SCENT IDENTIFICATION LINE-UPS USING TRAINED DOGS IN THE NETHERLANDS

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ABSTRACT: Scent identification line-ups have been in use as a forensic tool in a number of E
countries since the beginning of this century. The basic idea of identifications by dogs is gen
in these countries: a trained dog matches the scent collected at a crime scene to the scent o
suspected of this crime. However, there are also some marked differences between countrie
respect to method and experimental set-up.

This presentation will focus on the way the identifications are performed in the Netherlands.
years some scientific work has been done addressing some of the "hot points". The most imp
will be presented, and their consequences for the way in which the line-ups are performed n
shown. Time permitting, a video of a Dutch scent identification line-up will serve as illustratic

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Introduction

A scent identification lineup is a technical method for matching the odour of a perpetrator collected at a crime scene to the scent of a person suspected of this crime. In this way, scent traces that are left on for example breaking-in tools, murder weapons, or clothing discarded by the perpetrator can be linked to a certain suspect. Specially trained dogs are used for these identifications.

The assumptions that underlie these identifications are:
- each person has his or her own, unique odour;
- this unique odour remains stable in time;
- a dog is able to differentiate between odours of different people.

The problems in trying to "prove" these assumptions are many:
- an odour is defined as triggering an olfactory reaction;
- this makes "smelling" a subjective experience;
- the only testing methods are empirical ones, but these indicate that the above assumptions seem valid.

Scent identification lineups have been used by Dutch law enforcement since the beginning of this century [1]. The way in which these identifications are performed has changed significantly over the years. The scent from the scene of the crime has always been the scent presented first to the dog, and it had to look for a matching scent in a lineup. First, the lineup consisted of actual people, one of whom was the suspect. This led to all sorts of problems, so later the lineup consisted of different objects belonging to different people. Of course one always took care that the object the suspect "donated" to the lineup was one that a dog really loved to retrieve! Again, changes were made. Neutral clean key-bunches became standard objects, and the suspect and foils would scent these by carrying them in their jacket pockets. Mix-ups due to people changing clothes led to the final change: now stainless steel tubes are used, and everyone scents them by holding them in his or her hands.

Between 1991 and 1996 I researched the reliability aspect of these lineups. Some of the results obtained during these years led to a significant change in the protocol. These results will be presented first, followed by the description of a new protocol. Finally, the reliability of scent identification lineups will be placed in context of other identification methods.

Research questions and results

Scent identification lineups were performed according to the following protocol from 1991 to 1997. The suspect and 11 foils each scented a stainless steel tube by holding it in the hand for approximately 5 minutes. These 12 tubes were collected separately in glass containers or

plastic bags. A few hours or days later, the lineup was prepared by a helper in absence of the dog handler who performed the lineup. The 12 tubes were laid down in two rows of six tubes each. One of the rows therefore contained the tube scented by the suspect, the other row contained only foils (the "zero" row). Which of these rows had to be performed first, and the position of the tube scented by the suspect in the row, was determined by chance. The handler came to the lineup area after the tubes had been laid down in the two rows, and positioned himself near one of the two. He let his dog smell at the object from the crime scene, which was expected to carry the scent of the perpetrator. When he was satisfied the dog had smelled it well enough, the dog was given the command "search" and the dog then searched for a similar odour in the row. The response of the dog when finding a matching odour was to pick up the matching tube, and to bring it to his handler. After searching the first row (with or without a retrieval), the same procedure was followed for the second row. A positive identification meant that the dog had retrieved the odour of the suspect in one row, and had not retrieved any tube in the "zero" row.

In the protocol described above, a number of provisions were made to ensure that the dogs made the match between perpetrator and suspect purely on the basis of scent. These provisions were inspired by what was known from the way humans perform eyewitness lineups. This led to the rule that the odours of the foils in the lineup should be of different people of the same gender and race as the suspect, and to ensure that only human scent came on the tubes, all participants were asked to wash their hands with unperfumed soap prior to holding the tubes. In the course of the research it became necessary to test the validity of these assumptions.

