

Dogs trigger attention during Animal Assisted Intervention in prison: A preliminary study

Marine Grandgeorge¹, Martine Hausberger²,
Christine Heyraud³, Astrid Hirschelmann⁴



UNIVERSIDAD DE CORDOBA



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

M. Grandgeorge^{*,1}

M. Hausberger²

C. Heyraud³

A. Hirschelmann⁴

¹ Univ. Rennes, Normandie Univ, CNRS, EthoS (Éthologie animale et humaine) - UMR 6552, F-35380 Paimpont, France

² CNRS, Univ. Rennes, Normandie Univ, EthoS (Éthologie animale et humaine) - UMR 6552, F-35380 Paimpont, France

³ Univ. Rennes, Normandie Univ, CNRS, EthoS (Éthologie animale et humaine) - UMR 6552, F-35000 Rennes, France.

⁴ Laboratoire de Psychologie Caen Normandie, EA 7452, 14032 Caen Cedex, France

*E-mail: marine.grandgeorge@univ-rennes1.fr

Abstract: Animal-assisted interventions (AAI) seem to offer promising possibilities to prevent daily conditions of inmates (overcrowding or social isolation); however, nothing is known either about the potential processes involved or impact AAI on the development of interactions between inmates. We hypothesized that either dogs would be a source and the centre of attention, thereby that dog may induce more dog-inmate interactions, or dogs would be social catalyst, i.e. facilitator of social interactions between humans. For that, we analysed first one-hour AAI sessions involving 10 adult male inmates, 7 service dogs and one dog handler. An observer recorded, using ethological methods, spatial distances between dogs and inmates and between humans, direction of inmates' gazes and their vocal behaviour. Hypothesis that dogs could be social catalyst was not supported: each inmate interacted mainly with his own dog. Own dog was the almost only exclusive partner with whom they communicated: target of their visual gazes, vocal production and physical contact. Based on literature and this preliminary research, we suggested that the animal/human ratio could be a crucial factor influencing the quality and quantity of AAI interactions.

Keywords: animal assisted intervention, prison inmate, visual attention, interaction, group

HIGHLIGHTS

- Social isolation can occur even in overcrowded situations as social bonding can have been precluded
- Dogs here are not social catalysts, i.e. facilitator of social interactions between humans
- Dogs were the almost only exclusive partner with whom inmates had physical contact, preventing social isolation

INTRODUCTION

Life in jail is characterised, amongst other aspects, by spatial and social restrictions (or overcrowding) that can lead to “a variety of health problems, injuries, and selected symptoms of psychological distress” (Bonta & Gendreau, 1990). It decreases self-esteem (Schnittker & John, 2007) and different factors have negative effects on inmates’ mental health (e.g. depression and increased risk of suicide) such as “overcrowding, various forms of violence, enforced solitude or conversely, lack of privacy, lack of meaningful activity, isolation from social networks, insecurity about future prospects” (e.g. work, relationships) (Beynon & Drew, 2001). The specific social organisation in jails, where both social isolation and overcrowding add to inmates’ supposed earlier social difficulties, is a major aspect of the difficulties inmates encounter in jail and it can impact their preparation for their future return to the « outside world » (Beynon & Drew, 2001). Social isolation can occur even in overcrowded situations as social bonding can have been precluded. Interestingly animal models provide insights concerning the processes involved: starlings, in the absence of social bonding despite being in a group, developed neurological disorders similar to those related to physical social separation, revealing that « psychological » social isolation can be as deleterious as « physical » isolation (Cousillas et al., 2006). For example, young children lacking dedicated care and attention develop atypical behaviours and cognitive and social deficits, e.g. children’s language development is slower when they are neglected (Allen & Oliver, 1982), inducing general delays in many domains (Romanian orphans: Kaler & Freemann, 1994). Spatial restrictions imposed on animals as well as social isolation or instability elicit « psychological disorders » such as stereotypic behaviours or depression-like profiles, as for instance in horses (e.g. Fureix et al., 2012; Mills & McDonnell, 2005) or primates (e.g. Camus et al., 2013; Lutz et al., 2003). In particular, individuals can become apathetic and indifferent to environmental including social stimuli (e.g. Camus et al., 2013; Fureix et al., 2012; Fureix & Meagher, 2015; Rochais et al., 2016), but in many cases, they can work harder to obtain social stimuli, a need for any social species, especially humans (e.g. Perret et al., 2015; Søndergaard & Ladewig, 2004). Jail conditions and inmates’ past experiences could however prevent social stimuli to be perceived as positive.

