Obedience training effects on search dog performance

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ABSTRACT

Competent search dogs should be accurate, reliable, and work independently, yet be responsive to handler commands. The aim of this study was to identify training factors that contribute to producing competent search dogs. Demographics, obedience training methods, the age training was initiated, previous canine training experience of the trainer, and time spent training were determined using 177 responses to an online survey accessible through the National Search Dog Alliance (NSDA). Achievement of a national or state certification was used as a measure of performance success. Positive reinforcement methods were used by 72% of the respondents with a nationally certified dog. Women respondents utilized positive reinforcement training methods ($P = 0.004$) more than men. Responses indicated a preference for beginning obedience training early and using positive reinforcement; however, maturation of the dog increased the use of compulsive training aids ($P < 0.001$). Respondents indicated an overall preference to initiate obedience training (86%) and agility training (55%) before 6 months of age. Results indicate a strong association between the time spent training and the performance success, with 4 h or more each week having a higher association with national certifications ($P < 0.001$). Respondents also had more years of general canine training experience than search dog training experience ($P = 0.05$). While positive training methods were preferred and were associated with performance success, there was a significant association between the maturation of the dog and the increased use of compulsive methods.

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1. Introduction

A canine search team consists of a handler and their dog. Certifications are achieved by the team passing standardized blind field tests in specific disciplines, such as trailing, area search, avalanche, and human remains detection. Competent search dogs should be accurate and reliable in locating their target odor (Hammond, 2006; National Association for Search and Rescue [NASAR], 1999; Rebmann et al., 2000; Shaffer, 2008). They should be con-fident, energetic and adaptable in most environments; exhibit high hunt drive and be capable of working off lead but always under the handler's control through voice commands or hand signals (Hammond, 2006). Control of the dog in various environments, accomplished through obedience training is an essential quality (NASAR, 1999).

There are three types of search dogs: dogs that search only for live subjects, dogs that search only for human remains and dogs that are cross trained to search for both. All types of search dogs must have a distinct behavior to communicate to their handlers that they have located their target odor. This is known as a "final response behavior" (Scientific Working Group on Dog and Orthogonal Detector Guidelines [SWGDOG], 2005). Target odors through classical conditioning become discriminative stimuli which predict appetitive consequences. This is accomplished by

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paring a target odor with a high value reward such as toys, food, or play. Target odors are then paired with a final response behavior. Final response behaviors such as a sit or down are usually trained separately and then paired with the target odor (Rebmann et al., 2000; SWGDOG, 2005). Many methods of scent detection training have been found to be successful (American Rescue Dog Association (ARDA), 2002; Bulanda, 1994; Hammond, 2006; Hammond and Morris, 2000; Rebmann et al., 2000). Given that these methods have been proven to be successful, it is unclear as to why there are still vast inconsistencies among the performance of search dogs. One answer may lie in the methodology chosen for foundation obedience and agility training (Hiby et al., 2004).

Many training philosophies advise that a dog should not begin obedience training until after the age of 5 or 6 months (American Kennel Club (AKC), 2009) or until after the search behavior has been established. However, size increases as the dog matures making it more challenging to physically control the dog. Hiby et al. (2004) concluded that dogs trained with reward based methods responded on a more consistent basis to obedience commands. Studies on pet dogs have found no correlation between obedience training and behavioral problems (Jagoe and Serpell, 1996; Voith et al., 1992), but did not look at the method used to train the obedience. Compulsive training methods may achieve suitable results for pet dogs; however, working dogs trained with compulsion may have lower performance and are at risk for stress-induced welfare concerns (Haverbeke et al., 2008). Several studies support that compulsive based training is less successful in achieving behavioral goals and increases the propensity for welfare related issues to occur (Ben-Michael et al., 2000; Clark and Boyer, 1993; Schilder and Van Der Borg, 2004; Tilling, 2006). Because punishment induced training can have a variety of adverse effects, it is not recommended by the American Veterinary Society of Animal Behavior (AVSAB, 2007). Some detrimental effects cited were suppression of other behaviors and aversive associations, such as the handlers becoming punishment predictors to be avoided (Schilder and Van Der Borg, 2004; Sidman, 1989).

