# Social working dogs support to pupils with problematic school absence N2021-0022

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## Popular scientific summary

The aim of this project was to investigate whether certified social working dog teams could increase pupils school attendance and contribute to pupils achieving the basic learning goals, investigate the risks to the health and welfare of these dogs, and to assess the cost-effectiveness of using social working dogs in schools.

The study was a randomized controlled study with two treatment arms, pupils meeting a dog handler with a trained school dog (called dog-team, intervention arm) or a special education teacher or similar resource at the school (called pedagogue, comparison arm). Four pupils per school were offered one of the treatments (two pupils per arm). The project was carried out in14 schools with 55 pupils from grade 3-9. Those carrying out the interventions were14 dog handlers with 16 dogs, and 14 employed pedagogues.

Pupils were scored as being positive in a higher percentage of sessions by the dog handler than by the pedagogue, but there were no differences in being scored as negative. Pupils carried out significantly more Swedish and tended to carry out more mathematics as well as talked more about motivation in session with the dog team than with the pedagogue. From videos it was found that pupils smiled and laughed more during sessions with the dog team than with the pedagogue. The pedagogues tended to play games more with the pupils, but the dog teams spent about half of the time doing different dog interactions. Pupils attended a higher number of sessions when meeting the dog team than when meeting the pedagogue. Absence from school decreased slightly during the intervention compared to before but did not differ between treatments. Reaching learning goals in Swedish and mathematics and health related quality of pupils' life were slightly improved during and after interventions but did not differ between treatments.

The dog-assisted education costed more and gained fewer quality-adjusted-life years ( QALYs) compared to the pedagogue support with mean bootstrapped ICER of 1.39 million SEK per one QALY gained. At the Swedish willingness-to-pay (WTP) threshold of 500,000 SEK, the probability of the dog intervention being cost-effective was 22% and increased to 32% as WTP increased to 1 million SEK. The dog-assisted education was more cost-effective than pedagogue support with mean bootstrapped ICER of 4,620 SEK per one school absence day averted. The probability of dog intervention being cost-effective continued to increase with higher willingness-to-pay.

In conclusion, dog assisted education can be a positive motivation for pupils to come to school, but the intervention may need to be long term, and schools must be prepared to pay for the intervention.

## Introduction and scientific background

Problematic school absenteeism is a growing concern in many countries, posing substantial challenges for pupils, families, and educational systems. Absence from school is associated with reduced academic achievement, difficulties in reaching learning goals, diminished motivation, and an increased risk of long-term social exclusion and reduced well-being (Folkhälsomyndigheten 2023; Nilsson 2014). The underlying causes of absenteeism are

multifaceted and may involve factors related to the school organisation, the learning environment, pedagogy, and social relationships, as well as individual psychological or physical health challenges and broader social circumstances (Skolverket 2024; Kearney 2008). In Sweden, where compulsory school attendance is regulated by law, early identification and targeted interventions are essential to prevent pupils from falling behind academically and to safeguard their long-term development (SFS 2010:800; Skolinspektionen 2016).

Previous research highlights the importance of supportive adult relationships, flexible and individually adapted pedagogical strategies, and positive learning environments for increasing pupils' motivation to attend school and engage in their work (Forsell 2020; Westerberg 2023). Pupils report that meaningful activities, emotional support, and pedagogical adaptations can help restore motivation, enhance concentration, and increase a sense of belonging. In contrast, an exclusive focus on academic outcomes risks overlooking pupils' emotional well-being, which may negatively influence both attendance and school performance.

A growing body of evidence suggests that animal-assisted interventions, including the use of trained school dogs, may contribute positively to pupils' motivation, emotional regulation, happiness, and general well-being. Dogs in educational settings have been shown to reduce stress, support concentration, facilitate play and social interaction, and create a more positive schoolwork environment (Wohlfarth et al. 2013; Beetz 2017; Blakemore & Frith 2005). Such improvements in the learning climate may promote engagement and contribute to improved school attendance and academic outcomes.