In order to improve well-being and also cognitive and social skills, special procedures may be required. Heterospecific interactions could help develop the intraspecific social skills of individuals with social difficulties (e.g. children with autism spectrum disorders, Grandgeorge et al., 2012a). Positive outcomes have been observed for socially deprived people (e.g. elderly living alone Garrity et al., 1989), people for who human-animal relationships can promote interactive behaviours increasing, for instance, visual awareness or seeking proximity/contact (Grandgeorge et al., 2017; Grandgeorge et al., 2012b; Hunt et al., 1992; Mertens & Turner, 1988). Such observations have been the basis for the development of animal-assisted interventions (AAI) (Grandgeorge & Hausberger, 2011) which are based on triadic interactions between a professional, a human recipient and an animal. First dedicated to various human populations (e.g. with ASD, Alzheimer disease, or physical disabilities,



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
[doi:10.21071/pbs.vi11.13330](https://doi.org/10.21071/pbs.vi11.13330)

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



Nimer & Lundahl, 2007), they have become popular in prisons as a potential tool for increasing wellbeing and stimulating social skills, the animal being here a potential social “substitute”. Some studies have however focused on such interventions with inmates, highlighting that dog-assisted interventions reduce recidivism and suggesting an increase of inmates’ patience, sense of responsibility, self-esteem and self-worth and decrease disciplinary records and tension that need to be further explore (for a review, see Cooke & Farrington, 2016; Duindam et al, 2020). For example, thank to dog assisted interventions, inmates could “build an alternative anticriminal identity” (e.g. Duindam et al, 2020, Andrews et al., 2006, Hill, 2018). However, nothing is known either about the potential processes involved or about the potential impacts these interventions on the development of intraspecific skills, e.g. interactions between inmates. Only direct observations of inmates’ behaviours during AAI sessions can help understand the potential role of this triadic situation. Moreover, questions remain concerning how they should be performed: should each inmate be attributed one particular dog so as to develop a specific bond with it or should the sessions be centered on one dog “shared” by a group of inmates? A recent study of AAI with dogs and children with ASD showed that the children’s visual attention was triggered by the dog’s presence, especially when in a situation of “social rivalry” when the dog handler focused entirely on the dog (Grandgeorge et al., 2017). Another field of researches develop the concept of attunement and synchronization (i.e. coordination of behaviors between interacting partners; for review see Duranton & Gaunet, 2016). Since first work of Daniel Stern and colleagues (1985) and development of studies about infant and mother’s affect attunement, numerous studies confirmed the importance of coordinate behaviour as crucial key for the infants development of social skills (e.g. Tronick and Cohn, 1989). To date, such concepts are extended to interspecific interactions between humans and dogs (Duranton & Gaunet, 2015). This synchronization is expressed, for example, throughout direction of gazes and behaviors linked to spatial distances (Duranton et al., 2017). This human-pet dog synchronization is frequently linked to increased affiliation and social responsiveness both in adults and children (e.g. Duranton et al., 2017; Wanser et al., 2021). Interestingly, this behavioural synchrony exists during sessions of dog assisted interventions (Pirronne et al., 2017).

In the present study, we observed inmates’ behaviours during AAI performed in a group with dogs, focusing especially on “social aspects” that could be linked to synchrony. AAI programs in jail are based on the assumption that a dog can be a social catalyst, i.e. facilitator of social interactions between humans (Messent, 1983) as observed in daily situations (Hunt et al., 1992; McNicholas & Collis, 2000), especially if they are trained especially (Eddy et al., 1988). However, given that in the present case each inmate was allocated one dog, we hypothesised that these animals would be a source and the centre of attention, thereby potentially improving inmates’ well-being (Brickel, 1982). To evaluate the influence of AAI on inmates’ well-being, we developed an ethological approach involving direct observations, focusing on key aspects of social cognition: visual and vocal attention as well as inter-individual spatial distances (Blois-Heulin & Girona, 1999; Feh, 2005; Hausberger & Cousillas, 1995; Lemasson et al., 2003; Mason, 1976; Seyfarth, 1977).



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



MATERIAL AND METHODS

Study location and dog-assisted program.

The study was performed in a French jail unit (Condé-sur-Sarthe, France) from February to May 2016. This correctional institution is especially for adult male offenders with very long sentences (over 20 years). This jail offers different types of special treatment programs to help inmates prepare to reintegrate society. The dog-assisted program was one of these programs and was proposed on a voluntary basis to all motivated male inmates who do not fear dogs and after an interview with their integration and probation officer.