Studies are available on various aspects of dog ownership, including owner–companion dog interactions, pet dog response to obedience commands and owner and dog personality assessments (Bennett and Rohlf, 2007; Kubinyi et al., 2009; Schwab and Huber, 2006). Those studies, however, examined interactions between owners and pet dogs and emphasized dog welfare issues such as behaviors which are more likely to result in the dog being surrendered to an animal shelter. Those studies also examined the relationships between pet dogs and owners, often determining how compliant obedience resulted in improved relationships. As such, most contemporary research cannot be extrapolated to search and rescue (SAR) dog competency and performance success. Compliant obedience may also not always be in the best interest of a search dog if responding to an obedience command will result in the dog leaving a target odor resulting in the miss of a subject in the field.

The few previous studies that have been conducted on search dogs (Komar, 1999; Lasseter et al., 2003; Lit and Crawford, 2006) have not reported on training methods in relationship with performance results, and did not report the level of certification credentials the canine teams possessed.

The objective of this study was to analyze self-reported data from respondents to determine the effects of these factors on search performance. We hypothesize that as the dog matures and increases in size there will be an increased use of compulsive equipment and methods to achieve obedience compliance. We also hypothesized that the methods used to establish obedience and agility control are associated with the dog's future success as a search dog. There has been little peer reviewed research on search dogs in general, and none on the effect of obedience or agility training methods on search dog performance.

2. Materials and methods

2.1. Subjects

Self-reported respondents from across the United States of America were solicited through the NSDA's webpage, online newsletter, and email notifications. Any names attached to the survey were deleted. Respondents did not have to be a member of NSDA to participate in the survey. Participating handlers were directed to a 66 question online survey at surveymonkey.com. A total of 212 responses were recorded from September 1, 2007 until April 30, 2008, however, 35 surveys were discarded due to incomplete information or inappropriate responses leaving a total of 177. Handlers of varying experience had the opportunity to participate, as well as those without certified dogs.

2.2. Survey instrument

Questions were developed through literature research and discussions with over 20 expert SAR trainers from across the USA. A pilot survey was first conducted with 10 local handlers. The final instrument was then revised based on input from the pilot survey. Demographics, credentialing and respondent experience were determined using the questions in Table 1. Certifications with national or state certifying agencies were verified and were used as the measure of performance success.

The questions regarding canine age and equipment use are in Table 2. Age categories were based on both common breeder practices and developmental stages (Scott, 1958) quoted in common lay dog literature (O'Kelley, 1978). The most common weaning age of puppies is 6 weeks, although some breeders will wean and separate puppies as early as 4 weeks of age. Hobby breeders often mention a popular publication (O'Kelley, 1978) that advised breeders not to separate puppies from each other until after the end of the 7th week, making them available to new homes in their 8th week. Still other commonly used working breeds are held until between their 9th and their 10th week due to eye testing, and other breeders will not allow their puppies to go new homes until they are between 10 and 12 weeks of age. Three to six months is considered a juvenile stage and historical practices for obedience training recommended puppies not begin training until reaching 6 months

Table 1

Survey questions and response (%) pertaining to demographics, credentialing, and experience.

Question	Response	Answer choices
My age:	2%	18–25 years
	19%	26–35 years
	27%	36–45 years
	27%	46–55 years
	21%	More than 56 years
	4%	Not answered
My sex:	32%	Male
	68%	Female
My current deployable canine's breed or mix is?	Table 5	Respondents wrote in answers (Table 5)
My current canine partner's sex	18%	Intact male
	32%	Neutered male
	6%	Intact female
	44%	Spayed female
Please check all disciplines in which you have trained a dog that has passed national certifications and achieved mission ready status (please check all that apply)	12%	Trailing
	34%	Wilderness Area
	0%	Avalanche
	28%	Human Remains
	10%	Water Recovery
	9%	Disaster (Live)
	0.5%	Disaster (Remains)
	6.5%	Not answered
What National agencies have you certified your search dog under? (please check all that apply)	36%	NASAR
	13%	NNDDA
	9%	FEMA
	7%	NASDN
	9%	IPWDA
	9%	NAPWDA
	5%	TASK
	0%	USPCA
	4%	ARDA
	8%	Other – please list[a]
Please indicate how long you have worked with dogs in any training capacity, formal or informal	16%[b]	Less than 5 years
	23%	Between 5 and 10 years
	25%	Between 10 and 20 years
	36%	More than 20 years
Years of experience as a search dog handler	38%[b]	Less than 5 years
	29%	Between 5 and 10 years
	24%	Between 10 and 20 years
	9%	More than 20 years