**Aim and questions**

The aim of this project was to investigate whether certified social working dog teams could increase pupils school attendance and contribute to pupils achieving the basic learning goals. A second aim was to investigate the risks of the health and welfare of these dogs when working in the school environment, as well as the challenges that may arise when it comes to bringing dogs into the school world. A third aim was to assess the cost-effectiveness of using social working dogs in schools. These questions were investigated: 1) How do dog handlers work with their dog and how does pupils react and interact with the dog? 2) How do dogs react in meeting different pupils and are there incidents in the school environment? 3) How do different schools organize the social dog teams stay in the premises? 4) Which factors are important for pupils to increase their presence in school and eventually achieve the learning goals? 5) What are the costs, benefits and cost-effectiveness of social working dog teams compared to other interventions performed in the school, focusing on school presence, learning goals?

**Material and methods**

This project was performed from 2022-2024 in 14 Swedish schools on 55 pupils. The interventions were carried out by14 dog handlers with 16 dogs, and14 pedagogues employed by the schools. An application to the Etikprövningsmyndigheten was approved before interventions started (Dnr 2022-01706-01). An animal ethics application was written and discussed at the Department, but according to the Swedish Board of Agriculture it was not needed.

## Experimental design

The study was a randomized controlled study with two treatment arms. The treatments consisted of a pupil meeting a dog handler with a trained school dog (called dog-team, intervention arm) or a special education teacher or similar resource available at the school (called pedagogue, comparison arm). Four pupils per school were offered one of the treatments (two pupils per arm). The school randomize which arm each pupil was offered and contacted the parents and pupil and presented the offer. If interested, they received written information and had to sign a consent to participate. Pupils were informed that they could withdraw from the study whenever they wanted.

Each intervention lasted 12 weeks during the first semester and 10 weeks during the second and third semester. The shortening of the intervention was due to those pupils who missed several sessions during the first semester had to continue into the next semester, which caused problems in calculating some data (i.e. % of school absence, if approved in Swedish and Mathematics). Each session was carried out twice per week during 30 minutes/session. The time of the day for each session was adjusted according to the pupil's school schedule.

The sessions were carried out in the school and in a room that the principals considered appropriate. It was asked for that the dog-team should be close to a door so that the dog did not have to pass through corridors where many pupils were passing. This was both to protect pupils with dog allergy and to protect the dogs from being approached by pupils who wanted to pet it. Outdoor space for outdoor activities when the weather permitted was also available in the schools.

During the sessions dog handlers and pedagogues were told to work on improving the pupil's motivation to come to school with the methods they usually had, and to include the subjects Swedish and Mathematics where they found appropriate. They were asked to record what they did during the sessions so analysis of this could be done afterwards.

## Pupils

In total 65 pupils (n=33 dog team intervention, n=32 pedagogue intervention) of both genders were offered to participate in the project. The participating pupils were in school year 3-9, and 23 were girls (n=18 dog-team, n=8 pedagogue) and 30 boys (n=14 dog-team, n=15 pedagogue). For the control intervention only 23 pupils participated due to that some schools had problems to find enough pupils (n=6), control pupils withdraw from the intervention (n=2) and one interrupted the intervention. The prerequisite was that they should have a school absence at 20-50% the semester before the intervention, but schools sometimes selected pupils with other absences.

## Dog-teams

In total 16 dogs of different breeds participated, 7 dogs were males and 9 were females. The dogs were from 2-11 years and 8 of them were neutered (see table 2). Risk analysis was always carried out by the dog handler in contact with the school principal before the intervention started. Dogs were off leash during all sessions and free to leave when they wanted. They had free access to water. The dog's behaviour was recorded both by video and by protocols filled in by the dog handler after each session with a pupil.

There were 13 dog handlers, and three of them had two dogs that met different pupils during the project creating 16 unique dog-teams. Six of the dog handlers were employed on the school where the conducted the intervention and 7 were free consultants. All dog handlers were educated and approved by a Swedish organization that trains dog teams for animal-assisted education ("Svenska Terapihundskolan", "Pedagoghundsinstitutet", "Hundens Hus i Sundsvall and Malmö" and "Hundens Hus i Stockholm"). Before the dog team were allowed to start the educators tested each dog for mental stability as a social working dog. A certificate as a school dog had been received by all dog teams involved in this project. All dog handlers were informed about the project and signed an agreement of consent before they could start the interventions. Risk assessments were carried out by the handler and signed by the school principal before dogs entered the schools.