Question: Scent contains gender information, and also information on smoking habits. Do dogs utilize this information?
This question was addressed by analysing mistakes the dogs made in controlled lineups [2]. If dogs utilize this information, one would expect that when the dogs make a mistake, they select a male if presented with a male perpetrator scent, or select a smoker if presented with a smoking perpetrator (or select a non-smoker if presented with a non-smoking perpetrator). If dogs do not utilize this information, the mistakes will be made randomly over the row, and will depend on the relative presence of males and smokers.

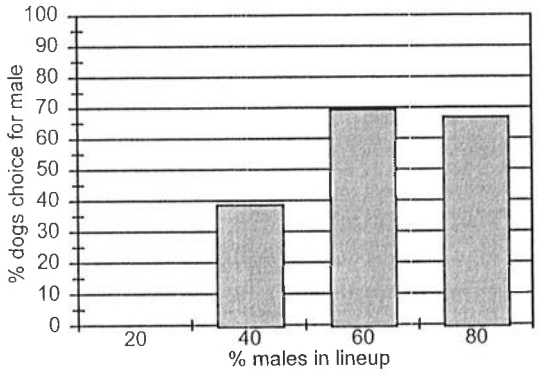

Fig. 1. Percentage incorrect choices for males related to the percentage of males in the lineup, dog was looking for a male.

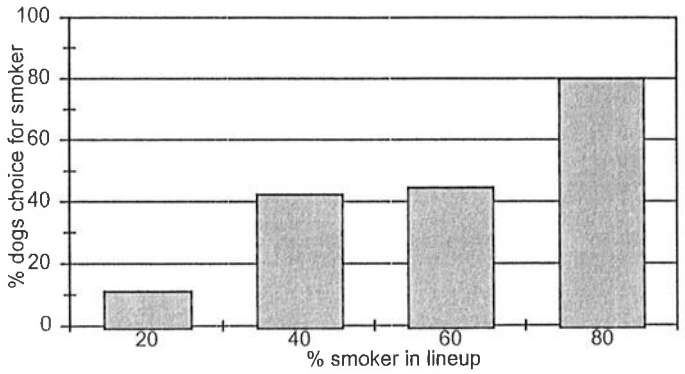

Fig. 2. Percentage incorrect choices for smoker related to percentage of smokers in the lineup, dog was looking for a smoker.

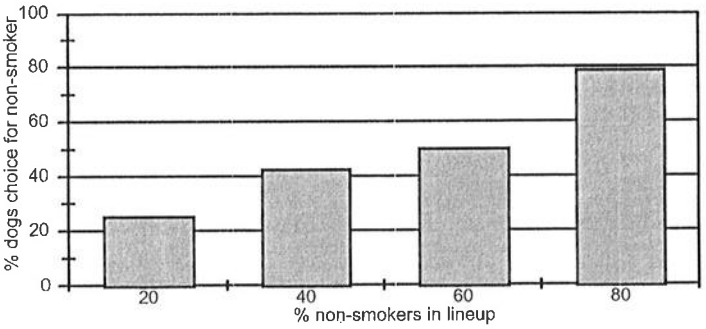

Fig. 3. Percentage incorrect choices for non-smoker related to percentage of non-smokers in the lineup, dog was looking for a non-smoker.

Results: In total 153 errors made by 25 dogs in the course of trials of three experimental series were analysed. The results are given in fig. 1, 2 and 3. No evidence was found that the dogs utilized the information on either gender or smoking habits (both cases: χ^2, df=2, NS). Recently, the results on smoking have been confirmed in a different setup by Misiewicz [3] who also concluded that dogs are not led by presence or absence of nicotine in their choices.

Question: Do dogs react to the "odd man out" in the row?
This question was addressed by analysing the mistakes in a series of controlled lineup experiments that contained an "odd man" as a foil [4]. This "odd man" was from a completely different environment than the others (civilians working at a police station in one town, vs. students in another town), differed in age (middle aged vs. students in their twenties), differed in precise moment of putting their scent on the tubes (roughly lunch time, vs. all scented at the same time at the same location), and differed in way of life (ordinary civilian life vs. campus student life). If the dogs reacted to the "odd man out" in the row, one would expect the mistakes to favour this person. If dogs do not react to the "odd man out", the mistakes will be made randomly over the odours in the row.