NASAR: National Association for Search and Rescue; NNDDA: National Narcotic Detector Dog Association; FEMA: Federal Emergency Management Agency; NASDN: North American Search Dog Network; IPWDA: International Police Work Dog Association; NAPWDA: North American Police Work Dog Association; TASK: The Alliance of Search K9s; USPCA: United States Police Canine Association; ARDA: American Rescue Dog Association.

[a] State or multi-State recognized credentialing agencies were accepted.

[b] Category of less than one year experience and one year to five years were combined for analysis.

Table 2

Survey questions and responses pertaining to obedience and agility training age preferences and equipment utilized.

Question	Response	Answer choices
Please check all the types of equipment you would utilize for training a canine under 4 months of age.	143	Buckle collar
	79	Harness
	11	Front pull harness
	25	Martingale[a]
	13	Head halter
	25	Choke chain
	20	Pinch collar
	13	Electronic collar
	25	Other
Please check all types of equipment you would use to train a puppy over 4 months of age but under 1 year.	143	Buckle collar
	86	Harness
	13	Front pull harness
	35	Martingale[a]
	21	Head Halter
	61	Choke chain
	65	Pinch collar
	36	Electronic collar
	22	Other
Please check all the types of equipment you might utilize to train a dog 1 year of age or older.	145	Buckle collar
	90	Harness
	19	Front pull harness
	38	Martingale[a]
	24	Head Halter
	67	Choke chain
	92	Pinch collar
	62	Electronic collar
	25	Other
What age did you begin teaching any obedience (such as sit, down, or come) to your dog?	4%	Less than 6 weeks
	30%	Between 6 and 8 weeks
	22%	Between 8 and 10 weeks
	17%	Between 10 and 12 weeks
	13%	Between 3 and 6 months
	7%	Between 6 months and 1 year
	6%	Between 1 and 2 years
	1%	More than 2 years
What age did you begin any kind of agility training with your dog?	2%	Less than 6 weeks
	8%	Between 6 and 8 weeks
	9%	Between 8 and 10 weeks
	12%	Between 10 and 12 weeks
	24%	Between 3 and 6 months
	26%	Between 6 months and 1 year
	17%	Between 1 and 2 years
	1%	More than 2 years

[a] Martingale collars were eliminated for statistical analysis due to their ambiguous nature.

of age, hence the 6 months to 1 year category. Dogs 1–2 years of age are considered young adults, approximately full size but may still be increasing in weight. The behavioral traits which are considered indicative of being a good SAR candidate should be fully developed by that age. Many SAR training programs, including some Federal Emergency Management Agency (FEMA) teams, will not consider a dog for SAR training until the dog is between 1 and 2 years of age for this reason. Dogs above 2 years have generally reached

their full size and weight. Obedience and agility training methods, and time spent training were determined using the questions in Table 3.

Because different types of equipment can enhance a trainer's ability to physically induce a behavior, handlers were asked to indicate the types of equipment they utilized for different age groups of dogs. Equipment choices were categorized for statistical analysis as passive or active in terms of the mechanical action involved in their utiliza-

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Table 3
Survey questions and responses (%) pertaining to obedience and agility training methods and training time investment.

Question
Please identify which statement best describes the method you would utilize for teaching a new obedience behavior, such as a sit.

13%	Wait for a behavior to occur, mark behavior with a clicker or voice cue, and offer a food or toy reward.
55%	Lure into a sitting position with food or toy, mark behavior with a clicker or voice cue, and offer reward.
19%	Offer voice cue to sit and gently place puppy into sit by tucking hind quarters under and then rewarding sit behavior.
10%	Offer voice cue to sit while gently pulling up on collar and pushing down on hind quarters and rewarding sit behavior.
3%	Offer voice cue to sit and stimulate with electric collar simultaneously then reward the dog for the behavior.

Please identify the statement which best describes the method you utilize for teaching a new agility behavior.

