Brief report: The effectiveness of Dutch Cell Dogs: A multiple case experimental study

Julia E Offermans[1], Hanne M Duindam[1], Jessica J Asscher[1,2], Geert Jan JM Stams[1] and Hanneke E Creemers[1] (iD)

[1]Research Institute of Child Development and Education, University of Amsterdam, Amsterdam, Netherlands
[2]Child and Adolescent Studies, Utrecht University

Abstract

Prison-based dog training programs (DTPs) aim to improve successful rehabilitation after detention. However, empirical evidence for their effectiveness is lacking. To evaluate the effectiveness of a DTP—Dutch Cell Dogs (DCD)—on externalizing behavior, stress, self-esteem, empathy, and treatment motivation, a pilot study with a Multiple Case Experimental Design in six adolescents residing in a juvenile justice center (JJC) was conducted. Results did not provide convincing evidence for DCD's effectiveness. Further research is needed to determine whether and for whom DCD could be a useful addition to regular JJC programming.

One way to improve rehabilitation of adolescents in juvenile justice centers (JJCs), might be to implement prison-based dog training programs (DTPs), a type of animal- assisted intervention (AAI). Such programs, in which inmates train shelter dogs that are subsequently adopted into the community, aim to increase inmates' and dogs' well-being by harvesting the benefits of the human-animal bond, and to provide both with skills to facilitate reintegration into society (Fine, 2015; Furst, 2006). Although positive effects of DTPs on externalizing and internalizing behavior have been found, the limited available research in this area has major methodological flaws, that is, only few studies used a treatment-control/pre-post (-follow-up) design (Cooke & Farrington, 2016; Duindam et al., 2020). Furthermore, studies on client characteristics that may moderate DTP effectiveness, needed to fine-tune interventions, are lacking (Serpell et al., 2017). To increase knowledge in this area, we examined the effects of Dutch Cell Dogs (DCD), a prison-based DTP where detainees train, take care of, and play with a matched asylum dog biweekly in 15 two-hour sessions.

Corresponding author:
Hanneke E Creemers, Research Institute of Child Development and Education, University of Amsterdam, Nieuwe Achtergracht 127, Amsterdam, 1018 WS, Netherlands.
Email: H.E.Creemers@UvA.nl

The first aim of this study was to examine the effects of DCD on primary outcome externalizing behavior. Immediate behavioral feedback provided by the dog during the training may improve self-awareness, thereby reducing externalizing behavior (Kruger & Serpell, 2006). The second aim was to examine the effects of DCD on secondary outcomes stress, self-esteem, empathy, and treatment motivation. DCD is assumed to reduce adolescents' stress levels, as the presence of a friendly animal (Beetz, 2017; Kellert & Wilson, 1995) and support in combination with physical contact (e.g., Ditzen et al., 2007) may help individuals relax. DCD may also improve adolescents' self-esteem, because unconditional positive regard provided by dogs (Kruger & Serpell, 2006) and empowerment resulting from successful dog training might boost their self-esteem (Davis, 2007). Furthermore, DCD may increase empathy. Many shelter dogs have experienced rejection and isolation (Furst, 2006), which makes it easy for detainees to empathize with them. This may generalize to empathy towards humans (Mills & Hall, 2014). Finally, DCD may improve treatment motivation. Interaction with animals is assumed to activate implicit-experiential information processing rather than verbal information processing, thereby promoting implicit motivation (Beetz, 2017). Furthermore, active goal setting in DTPs might translate to doing so in treatments (Furst, 2006). In addition, achieving goals may enable detainees to give back to society, which can increase their motivation for attending reintegration programs (Britton & Button, 2005).

To address these aims, we conducted a pilot study with a Multiple Case Experimental Design (MCED) in six adolescents residing in a JJC. Case Experimental Designs (CEDs) can provide a strong basis for establishing causal inference (Kratochwill et al., 2010). In CEDs, participants function as their own controls, as multiple assessments prior to the start of an intervention are compared to assessments during and after that intervention. Series of single CED studies can provide insight into the effectiveness of an intervention and into client characteristics that modify effectiveness (Kratochwill et al., 2010). Because of the small sample sizes required and relatively low costs made, CED studies are increasingly conducted in practice-based intervention research (Borckardt et al., 2008). Also, CEDs have been recommended to improve the evidence base of AAIs (Kazdin, 2017).