Results: In total 30 errors made by 6 dogs in the course of two experiments were analysed. No evidence was found that the dogs reacted preferently to the "odd man out" (binominal test, NS).

Question: Does hand-washing prior to scenting tubes affect the results?
This question was addressed by comparing the results in controlled lineup experiments where the hands had been washed, with comparable experiments where hands had not been washed [2]. For 15 dogs the percentage correct was calculated for the two conditions, and the results were compared.

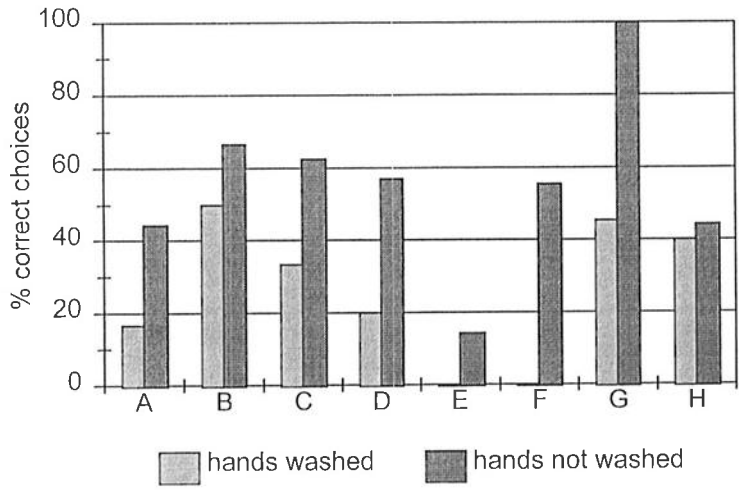

Fig. 4. Percentage correct and incorrect obtained in tests where hands had, or had not, been washed prior to scenting the tubes. A to H are results of 15 different dogs.

Results: the results in experiments where hands had not been washed were significantly better than the results in experiments where the hands had been washed (Wilcoxon signed rank test, p=.002, N=12). The average percentage correct was 4.6 times higher in the unwashed-hands condition.

Question: do dogs repeat mistakes?
This question was generated because it became apparent that a dog can show a marked preference for the odour of certain person. Since the names of the foils had always been noted in the controlled lineups, a number of cases could be traced where a dog was confronted with the odour of a certain foil twice (in a time space of weeks to months earlier) and had responded to that odour both times, even though the odour of the perpetrator differed. In one experiment [4] one dog showed a marked preference for the odour of one test-person in 5 experiments conducted on a two weeks interval scheme. In the interval, the dog was not confronted with this odour, nor had the dog been confronted with this odour before. Five other dogs participating in the same experiment did not share this preference, and none of the six dogs showed a preference for the odour of a second, similar test-person presented on a two weeks interval scheme.

Results: Occasionally, a certain dog may show a marked preference for the odour of a person. This preference can be stable in time, but is usually a one dog - one person preference that is not shared by other dogs.

Question: does the experimental setup affect the results?
It became clear that the dogs varied in performance from day to day, even from lineup to lineup. Besides differences in motivation, sometimes apparent from personal behavioural observation, a number of studies have shown that the olfactory organ itself is also subject to variation. Four different experimental protocols were compared with dogs responding by retrieving a matching tube [5] and with dogs responding by lying down near the matching odour on a cloth [6].
Results: the protocol used for the lineup has significant effect on the reliability of the lineup. A lineup with built in controls to check if the dog is performing well, and to see if the dog does not have a special preference for the scent of the suspect, was shown to be more reliable than the standard protocol and 2 others. Lineups where the dogs had to respond by lying down, and therefore differentiated response and reward in a more clear way than retrieving loose-lying tubes, led to less mistakes.