56%	Lure dog to, across, or through object with food
22%	Lure dog to, across, or through object with toy
19%	Use leash to guide dog to, across, or through object
1%	Use leash tugs/jerks to help guide dog to, across, or through object
2%	Use electric collar stimulations to guide dog to, across, or through

I spend the following amount of time weekly to train my dog on scent detection, obedience, and/or agility.

4%	Between 0 and 2 h per week
30%	Between 2 and 4 h per week
45%	Between 4 and 8 h per week
21%	More than 8 h per week

Table 4
Equipment classification in terms of mechanical force induced upon the dog during training.

Collar type	Functional assessment
Passive	No or limited mechanical action with limited discomfort
None	Non-mechanical
Buckle	Non-mechanical, opposition reflex
Harness	Non-mechanical, opposition reflex, pulling force
Front Pull Harness	Limited mechanical, rotational force, no opposition reflex,
Active	Mechanical action with mild to severe discomfort
Head Halter	Mechanical, lever force
Slip	Mechanical, choke force
Pinch	Mechanical, limited choke and pressure point force
Electronic	Mechanical, electric stimulation

tion (Table 4). Equipment patents submitted when patent protection was applied for were referred to for the mechanical action of buckle collars, harnesses, front pull harnesses, head halters, slip and limited slip collars, and pinch collars. Buckle collars were considered the neutral standard and were compared against the other equipment to determine if the design delivered a mechanical advantage for the handler. Generally recognized discomfort levels indicated by behavioral responses to equipment were also considered. Equipment was categorized as passive if it's mode of action did not give the respondent a mechanical advantage and provided minimal discomfort. Equipment was categorized

Table 5
Classification and definition of training methods utilized to teach basic obedience and agility.

Method classification	Training technique
Positive reinforcement	Capturing – The trainer rewards an animal for a spontaneous behavior when it is offered. Luring – A food treat is used to lure the dog into position. Shaping – This begins with reinforcement of small approximations of the behavior Through rewarding incremental steps, previous approximations are extinguished and the goal behavior is achieved.
Compulsion	Physical Manipulation – Physical force is applied to dog to achieve behavior which may result in discomfort. Mechanical Force – Physical or electrical force is applied to dog to achieve behavior which may result in discomfort.

as active if it's mode of action gave the respondent a physical advantage over the dog regardless of the dog's weight and subsequently provided mild to severe discomfort.

Training methods were categorized as either positive reinforcement or compulsive (Table 5). Positive reinforcement methods for the purpose of this study were defined as methods utilizing capturing, shaping, and luring to train a behavior. Compulsive methods for the purpose of this study were defined as methods utilizing mechanical force to physically induce a behavior during training.

2.3. Analysis

Proportional data was recorded for several categories and are presented using descriptive statistics. Categorical data was analyzed using the Chi-square test with SPSS, 16.0 and by hand, similarly to survey data from past studies (Jagoe and Serpell, 1996). G-tests were performed for confirmation and P values for the G-test were pre-set at $P = 0.05$.

3. Results

3.1. Demographics, credentialing and respondent canine training experience

The greatest proportion of respondents, 54%, fell between 36 and 55 years of age, however no association was found between handler age and performance success. Men accounted for 32% of respondents while 68% were women. Respondent gender was significantly associated with the type of obedience training method chosen ($X^2 = 8.504$, df = 1, $P = 004$) and the G-test confirmed the association ($G = 8.46$, df = 1, $P = 0.05$). Positive reinforcement methods were preferred by 76% of female respondents but only 54% of males.

The most common breed among mission ready dogs was the German Shepherd Dog, with 33% of the total respondents, followed by sporting, herding, hound, and other working breeds with size averaging over 18 kg at maturity (Table 6). Spayed female dogs accounted for 44% of

Table 6
Percentage of mission ready canines reported for each breed.

Breed	Reported canines
German Shepherd Dog	33%
Labrador Retrievers	16%
Mix breeds	10%
Border Collies	8%
Golden Retrievers	8%
Belgian Malinois	7%
Bloodhounds	7%
Various Other Breeds[a]	7%
Doberman Pinschers	3%
Australian Shepherds	1%

[a] One of each of the following breeds: Belgian Sheepdog, Chesapeake Bay Retriever, Flat Coated Retriever, Rhodesian Ridgeback, English Shepherd, German Short Haired Pointer, Springer Spaniel, Weimaraner, Viszla, Pit Bull and Newfoundland.