Method

Design

This study followed an ABA'-design (Kratochwill et al., 2010) with two measurements 1 week pre-DCD (A; baseline), 15 measurements during the DCD program (B; intervention phase), and four measurements in the 2 weeks post-DCD (A'; follow-up).

Intervention

The DCD program is provided within the detention center by two dog trainers who bring and return the shelter dogs for each session. Each detainee, with a maximum of six detainees per group, is matched to a dog by the dog trainers, based on the detainees' abilities and characteristics observed during an intake.

During the semi-structured training sessions, detainees perform caring tasks, offer recreation through play, and teach their dogs basic commands through operant conditioning, meaning that they are taught to reward their dogs' desirable behavior and ignore undesirable behavior. Through this process, detainees are ought to learn how to recognize, interpret, and anticipate their dogs' emotions, body language, and behavior. Extra attention is paid to learning how to understand and handle dog aggression. The training ends with a celebratory demonstration in the presence of JJC staff, family members, and staff of the asylum centers.

To ensure safety, the dog trainers, who are experts in reading the dogs' signals to safeguard the dogs' well-being, are present during the entire training-sessions, constantly observing whether the dogs are treated appropriately. For a more elaborate description of DCD, see Schenk et al. (2018).

Subjects and procedures

Participants were five boys and one girl (aged 18–24 years) who were convicted for violent crimes and resided in a long-stay department of a Dutch JJC. They voluntarily applied for participation in DCD and were selected by JJC staff based on their motivation letter, mental and physical capacity to train a dog, and residence in the JJC for at least the duration of the training.

Prior to study participation, the candidates were informed and signed a consent form. During the research period, they individually completed a questionnaire, including the measures below, every Tuesday (non-training day) and Thursday (after that day's training session) in the presence of a research-assistant. The Ethical Committee of the University of Amsterdam approved the research project (number: 2017-CDE-7633).

Instruments

For all measures, validated self-report scales were shortened to keep adolescents motivated to participate. Selection of core items was based on face validity. To increase sensitivity to change (Smith, 2012), items were rephrased so they referred to the last couple of days, and instead of using the original Likert scaling, participants were asked to report their answers on a more fine-grained 'slider' (i.e., 0–100).

Externalizing behavior was measured with six items of the Externalizing subscale of the Youth Self Report (YSR; Achenbach, 1991), asking how many times (0–10) during the last couple of days participants physically hurt someone, disobeyed, lied, stole, used drugs, and destroyed something. Sum-scores for each participant on each time point were calculated.

For the secondary outcomes, participants indicated on a slider (0–100) how much the items applied to them. *Stress* was measured with three items of the Perceived Stress Scale (Cohen et al., 1997), that is, everything went the way I wanted (recoded); I encountered so many problems that I didn't know what to do; I was nervous/stressed. *Self-esteem* was measured with two items of the Rosenberg Self-Esteem Scale (Rosenberg, 1965), that is, I was satisfied with myself; I felt like I was a failure (recoded). *Empathy* was assessed with two items of the Basic Empathy Scale (Jolliffe & Farrington, 2006), that is, I was indifferent to the feelings of others around me (recoded); I understood the feelings of others around me. *Treatment motivation* was measured with two items of Van Binsbergen's (2003) Treatment motivation questionnaire, that is, I tried to change my behavior; I felt like it was useless to be here (recoded). For all secondary outcomes, mean-scores for each participant on each time point were calculated.