The dog handlers had the following title/education; 1 special education needs specialist, 1 special education teacher, 7 teachers (2 class teachers, primary school teacher in after schoolteacher and physical education teacher), 1 social pedagogue, 1 teacher assistant, 1 school dog pedagogue, 1 dog behaviourist.

Control intervention (comparison)

The control intervention with "pedagogues" had the following title/education; 3 special education needs specialist, 3 special education teachers, 4 teachers (1 class teacher, 1 teacher in Swedish, 1 teacher in mathematics, biology and chemistry, 1 teacher in German and being mentor) ,1 school counsellor, 1 social pedagogue, 1 pupil coordinator and 1 pupil assistant).

Data on pupils' school performance

To keep the anonymity of each pupil each school was given a code (A-M) and then each pupil was given a number (1-65). These codes were used throughout the study in all data files and protocols and used in communication with the schools. Schools were asked to send information from the computer systems on each pupils % of absence per semester before, during and after the intervention. Schools were also asked to send information from the computer system on if pupils had passed or not in Swedish and Mathematics the semester before, during and after the intervention.

Behaviours of pupils during sessions

The dog handlers and pedagogues were lending a video camera (GoPro Hero 10 Black, manufacturer) that they mounted on a shelf or placed on a tripod in the room where sessions took place. They could also video film during outdoor activities. Video filming was planned to be carried out during three 30 minutes meetings per pupil (beginning, middle, and end of intervention). Pupils were always asked to approve video filming before it started, and some pupils did not approve this.

The behaviours from each film were analysed in Observer XT vers. 16 (Noldus Technology) by the same observer (SK). The durations (s.) and frequency of each behaviour was recorded and summarised per film, which was exported to Excel.

Health-related quality of life

Children's health-rated quality of life (HRQoL) for both control and intervention groups were measured using the self-reported Child Health Utility 9 Dimensions (CHU9D) questionnaire

administered at baseline, immediately after intervention, 3 months after intervention, and 6 months after intervention. The utility scores were calculated using tariffs derived from a sample of adolescents aged 11-17 years in the UK (Stevens, 2012). Utility values were then used to estimate quality adjusted life years (QALYs) for children over the study period using the area under the curve method (Matthews et al., 1990).

Interviews of dog handlers and pedagogues

All 14 dog handlers were interviewed by the same researcher (MA) and 6 of the pedagogues were interviewed by another researcher (LL). The interview guide included two separate parts. The first section contained statements regarding their experiences of participating in the project. The dog handlers were asked to indicate the degree to which each of the following statements corresponded with their experience (in relation to a Likert scale from 1 "Strongly disagree" to 6 "Strongly agree". 1) *I perceive that the contribution I made during this project has had a positive impact on the pupil. 2) I perceive that the conditions for implementing this type of intervention within the school environment were favourable. 3) I perceive that the pupil had suitable prerequisites for this type of intervention to be effective. 4) I perceive that the intervention we implemented has made a difference in the pupils' learning. 5) I perceive that there is a need for structured, dog-assisted interventions in schools.*

The second section included in-depth, semi-structured interviews to explore the experiences and perspectives of dog handlers. The purpose of the interviews was to gain a deeper understanding of how the interventions are organized, experienced, and perceived to influence pupils' motivation, relationships, and behavior in educational settings.

Dog welfare

The behaviour of the dogs was documented by the dog handler filling in a protocol directly after each session where she ticked whether the dog had shown each behaviour or not. The video films were also used for analysing the dogs´ behaviours, where focus was on if the behaviours shown indicated positive, negative or neutral behaviours. One master thesis in veterinary medicine (Karin Johansson 2024) has published half of the material (7 dogs and 6 dog handlers), and another master thesis will be carried out during Spring 2026.

Data analysis

Behavioural data of pupils were first handled in Excel where durations of each behaviour were calculated into seconds and then divided by the total film time and multiplied by 100 to get % of duration. The Excel file was imported to the statistical program SAS (Statistical Analysis Systems, Cary, USA, vers. 9.4). The individual films were summarised for each 30 min. session. In SAS frequencies were divided by each film time and multiplied with 1800 to get frequency per 30 minutes. Behaviours which had enough numbers of pupils performing them were analysed with Wilcoxon Rank Sum test. Dog behaviour was analysed with descriptive statistics and tested statistically with Chi2-test.