Table 7
Years of previous canine training experience and years of SAR canine training experience for handlers.

| Number of years	Previous canine training experience	SAR canine training experience
Less than 5 years	16%	38%
Between 5 and 10 years	23%	29%
Between 10 and 20 years	25%	24%
More than 20 years	36%	9%

the dogs reported, neutered males 32%, intact males 18% and intact females 6%. No association was found between a specific breed or sex and reported training method. The survey did not allow for specific breed or sex to be compared to achievement of certification. Responses indicated 95 of the 177 respondents had achieved national or state certifications with their dog through 18 separate credentialing agencies. Some respondents indicated their dog had achieved certifications through more than one agency. The largest proportion of certifications, 36% (Table 1) were issued by NASAR.

Increasing years of any type of dog training experience (Table 7) was inversely related to years of SAR canine training experience [$X^2 = 118.36$, df = 9, $P = 0.05$], which the G test confirmed ($G = 136.72$, df = 9, $P = 0.05$). No relationship was found between either years of previous canine training experience or SAR training experience and achieving national certification. Handlers also had more years of informal or formal canine training experience than SAR training experience (Table 7).

3.2. Age and equipment

Respondents could select more than one type of training equipment within each age group of canines. Limited slip (Martingale) collars were eliminated from the statistical analysis due to their ambiguous nature in terms of mechanical application and discomfort. A strong association ($X^2 = 54.043$, df = 2, $P < 0.001$) between increasing age of the dog and the respondents increased use of active equipment (Fig. 1) was found. G test confirmed the association ($G = 56.722$, df = 2, $P < 0.001$).

Respondents indicated a significant preference for early introduction to obedience training, with 72% of respon-
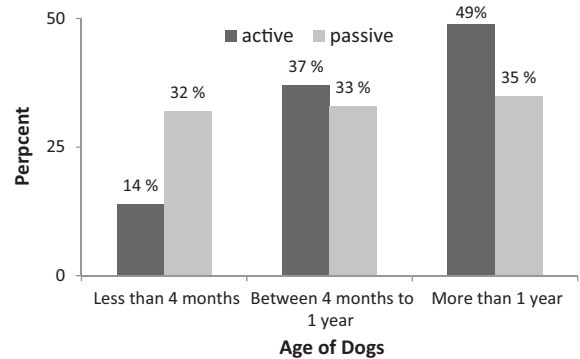
Fig. 1. The relationship between age of the dog and whether active or passive training equipment was used.
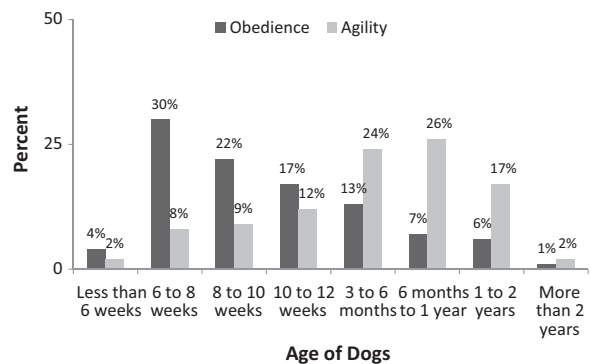
Fig. 2. The relationship between the age of the dog and when handlers preferred to introduce obedience and agility training.

dents choosing to introduce obedience training before 12 weeks (Fig. 2). Respondents (81%) also indicated a preference for introducing dogs to agility training when less than 1 year. In contrast to early obedience training, however, only 55% of respondents indicated a preference for introduction to agility prior to 6 months (Fig. 2).

3.3. Training methods and time investment

National certification achievements were indicated by 95 of the 177 respondents. Positive reinforcement was indicated as preferential by 72% of those achieving national certifications, whereas compulsive methods were preferential 28%.

Based on case law set in federal court, training for scent detection dogs must be maintained at a minimum of 4 h per week (Fleck, 2009). Therefore 4 h was chosen as a dividing point for statistical analysis. An association was found between spending more than 4 h per week with achieving a national certification ($X^2 = 16.379$, df = 1, $P < 0.0001$). The G test confirmed the association ($G = 16.633$, df = 1, $P < 0.001$). Respondents who did achieve a national certification were roughly equal in proportions with respondents who did not, with 51% spending less than 4 h per week, and 49% spending over 4 h per week. Respondents with national certifications however, reported 80% spent more than 4 h and only 20% spent less than 4 h per week training.