Analyses

To analyze the case series data, we used simulation modeling analysis (SMA; SMA software version 8.3.3), which is suitable when each phase consists of a relatively small number of observations (i.e., $n < 30$; Borckardt, 2006). In SMA, a bootstrapping method enables the analysis of variable changes across phases, while accounting for autocorrelation, which is the dependence of a value on the value of one or more of the immediately preceding measurements. Across phases, Pearson correlations were calculated per variable and per participant for 1) changes in mean levels (i.e., level changes) and 2) changes in data patterns (i.e., slope changes). For clinically relevant level changes (i.e., $> 80\%$; Scotti
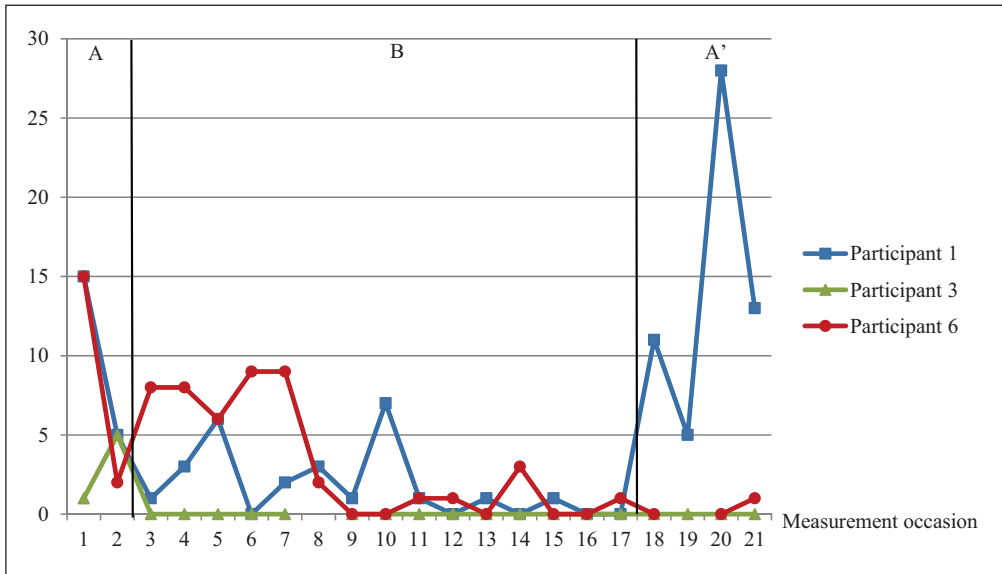
Figure 1. Externalizing behavior (number of incidents).
Only the data patterns of the participants with significant changes in externalizing behavior across phases are depicted.

et al., 1991), the Percentage of Non-overlapping Data (PND) was provided. To adjust for multiple comparisons, a Bonferroni correction was applied. Associations were considered significant at $p \leqslant .017$.

Results

Participants completed all training sessions. Participants 3 and 6 were absent for one measurement occasion. In this section, only significant results are reported. Slope changes are only reported when significant level changes are absent, since they provide additional insight into changes within phases. Full results are provided in the Appendix.

Externalizing behavior

From baseline to intervention, participants 1 ($r = -.713$, $p = .006$, $PND = 86.67\%$) and 3 ($r = -.814$, $p < .001$, $PND = 100\%$) showed reduced externalizing behavior. Participant 6 ($r = -.752$, $p = .013$) showed a further decline in slope of externalizing behavior during intervention. For participants 1 (level change: $r = .764$, $p = .002$, $PND = 75\%$) and 6 (slope change: $r = -.799$, $p = .004$), positive effects were reversed at follow-up (Figure 1).

Secondary outcomes

From baseline to intervention, *stress* decreased in participants 1 ($r = -.644$, $p = .010$, $PND = 93.33\%$) and 2 ($r = -.682$, $p = .006$, $PND = 93.33\%$), but increased in participant 6 ($r = .592$, $p = .016$, $PND = 93.33\%$). For participant 1, the decrease was reversed at follow-up ($r = .691$, $p = .004$).

Decreased *self-esteem* was observed in participant 3 from baseline to follow-up ($r = -.971$, $p = .004$, $PND = 100\%$) and in participant 5 from intervention to follow-up ($r = -.785$, $p = .002$, $PND = 100\%$).

Decreases in *empathy* were observed from baseline to follow-up in participants 3 ($r = -.997$, $p < .001$, $PND = 100\%$) and 5 ($r = -.956$, $p = .004$, $PND = 100\%$). For participant 1, the decreasing slope of *empathy* during baseline increased during intervention ($r = -.641$, $p = .014$), sharply dropped after the completion of DCD, and then gradually increased during follow-up ($r = .720$, $p = .001$).

For participant 1, the slope of *treatment motivation* sharply dropped after the completion of DCD and then gradually increased during follow-up ($r = .701$, $p = .002$).