Statistical analyses on outcomes were carried out in STATA MP.18 using modified "intention to treat" approach. Multiple imputation was done for missing data. Outcomes were analysed using linear mixed effect models for child health utilities and school absence, and logistic regression for reached learning goals of Swedish and Mathematics. Costs for intervention and control arms were estimated using publicly data from Statistics Sweden and published

report. For health economic analyses, cost-utility analysis using cost per one quality adjusted life year (QALY) gained, and cost-effectiveness analysis using cost per one day of school absence reduction per semester were estimated. Health economics results were reported in terms of incremental cost-effectiveness ratio (ICERs).

**Results**

**1) How do dog handlers work with their dog and how does pupils react and interact with the dog.**

The protocols filled in by the dog handlers and pedagogues after each session showed that Swedish was carried out in the dog-teams during a significantly higher percentage of the sessions than in the pedagogue sessions (Table 1). In the dog-team sessions mathematics and talking about motivation tended to have been carried out more often than in the pedagogue sessions (Table 1). English and being social during the sessions was carried out less and did not differ between the interventions (Table 1).

Table 1. Mean % (± SE) of sessions that pupils carried out different activities with dog-team (n=30) or pedagogue (n=23). Tested with Wilcoxon Rank Sum test

| Activities | Dog-team | Pedagogue | Z-value | P-value |
| --- | --- | --- | --- | --- |
| Talked about motivation | 69.5 ± 4.86 | 55.4 ± 6.74 | -1.52 | 0.06 |
| Carried out Swedish | 39.8 ± 4.89 | 24.6 ± 5.62 | -2.31 | 0.01 |
| Carried out Mathematics | 36.8 ± 4.27 | 28.9 ± 6.57 | -1.48 | 0.07 |
| Carried out English | 2.9 ± 0.90 | 2.8 ± 1.97 | -1.62 | 0.05 |
| Were social | 3.0 ± 1.54 | 1.4 ± 0.71 | -0.01 | 0.49 |

According to the dog-handler versus pedagogue the pupils were more positive during sessions with the dog-team (95.4 ± 1.92 %) than with the pedagogue (62.1 ± 7.13 %) (Z=-4.80, p<0.0001). Pupils being negative during sessions was quite equal between dog-teams (12.5 ± 3.23 %) and pedagogues (10.3 ± 2.63 %) (Z=0.24, p=0.40). Some pupils were neither positive nor negative during sessions and were then scored as neutral.

*Behaviour of pupils during sessions from videos*

All pupils communicated with the dog handler or pedagogue, and it had a high % of the duration and no significant differences between the treatments (Table 2). Swedish and mathematics was carried out for about half of the pupils meeting a dog-team and only a few pupils meeting a pedagogue (Table 2). There was a tendency for pupils meeting a dog-teams to do Swedish for a higher % of duration than pupils meeting a pedagogue (Table 2). The % of duration doing mathematics, doing other subjects, being shown material or carrying out physical activity did not differ significantly between the pupils meeting a dog-team and those meeting a pedagogue (Table 2). Playing games tended to have a higher % of duration for pupils meeting a pedagogue than pupils meeting a dog-team, but on the other hand pupils meeting the dog-team had a high % of duration interacting with the dog (Table 2). As there were only few pupils involved in some activities medians were often zero (Table 2).

Table 2. Number of pupils from video recordings performing different activities during 30 min. sessions with means (± SE) and medians (Q1, Q3) for % of durations when meeting a dog-team (n=23 pupils) or a pedagogue (n=11 pupils). Data were tested statistically with Wilcoxon Rank Sum test