4. Discussion

There were approximately twice as many women as men respondents to the survey. SAR dog handlers are primarily volunteers who do not receive pay for their efforts. Conversely, the majority of paid military working dog handlers and law enforcement dog handlers are men. Additionally, female trainers had a preference towards positive reinforcement training methods over men. This may account for the overall preference for positive reinforcement methods in SAR dog training. We did find that the dog breeds used by respondents consisted of larger breeds weighing above 13 kg at maturity. However, no associations were found between dog breed or sex of the handler and performance success. A wide variety of breeds are utilized in SAR. The breed or sex may have less to do with predisposed success, and more to do with personal preference. Even within a breed, huge variances of personalities occur. However, other traits commonly observed, such as environmental confidence referred to by canine handlers as "nerve strength," and reward seeking behavior such as toy engagement which is referred to as "drive" or "motivation" by canine handlers (Brownell et al., 2002), may be more suggestive of a good candidate and deserve further research.

NASAR was the most popular credentialing agency. One reason for this may be availability of certification testing. NASAR does not require handlers or teams to be attached to a law enforcement entity to certify their dogs, whereas, organizations such as the North American Police Work Dog Association (NAPWDA) and International Police Work Dog Association (IPWDA) require letters of support from a local law enforcement agency within the jurisdiction of the handler or team. The National Narcotic Detector Dog Association (NNDDA) no longer certifies civilian handlers and some of the smaller national organizations have small regional service areas. The study found that 95 of 177 respondents had obtained national certifications. Certifications provided by one of the many national, regional or state organizations are now highly recommended by SWGDOG (2005).

Handlers without previous canine training experience are often recruited and used in law enforcement, military, fire, and volunteer SAR endeavors. No research has examined how the amount of handler experience affects canine performance; however, it is anecdotally assumed that SAR dog handlers with previous canine training experience will be more successful than SAR dog handlers who lack previous canine experience. This study did find that the majority of handlers have previous canine training experience in excess of their SAR canine training experience; however, we did not find an association between performance success and previous canine training experience. This may imply that more general canine training experience does not necessarily reflect success in canine SAR as generally speculated. The lower proportion of responses in the SAR canine training experience categories may be indicative of drop out due to training issues, testing failures, lost interest or that involvement in SAR dog training is part of an evolution as a canine trainer and merits further research. Further research in this area is suggested especially in regards to

handlers' understanding of the principles of learning theory and its application with search dogs. Surveying handlers prior to initial tests and then following up on the portion of handlers who failed their first national test 5 years later would also help clarify if and where a drop-out rate occurs or whether those handlers continued to participate at local levels without any credentials. This will also assist in evaluation of factors which are contributing to failure on certifications.

We hypothesized that training larger and physically stronger dogs increases the likelihood of resorting to compulsive methods and harsher equipment such as choke chains, pinch collars and/or electronic collars to gain physical control of the dog to teach compliance to obedience commands as the dog matured. This was supported through the findings that as dogs matured and increased in age and size, the respondents utilized harsher equipment for training. The equipment classification of passive or active was based primarily on mechanical action; however, the canine's typical pain response was also factored in. The inclusion of the front pull harness in the passive category may be questioned by some, as there is a rotational mechanical action, however, observation of canine reactions to this device does not usually indicate pain induction as is the case with choke chains, head halters, pinch collars and electronic collars.

We did not collect actual weights on each of the dogs from the survey, but only breed information. The limitation with this is the huge variance of weight in dogs, even within a single breed. For instance, border collies typically range from as small as 13 kg to 34 kg. Although we cannot associate a specific breed with weights and the level of compulsion used, we can extrapolate that the majority of SAR dogs, regardless of breed, exceed 13 kg due to the conditions of field work. Dogs that are smaller than 13 kg often have difficulty navigating some types of environments and are not traditionally used for SAR dog endeavors.