Discussion

Two out of six participants showed reduced levels of externalizing behavior during DCD. However, in only one participant this effect remained at follow-up. Effects on secondary outcomes were either absent or in opposing directions. Therefore, our results did not provide evidence for DCD's effectiveness in reducing externalizing behavior and improving stress, self-esteem, empathy, and treatment motivation. This is in contrast with previous research showing mostly positive results of DTP's. Yet, most of these studies did not use a robust design (Cooke & Farrington, 2016; Duindam et al., 2020). In addition, publication bias (i.e., the tendency not to publish non-significant results) seems to be apparent in the research field of animal-assisted interventions (Beetz, 2017). As such, expectations based on previous research may be inflated.

The variation in effects across participants in the current study suggests that some participants (1, 3, and 6) were more responsive to DCD than others, albeit temporarily and not overall in the desired direction. Other than having a larger number of clinical diagnoses, these participants could not be distinguished from the other participants, for instance in terms of age, previous dog ownership, attachment problems, and time already served. Serpell and colleagues (2017) already argued that more research is needed to identify characteristics affecting receptiveness to AAIs, as the beneficial effects of human-animal interactions do not seem to be universal. From the perspective of personalized treatment, this information is important to improve intervention effectiveness (Ng & Weisz, 2016).

The present study has some methodological limitations that should be acknowledged. First, due to DCD's "last minute" selection of participants and the strict schedules in the JJC, the baseline and follow-up phases were relatively short ($n < 6$) and the baseline periods were not randomized. More assessments improve the stability of mean-levels per phase and randomization of baseline periods helps to rule out alternative explanations for intervention effects (Borckardt et al., 2008; Onghena & Edgington, 2005). Second, because no validated questionnaires for MCED research exist with reference to our variables, we adjusted validated instruments. This may have negatively affected the reliability and validity of our measures. We urge for the development and validation of instruments for CED research, as well as for the inclusion of multiple informants and psychophysiological measures next to questionnaires (Smith, 2012).

In sum, there was variety in how incarcerated adolescents responded to DCD. Overall, we did not find convincing evidence for the effectiveness of DCD. More (randomized) controlled studies and MCED studies are needed to gain more insight in the effectiveness of DTPs and DCD in particular, and to determine for whom such program could be a useful addition to regular JJC programming.

Declaration of conflicting interests

Funding

ORCID iD

Hanneke E Creemers [ID] https://orcid.org/0000-0001-8834-5895

Supplemental material

Supplemental material for this article is available online.

References

Achenbach, T. (1991). *Manual for the youth self-report and 1991 profile*. University of Vermont, Department of Psychiatry.

Beetz, A. M. (2017). Theories and possible processes of action in animal-assisted interventions. *Applied Developmental Science*, *21*(2), 139–149.

Borckardt, J. J. (2006). *Simulation modeling analysis: Time series analysis program for short time series data streams (Version 8.3.3)*. Medical University of South Carolina.

Borckardt, J. J., Nash, M. R., Murphy, M. D., Moore, M., Shaw, D., & O'neil, P. (2008). Clinical practice as natural laboratory for psychotherapy research: A guide to case-based time-series analysis. *American Psychologist*, *63*(2), 77–95.

Britton, D. M., & Button, A. (2005). Prison Pups: Assessing the effects of dog training programs in correctional facilities. *Journal of Family Social Work*, *9*(4), 79–95.

Cohen, S., Kamarck, T., & Mermelstein, R. (1997). *Perceived stress scale. Measuring stress: A guide for health and social scientists*. Oxford University Press on Demand.

Cooke, B. J., & Farrington, D. P. (2016). The effectiveness of dog-training programs in prison: A systematic review and meta-analysis of the literature. *The Prison Journal*, *96*(6), 854–876.

Davis, K. (2007). *Perspectives of youth in an animal-centered correctional vocational program: A qualitative evaluation of Project Pooch* (Unpublished research monograph). Portland State University, OR.

Ditzen, B., Neumann, I. D., Bodenmann, G., von Dawans, B., Turner, R. A., Ehlert, U., & Heinrichs, M. (2007). Effects of different kinds of couple interaction on cortisol and heart rate responses to stress in women. *Psychoneuroendocrinology*, *32*(5), 565–574.

Duindam, H. M., Asscher, J. J., Hoeve, M., Stams, GJJM., & Creemers, H. E. (2020). Are we barking up the right tree? A meta-analysis on the effectiveness of Prison-based Dog Programs. *Criminal Justice and Behavior*, *47*(6): 749–767.