| Behaviour | Intervent. | N | Mean (± SE) | Median (Q1, Q3) | Z | P<Z |
| --- | --- | --- | --- | --- | --- | --- |
| Communication | Dog-team | 23 | 86.2 (2.17) | 85.8 (79.58, 95.05) | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Pedagogue | 11 | 75.4 (8.94) | 78.6 (63.69, 99.25) | -0.55 | 0.29 |
| Swedish | Dog-team | 12 | 13.5 (3.19) | 9.4 (0, 28.28) | | |
| | Pedagogue | 2 | 11.7 (8.59) | 0 (0, 0) | -1.38 | 0.08 |
| Mathematics | Dog-team | 11 | 9.4 (2.64) | 0 (0, 17.96) | | |
| | Pedagogue | 4 | 28.3 (12.63) | 0 (0, 83.45) | 0.24 | 0.40 |
| Other subjects | Dog-team | 4 | 7.2 (4.43) | 0 (0, 0) | 0.14 | 0.44 |
| | Pedagogue | 2 | 9.9 (6.64) | 0 (0, 0) | | |
| Playing games | Dog-team | 4 | 2.6 (1.52) | 0 (0, 0) | | |
| | Pedagogue | 4 | 15.7 (8.27) | 0 (0, 36.17) | 1.41 | 0.08 |
| Shown material | Dog-team | 8 | 1.39 (0.70) | 0 (0, 0.91) | | |
| | Pedagogue | 4 | 4.03 (2.14) | 0 (0, 5.42) | 0.54 | 0.29 |
| Physical activity | Dog-team | 3 | 0.8 (0.59) | 0 (0, 0) | | |
| | Pedagogue | 2 | 14.5 (10.07) | 0 (0, 0) | 0.54 | 0.29 |
| Dog interactions | Dog-team | 23 | 52.1 (4.60) | 52.8 (35.86, 69.79) | | |
| | Pedagogue | 0 | 0 | 0 | - | - |
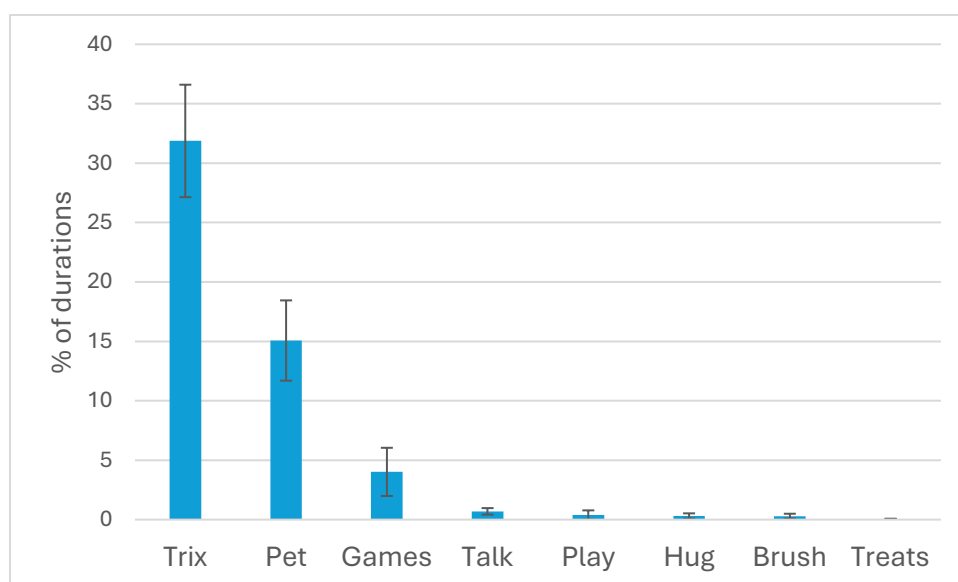


*Figure 1. Percentage of duration during 30 min. sessions that pupils were performing different interactions with the dog in the beginning (n=24).*

Pupils were smiling for a significantly longer % of duration during sessions with the dog-team (mean ± SE 4.2 ± 1.09, n=22) than with the pedagogue (0.8 ± 0.37, n=4) (Z=-3.24, P<Z 0.004, Wilcoxon Rank Sum test). Pupils were laughing for a significantly longer % of duration during sessions with the dog-team (mean ± SE 1.2 ± 0.27 n=22) than with the pedagogue (mean ± SE 0.3 ± 0.18, n=7, Z=-3.24, P<Z 0.000, Wilcoxon Rank Sum test).