The association between increasing size and strength of the dog and onset of obedience training may support the practice of early training when luring and shaping can be utilized without the need of compulsive training aids. Research on the effect of compulsive training of foundation skills on search performance and the effect of age and size on the initiation of compulsive training should be conducted. If age and size are factors, early enrichment and training when the dogs are young and small in size with positive reinforcement methods may negate the need for compulsive training and associated equipment later in life. SAR handlers who also breed litters often begin obedience and agility training with their puppies at a very early age even before weaning. This is demonstrated in the last chapter in NSDA's book (Crippen, 2008) entitled "Puppy Enrichment" which outlines the introduction of size appropriate agility equipment and introduction to basic obedience commands such as come, sit, and down through luring and shaping. The success of this litter highlights the possible benefits of early learning on a litter of six puppies reared with enrichment techniques and early positive reinforcement obedience and agility training. All six pups from this litter went on to be nationally credentialed search dogs. Significance of this lies in the question

of whether compulsion deteriorates the performance of search dogs. If indeed it does, and compulsion can be correlated to a growing puppy whose increasing size and strength over rules the handler's ability to physically control the puppy, then early learning may be a key to counter this problem. Use of positive reinforcement at this age may also avoid any aversive associations which may adversely affect performance as an adult. This emphasizes the need for more research on the effects of early exposure and training methods to determine the efficacy of early training versus later training in reliability, competency, and consistency in performance and successfulness of search dogs.

Obedience training methods were evaluated in terms of positive reinforcement or compulsion in this study. We acknowledge that varying degrees of discomfort exist within dogs experiencing compulsion training techniques, depending on the equipment, the dog's pain threshold, and the execution of the compulsion by the trainer. There is a great deal of anecdotal evidence supporting the use of positive reinforcement methods for obedience training of search dogs versus compulsive methods. One argument used to support positive reinforcement methods relates to the dog's willingness to stay committed to a target odor, even if that behavior conflicts with the handlers commands. Many search dog trainers feel that dogs that have had compulsive obedience training are not capable of this level of disobedience and therefore can easily be pulled off of a target odor. In fact, many bloodhound trailing handlers will not teach any, or very minimal, obedience due to this potential conflict with the dog's performance. Any type of scent detection training is based on establishing an appetitive association of a target odor with a reinforcer, therefore utilizing commands previously associated with aversive experiences may have a negative effect on a search dog. As noted by the AVSAB (2007), unpleasant associations are more often coupled with compulsive obedience methods. Schilder and Van Der Borg (2004) also noted that aversive associations affect the dog's performance. Dogs typically selected by the military or law enforcement are exceedingly confident (Svartberg, 2002), and may very well be successful despite even harsh compulsion. Search dogs that are often family pets may lack this level of confidence and therefore fail to perform reliably if trained with compulsive methods. However, because no studies have evaluated the relationship between obedience control and SAR dog performance further research is needed. Only one study has compared obedience methodology and performance success, and this was in pet dogs' ability to satisfactorily comply with owner commands (Hiby et al., 2004). Hiby et al. (2004) found that obedience success was associated with positive reinforcement training rather than compulsive methods. Obedience success as defined from a SAR dog handler perspective may from handler to handler.

Respondents whose time investment in weekly training exceeded 4 h were significantly more likely to have a national certification. The minimal hours of weekly training set in court precedent is 4 h per week of training for law enforcement agency detector dogs (Fleck, 2009). In actuality, most of these dogs greatly exceed this minimal number of hours due to the maintenance of the scent detection specialty, maintenance of obedience and agility, and the actual duty hours that the canine works (Kristofeck, 1991). SAR dogs generally belong to volunteer handlers and therefore may not receive as many training or duty hours as a law enforcement dog. However, continuous training is essential and SWGDOG (2005) recommends a minimum of 4 h per week of training for scent detection dogs of any discipline. The results indicating that dogs with national certification were trained for more than 4 h per week support the need of continued ongoing training for a successful search dog.

5. Conclusion

This study found that positive reinforcement is a successful training method for SAR dogs. Age of the dog was strongly associated to the type of equipment and method of obedience training selected. As the age of the dog increased there was an increase in the use of compulsive equipment. Training for more than 4 h per week appears crucial because it was associated with achieving a national certification. Further research on the effects of handler experience, the reasons for failure of search dogs, and how early puppy enrichment and training might be utilized to decrease failure and increase the reliability of search dogs would be useful.

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