The protocol for scent identification lineups since 1997
The rules for a revised protocol were published in September 1997. The handlers and their dogs have to be certified every two years according to this protocol.
The lineup is prepared by a qualified helper. The lineup consists of two rows that each contain the odours of 7 people (one suspect and 6 foils) on stainless steel tubes, clamped down on two platforms. The order of the odours is semi random but the handler performing the lineup is unaware of the position of the different tubes. After having been given the smell on the starter object, the dog runs freely over a lineup of tubes. After a dog chooses (by scratching or biting), the handler indicates that the dog has actually made his choice. The helper signals this is correct or wrong by turning on a green or a red light. After a correct response the handler releases the tube, whereupon the dog can run around a bit with it as a reward.

The protocol is essentially a 5 step procedure:

step 1: match the scent of person A on a control object to his scent on a control tube in row 1
- a fault or a non-response lead to — disqualification
- a correct response leads to — continue with step 2

step 2: match the scent of person A on a control object to his scent in a control tube in row 2
- a fault or a non-response leads to — disqualification
- a correct response leads to — continue with step 3

step 3: establish that the dog has not shown interest for the tube of the suspect
- if he did — disqualification
- if not — continue with step 4

step 4: match scent on object related to crime to scent of suspect on tube in row 1
- no response — conclusion: **no odour similarity**
- fault — conclusion: **incorrect test**
- response to suspect's tube: — continue with step 5

step 5: match scent on object related to crime to scent of suspect on tube in row 2

no response	conclusion:	**no odour similarity**
fault	conclusion:	**incorrect test**
response to suspect's tube	conclusion:	**odour similarity**

A written report, signed under oath of office, concludes the work of the dog handler and the helper involved in the lineup.

Reliability

The reliability of any piece of evidence consists not only of technical limitations (margin of error of measurement, chances of a duplicate) but also on limitations of people performing the inquiry. Technical limitations of scent identification lineups focus on the scent production of humans (how big is the chance that two people smell alike?) and on scent perception of dogs, both very difficult and barely studied subjects. Human scent seems coupled to the immune system and therefore chances of duplicates existing should be similar to duplicates in DNA profiles. The limits of dogs in detecting human odour are as yet unparalleled. However, the whole procedure, that takes the varying performance of the dogs (and their handlers) into account, is not infallible. But neither is other technical evidence when measured in the same way.

The results of human scent identifications obtained in an early experiment with trained but not yet certified dogs following the revised protocol [4] were compared with the results of common kinds of forensic evidence compiled by Peterson & Markham [7]. Those lineups fitted into the "moderate success" group together with bloodstain analysis, questioned documents, tool marks and hair analysis. Peterson & Markham described analysis on paint, glass, fibres and body fluid mixtures as less reliable and a category of concern, and fingerprint, firearms and footwear analysis as best[1].

However, there is now also data available from recent police cases. A number of dogs have been trained extensively under standard conditions, where tubes are used that are clamped onto platforms and that can be released for the dog to retrieve. This combines the advantage of the tubes with control over this reward: a dog cannot now retrieve an incorrect tube and thus "reward" himself. Results were obtained from 7 dogs from January through August 2000 (8 months). In all, dogs were used for a lineup 493 times. They were disqualified in the control trials in 3.5% of these cases (variation 1.2 - 7.1%). On average, 43% of the lineups led to a "odour similarity" conclusion (variation 14.2 - 71.1%), but no value for the quality of the dogs work can be attributed to this figure since the reality is not known. If no identification of the suspect took place, the dogs made a mistake in on average 6.8% of the cases (variation 2.3 to 13.5%). Since the suspect is one of six people in the lineup, we can calculate a "false positive" indication of 1.1%. Combining this with the qualification results as a measure for "correct indications" (96.5%), the revised protocol can be placed in Peterson and Markhams [7] "highest reliability" category. Even when combining the level of false positives with a more realistic measure of correct indications of 60% [4], "odour similarity" is a useful tool in criminal investigation and evidence collection.

[1]DNA evidence was not included in their analysis due to lack of data.

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