This dog-assisted program was conducted in a specific room in the jail unit and was a group activity as 2-4 inmates were present simultaneously during the sessions in addition to the dog-handler (always the same woman). Each inmate was allocated a service dog by the dog-handler in accordance with the subjectively assessed inmate's and dog's temperament (i.e. 2-4 service dogs were present simultaneously). Inmates were asked their preference and in our study dog handler and inmate choices were similar. The dog-handler interacted with the inmates with an open-minded attitude and was unaware of the inmates' life history unless an inmate chose to inform her. Each session lasted one hour and there was one session per week. The intervention was semi-structured, with at least three 20-min activities during each session, namely grooming dog (e.g. brushing), feeding and finally walking it. Between activities, inmates were free to occupy themselves otherwise (e.g. inmate talked to his dog or played with a ball).

Ethical concern

Regarding service dogs, the study was conducted in accordance with the French regulations governing the care and use of animals. These animals were not research dogs but were under the supervision of an accredited dog-handler. The research was observational and did not influence dog treatment. All participants gave their free and informed consent to participate. All human-related methods were performed in accordance with the Declaration of Helsinki (6th revision) and French regulations. All procedures were approved by the penal multidisciplinary committee, including the jail administration (Commission Pluridisciplinaire Unique). All data were anonymous and neither video nor audio recordings were performed.

Participants

Inmates

Only inmates imprisoned for a long sentence (i.e. more than 10 years) and who had been in prison for at least 5 years were included after having given their consent. Eight male inmates (mean age of 38 ± 5.0 years old, min-max: 28-51 years old), with a mean sentence of 24.7 ± 3.8 years (range: 12-30 years) participated in this study. Although pet ownership or an interest for animals were not criteria for inclusion, all except one inmate had had at least one pet (i.e.



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
[doi:10.21071/pbs.vi11.13330](https://doi.org/10.21071/pbs.vi11.13330)

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



cat and/or dog) before going to jail and said they were interested in animals. To our knowledge, none was diagnosed with psychiatric or developmental disorders, but all presented relationship disorders.

Service dogs

Seven service dogs participated in this dog-assisted program: 3 males and 4 females (mean age \pm SD: 18.9 \pm 2.9 months, from two breeds: Golden and Labrador retrievers). They were provided by the Handi'chiens association where they had been trained appropriately and their behavioural evaluated (www.handichiens.org for more information). All service dogs had received the same training, which limited individual behavioural variations during sessions.

Dog-handler

A 40-years-old female dog-handler working for the Handi'chiens association animated all dog-assisted sessions. She had 20 years' experience of animal assisted interventions as a professional dog handler and had been working with inmates regularly for several years.

Experimental design

The present study focused on the first AAI session performed with each group of inmates, i.e. 2 groups of 4 inmates and one of 2 inmates. Groups were composed according to inmates' jail zone (i.e. all inmates in a group were familiar with each other). Each session lasted one hour. Dog AAI material was available, i.e. leash, ball, brush, chair and floor mat. At the beginning of a session, each inmate was introduced to his service dog by the dog-handler.

All sessions were observed by the same female observer who was unfamiliar to inmates (only one encounter before to explain the research and to obtain their consent).

Data collection and analyses

To respect correctional institution rules, no video recording material was used. All data were recorded through direct observation by the same observer, previously trained for coding interactions directly using ethological sampling methods (Altmann, 1974: instantaneous scan sampling at 2-minute intervals to record, for each inmate, the following behavioural items:

- Direction of inmate's gazes (independently of behaviour): gaze directed either towards his service dog, another service dog, another inmate, dog-handler, observer or environment.
- Target of inmate's vocal behaviour (independently of content): speech or vocalisation addressed to his service dog, another service dog, another inmate, dog-handler or observer. It could be a word, a sentence or an onomatopoeia.
- Spatial distance between inmate subject and his partners, i.e. his service dog, another closest service dog, closest inmate and dog-handler. Our spatial distance unit was one inmate's arm length: physical contact (i.e. touch the target), proximity (i.e. one to two arm lengths), medium distance (i.e. three to



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



four arm lengths) and farthest away (i.e. more than 5 arm lengths)

Instantaneous scan sampling yielded two types of data: (1) frequency (in % of scans) of the different behavioural items recorded (i.e. vocal and eye direction) and (2) frequency of time spent at a given distance category from the different partners (i.e. proximity).

Statistical analyses

As our data did not fit a normal distribution, we applied nonparametric statistical tests (Siegel & Castellan, 1988), i.e. Kruskal Wallis and Mann-Whitney U tests to compare independent samples, Friedman and Wilcoxon Signed Rank tests to compare dependent samples and Spearman rank-order correlation coefficient to compare strength and direction of associations between behaviours and inmates' characteristics (e.g. age). Power analysis was done using Kendall's coefficient of concordance. These analyses were run using Statistica software© with the accepted p-level set at 0.05.

