.8% of dogs that were directly adopted (a TTP result was shown to be associated with decreased likelihood of successful adoption overall, compared to dogs achieving TTP+). Despite the potential bias in selecting dogs for foster that might have more difficulty in being successfully re-homed, 14.4% of fostered dogs were returned from adoption compared with 18.1% of dogs that were not fostered first, suggesting that fostering might contribute to re-homing success. Investigation of the criteria, methods and effects of fostering would be necessary to identify elements associated with adoption success and aid standardisation of the process.

Although not all trainers raise puppies, and therefore may not impact on sensitive periods of development, trainers do not all raise, manage or train their dogs in the same way, and some authors report on an extremely wide range of practices (Atkinson & Young 2005; Huggins 2007), which have the potential to impact on the adoptability of dogs. Our evaluation of trainer effects is largely based on descriptive analysis due to the small subset of data restricted to the five trainers entering 25 dogs or more into the GAP programme. Due to this small subset, we were unable to explore trainer effects on re-homing success of adopted dogs. From our descriptive analyses, there were observed differences among trainers in entry reason, sex and age profile of dogs entered, suggesting differences in the criteria used to select dogs to enter the adoption programme. For example, two trainers entered considerably more younger dogs than the others. Although our previous analysis showed younger dogs were more likely to pass the temperament test than older dogs, our data show no significant effect of trainer on temperament test outcome.

Conclusion

Greyhound adoption is very successful for those dogs entering the GAP programme. Younger dogs were more likely to pass the temperament test, possibly due to having more malleable temperaments, and having their predatory behaviour reinforced for less time than older adults involved in training and racing for more than two years. However, this observed age effect might also reflect an unjustified bias in either the design or application of the temperament test, as the success of adopted dogs was not affected by age. Sex (female) and temperament test outcome (TTP+) were factors associated with increased adoption success and warrant further investigation in terms of the type and prevalence of behavioural problems that place greyhound adoptions at risk.

Further understanding of factors likely to impact greyhound adoption are likely to be obscured because most dogs do not enter the programme and, for those that do, there is a lack of clarity around the criteria used by trainers in their selection. While we appreciate the practical necessity of having the temperament test to assess the suitability of dogs for adoption, this additional removal of dogs from the adoption process provides another unavoidable bias in our sample population. Testing the range of effects on successful adoption is restricted to those dogs passing an as yet scientifically unvalidated temperament test. Although the GAP temperament test showed reliability over time, the programme would benefit from scientific evaluation of the validity and reliability of the temperament test.

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