Fine, A. H. (2015). Incorporating animal-assisted interventions into psychotherapy: Guidelines and suggestions for therapists. In A. Fine (Ed.), *Handbook on animal-assisted therapy. Foundations and guidelines for animal-assisted interventions* (4th ed., pp. 141–155). Elsevier.

Furst, G. (2006). Prison-based animal programs: A national survey. *The Prison Journal*, *86*(4), 407–430.

Jolliffe, D., & Farrington, D. P. (2006). Development and validation of the Basic Empathy Scale. *Journal of Adolescence*, *29*(4), 589–611.

Kazdin, A. E. (2017). Strategies to improve the evidence base of animal-assisted interventions. *Applied Developmental Science*, *21*(2), 150–164.

Kellert, S. R., & Wilson, E. O. (Eds.). (1995). *The biophilia hypothesis*. Island Press.

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2010). *Single-case designs technical documentation*. https://ies.ed.gov/ncee/wwc/Docs/ReferenceResources/wwc_scd.pdf

Kruger, K. A., & Serpell, J. A. (2006). Animal-assisted interventions in mental health: Definitions and theoretical foundations. In A. Fine (Ed.), *Handbook on animal-assisted therapy: Theoretical foundations and guidelines for practice* (pp. 21–38). Academic Press.

Mills, D., & Hall, S. (2014). Animal-assisted interventions: Making better use of the human-animal bond. *Veterinary Record*, *174*(11), 269–273.

Ng, M. Y., & Weisz, J. R. (2016). Annual research review: Building a science of personalized intervention for youth mental health. *Journal of Child Psychology and Psychiatry*, *57*(3), 216–236.

Onghena, P., & Edgington, E. S. (2005). Customization of pain treatments: Single-case design and analysis. *The Clinical Journal of Pain*, *21*(1), 56–68.

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton University Press.

Schenk, G., Duindam, H. M., Creemers, H. E., Hoeve, M., Stams, G. J. M., & Asscher, J. J. (2018). The effectiveness of Dutch Cell Dogs in correctional facilities in the Netherlands: A study protocol of a quasi-experimental trial. *BMC Psychiatry*, *18*(1), 218.

Scotti, J. R., Evans, I. M., Meyer, L. H., & Walker, P. (1991). A meta-analysis of intervention research with problem behavior: Treatment validity and standards of practice. *American Journal on Mental Retardation*, *96*, 233–256.

Serpell, J., McMune, S., Gee, N., & Griffin, A. J. (2017). Current challenges to research on animal-assisted interventions. *Applied Developmental Science*, *21*(3), 223–233.

Smith, J. D. (2012). Single-case experimental designs: A systematic review of published research and current standards. *Psychological Methods*, *17*(4), 510–550.

Van Binsbergen, M. (2003). *Motivatie voor Behandeling: Ontwikkeling van Behandelmotivatie in een Justitiële Instelling*. Garant.

Author biographies

Julia E Offermans, MSc, is a junior researcher at UvA Minds, an academic diagnostics and treatment center linked to the University of Amsterdam, the Netherlands. Her research focuses on the effectiveness of interventions.

Hanne M Duindam, MA, is a PhD student of Forensic Child and Youth Care Sciences at the Research Institute of Child Development and Education (RICDE) at the University of Amsterdam, the Netherlands. For her dissertation, she examines the effectiveness of a prison-based dog training program in the Netherlands.

Jessica J Asscher, PhD, is a Professor of Forensic Child and Youth Care Sciences at the University of Utrecht, Faculty of Social Sciences, and University of Amsterdam, Faculty of Social and Behavioral Sciences, Department of Educational Sciences. She has conducted longitudinal and experimental research in the field of forensic child and youth care, and has a special interest in intervention research under clinically representative conditions.

Geert Jan JM Stams, is a Professor of Forensic Child and Youth Care Sciences at the University of Amsterdam, Faculty of Social and Behavioral Sciences, Department of Educational Sciences. He has conducted research on child–parent attachment relationships, moral development, child maltreatment, and juvenile delinquency.

Hanneke E Creemers, PhD, is an Assistant Professor of Forensic Child and Youth Care Sciences at the RICDE at the University of Amsterdam, the Netherlands. Her research focuses on the development of severe child and parenting problems, including juvenile delinquency and child maltreatment and neglect, and the effectiveness and working mechanisms of interventions to reduce such problems.