**2) How do dogs react in meeting different pupils and are there incidents in the school environment?**

All six video filmed dogs showed the following behaviours: physical contact with the pupil, performed commands from the handler, exploration, lifted paw (without a command). Five of the dogs received a treat from the pupil and was tail wagging. Four of the dogs were contact seeking to the handler, was seeking eye contact with the handler, walked away, received a treat from the handler, performed a command from the pupil, was sniffing, and was licking around

its mouth. The behaviours were split up into intervention related behaviours, positive indicators, negative indicators and neutral indicators.

The dogs predominantly showed signs of positive welfare, with common behaviours including seeking contact with students and wagging their tails. However, there were variations in behaviours among different dogs, emphasizing the importance of considering individual differences. Some less desirable behaviours were recorded, such as barking (in reaction to external sounds) or walking away, but these occurred to a lesser extent. For some of the behaviours, there was a difference between the different sessions or parts of the sessions. For example, the behaviour "perform a command from student" was significantly more common during the last third of the session ($p<0.005$). A behaviour that was different between the third session was "wagging tail", which occurred less during the last sessions ($p<0.05$). Furthermore, the behaviour "physical contact with the pupil" was most common in the first part of the session ($p<0.005$).

### 3) How do different schools organize the social dog teams stay in the premises?

<u>Experiences from dog handlers</u>

The Likert-scale responses from eight dog handlers indicated generally positive perceptions of the intervention. The first statement: I perceive that the contribution I made during this project has had a positive impact on the pupil. The rating for this statement suggested strong overall agreement (Median=5,65, IQR=0,63, se table 3). The last statement: A structured, dog-assisted intervention is needed in schools. The rating for this statement suggested very strong overall agreement between dog handlers (Median=6,0, IQR:0).

*Table 3. Quantitative summary of dog handlers' perceptions of the dog-assisted educational intervention, based on six-point Likert-scale responses*

| Statement | Median | Mean (SD) | Range | IQR | n |
|---|---|---|---|---|---|
| *The contribution I made has been positive for the pupil.* | 5,65 | 5,57 (0,50) | 4,50–6,00 | 0,63 | 12 |
| *Conditions for implementing such an intervention were good.* | 5,75 | 5,21 (1,03) | 3,00–6,00 | 1,25 | 12 |
| *The pupil had good prerequisites for this intervention.* | 5,12 | 5,02 (1,15) | 2,00–6,00 | 1,13 | 12 |
| *The intervention made a difference for the pupil's learning.* | 5,00 | 4,76 (0,97) | 3,00–6,00 | 1,20 | 12 |
| *A structured, dog-assisted intervention is needed in schools.* | 6,00 | 5,92 (0,29) | 5,00–6,00 | 0,00 | 12 |

### 4) Which factors are important for pupils to increase their presence in school and eventually achieve the learning goals?

<u>Motivation to attend</u>

The mean number of pupils that started the intervention were 33 of 33 offered for the dog-team (one pupil was removed from data analysis due to moving to a new school after some session and 2 pupils were removed from behavioural analysis due to having 100% absence before the intervention). For the pedagogue (control) 26 of 32 that were offered an

intervention started (3 removed from data analysis, see above). Schools had sometimes problems to find and to motivate pupils to start the intervention with a pedagogue.

Pupils who started the intervention had significantly higher number of sessions with the dog-team intervention (mean ± SD 18.2 ± 5.50, min 3 – max 24) than pupils with the special teacher intervention mean ± SD 14.2 ± 4.98, min 5 - max 21) (p<0.01, t=2.79, t-test). There were large individual differences in the number of sessions attended.

School absence

There was a reduction in % of absence per semester in the dog-team during the intervention period compared to the baseline, but it increased slightly after the intervention (Table 4). For the pedagogue team, school absence gradually decreased throughout the timepoints (Table 4). However, no significant differences between the treatments were found at all time points.

Table 4. Average school absence, learning performance, utility scores, total QALYs and total costs by trial arm over the trial period (after imputation)

| | Special Pedagogue (N=23) | | | Dog-assisted Supports (N=32) | | |
|---|---|---|---|---|---|---|
| | mean/ proportion | SE | 95% CI | mean/ proportion | SE | 95% CI |
| School absence (baseline) | 33.71 | 3.39 | 26.90, 40.52 | 41.92 | 4.19 | 33.51, 50.33 |
| School absence (during intervention) | 29.64 | 3.84 | 21.94, 37.35 | 33.85 | 3.84 | 26.14, 41.55 |
| School absence (6 months post intervention) | 30.40 | 5.20 | 19.97, 40.83 | 36.08 | 4.32 | 27.40, 44.76 |
| | | | | | | |
| Swedish (Pass) (baseline) | 0.609 | 0.102 | 0.404, 0.813 | 0.531 | 0.088 | 0.354, 0.708 |
| Swedish (Pass) T1 (during intervention) | 0.478 | 0.104 | 0.269, 0.687 | 0.563 | 0.089 | 0.387, 0.738 |
| Swedish (Pass) T3 (6 months post intervention) | 0.565 | 0.104 | 0.358, 0.773 | 0.631 | 0.090 | 0.450, 0.812 |
| | | | | | | |
| Maths (Pass) T0 (baseline) | 0.522 | 0.104 | 0.313, 0.731 | 0.563 | 0.089 | 0.387, 0.738 |
| Maths (Pass) T1 (during intervention) | 0.522 | 0.104 | 0.313, 0.731 | 0.625 | 0.088 | 0.453, 0.797 |
| Maths (Pass) T3 (6 months post intervention) | 0.609 | 0.103 | 0.405, 0.813 | 0.536 | 0.090 | 0.358, 0.715 |
| | | | | | | |
| CHU9D (baseline) | 0.767 | 0.029 | 0.707, 0.827 | 0.791 | 0.019 | 0.749, 0.822 |
| CHU9D (immediately after intervention) | 0.815 | 0.030 | 0.756, 0.873 | 0.803 | 0.020 | 0.767, 0.839 |
| CHU9D (3 months post intervention) | 0.764 | 0.033 | 0.697, 0.831 | 0.787 | 0.022 | 0.742, 0.831 |
| CHU9D (6 months post intervention) | 0.792 | 0.032 | 0.728, 0.856 | 0.799 | 0.024 | 0.750, 0.848 |
| | | | | | | |
| Total QALYs | 0.721 | 0.022 | 0.677, 0.766 | 0.728 | 0.013 | 0.701, 0.756 |
| | | | | | | |
| Total intervention costs per participant (SEK) | 5,924 | 434 | 5,053, 6,794 | 11,098 | 571 | 9,952, 12,243 |

Reached learning goals in Swedish and Mathematics

The percentage of pupils who passed Swedish gradually increased from 50% before, 55% during to 60% after the intervention for the dog team. For the pedagogue team, it decreased from 60% to 50% during intervention and then increased to 58% after. The percentage of pupils with passed Mathematics also increased from before (56%) to during the dog intervention (62%) but decreased after intervention (54%). For the pedagogue team, it stayed at 52% before and during and increased to 61% after the intervention. There were no significant differences between the dog-team and pedagogue team in either Swedish or Mathematics.

**5) What are the costs, benefits and cost-effectiveness of social working dog teams compared to other interventions performed in the school, focusing on school presence, learning goals?**

Health Economics Evaluation

 Cost-utility analysis

The dog-assisted education costed more and gained fewer QALYs compared to the pedagogue support with mean bootstrapped ICER of 1.39 million SEK per one QALY gained. At the Swedish willingness-to-pay (WTP) threshold of 500,000 SEK, the probability of the dog intervention being cost-effective was 22% and increased to 32% as WTP increased to 1 million SEK (Figure 2).
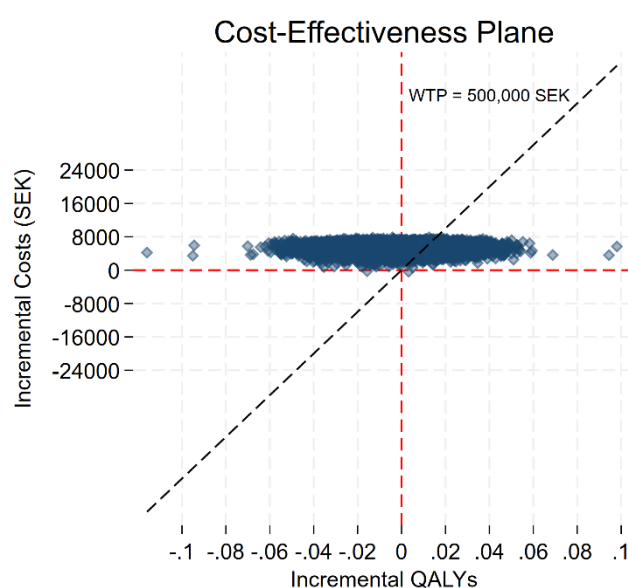


*Figure 2. Cost-effectiveness plane with 1000 bootstrapped ICER (cost per QALY) estimates plotted against Swedish willingness-to-pay of 500,000 SEK.*

Cost-effectiveness analysis

For easier interpretation, school absence percentages were converted to days of absence per semester. The dog-assisted education was more cost-effective than special pedagogue support with mean bootstrapped ICER of 4,620 SEK per one school absence day averted. The probability of dog intervention being cost-effective continued to increase with higher willingness-to-pay (Figure 3).
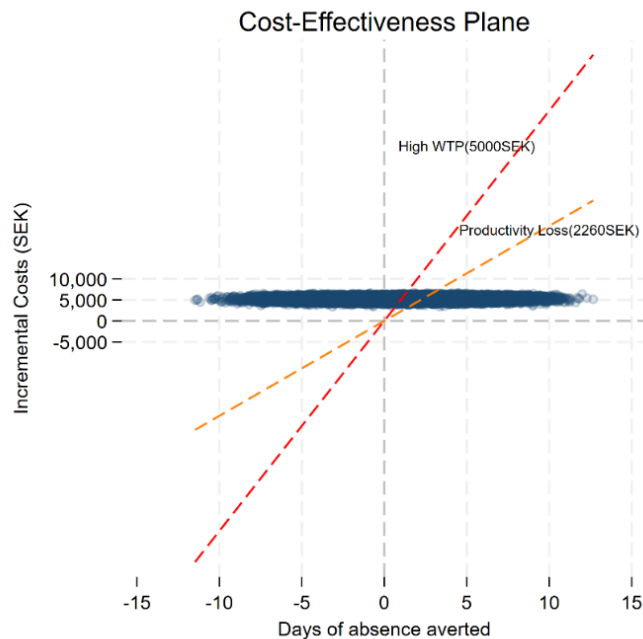
*Figure 3. Cost-effectiveness plane with 1000 bootstrapped ICER (cost per one day reduction in absence) estimates plotted against Swedish willingness-to-pay of 500,000 SEK.*

## Discussion with conclusions and practical applications

The results from this study show that there were several positive interactions between the dog teams and the pupils, which was reflected in a higher motivation to attend sessions, and more smiling and laughing by the pupils during the sessions compared to when meeting the school pedagogue. However, there were no differences in school absence or reached learning goals between the treatments, which caused the health economics analysis showing that it did not pay off to put money into the dog assisted education as it was made in this project. It should be noted that the study did not include a treatment group that did not receive any intervention, as for example a waiting list. This has been part of some earlier studies and should be included in future studies.

This study did not consider if the pupils had any diagnosis such as autism spectrum diagnose, ADHD, ADD, or any health problems, private issues or were bullied by class mates. When going through protocols from the sessions and interviewing pedagogues and dog handlers it was noticed that several of the pupils had problems that could explain why the had a high school absence. Pupils appreciated to be alone with an adult in school, and some pupils needed smaller groups to thrive in school. In future studies interviews with pupils, parents and teachers may give information so that the results could be better understood.

The dog welfare appeared to be good in this project and is probably due to that we used experienced dog handlers who were educated and had their dog/dogs approved by a special educator in this field. The schools organised that the dog teams had their own room close to an entrance or in a separate building. There were no incidences reported during any of the sessions.

When the project leader tried to organise these interventions it was noted that it was easier to get information from the school if the dog handler already worked in the school or if the school had a contact persons that made sure that the questionnaires were filled in by pupils

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at the correct time and that percentage absence per semester and learning goals were collected and sent to the project leader. In the future it may be easier to carry out a project in fewer schools and with more pupils per schools.

In conclusion, dog teams can support pupils that need extra time with an adult, and the dog can make the meeting more fun and inspire them to learn more. Having a dog team permanently in the schools is probably the best solution. But schools then have to be prepared to pay for this.

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