RESULTS

Visual attention (figure 1A)

Globally, inmates gazed most of the time at living partners, i.e. humans or dogs (in only 5.64±3.86% scans were gazes directed towards the environment). Around half of inmates' visual attention was focused on their own dog (45.84±5.38% scans, Kendall W=0.779, Friedman test=38.64 p<0.001). Inmates gazed at the dog handler for approximately a fifth of the session duration (21.49±6.96%) and spent more time gazing at the observer than at the other inmates (12.41±4.18% versus 3.53±0.64% respectively; Wilcoxon test Z=2.93 p=0.003). Inmates paired with a dog gazed less at the other dogs than at their own dog (9.73±1.4%; Wilcoxon test Z=2.8 p=0.005). Inmates gazed rarely at each other (i.e. other participants were gazed significantly less 3.53±0.64% than all dogs, observer or dog handler, all Wilcoxon tests, p<0.01).

Vocal behaviours (figure 1B)

First, during approximately half the session the inmates did not talk (47.19±11.09%; Kendall W=0.779, Friedman test p<0.001). Their own dog was the privileged target of an inmate's vocal utterances (53.09±17.98%, Kendall W=0.728, Friedman test=36.72 p<0.001). Inmates directed their vocal utterances significantly more often to the dog handler than to the observer, the other inmates or the other dogs (27.88±16.87% versus 9.35±6.65%, 3.09±2.21%, 6.58±6.29%, respectively; all Wilcoxon tests, p<0.01).



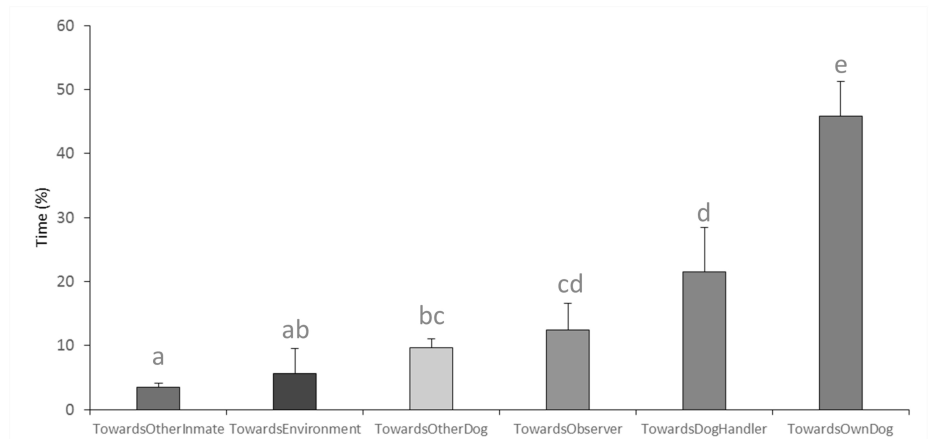
**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



(A) Visual attention



(B) Vocal behaviour

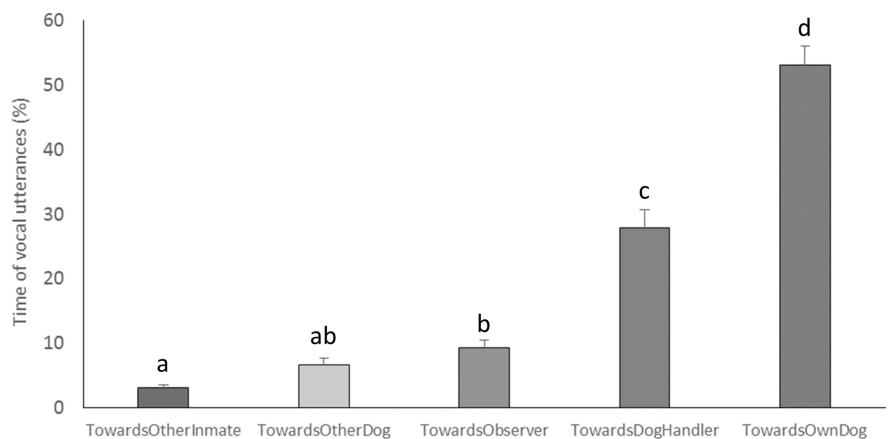


Figure 1. Direction of (A) the inmates' gazes (frequency of number of scans) and (B) the inmates' vocal utterances, towards their own dog, another dog, another inmate, the dog-handler, the observer or the environment (for visual attention only). Wilcoxon tests, $p < 0.05$ when letters differ.



Pet Behaviour Science
 2021, Vol. 11, 1 - 14
[doi:10.21071/pbs.vi11.13330](https://doi.org/10.21071/pbs.vi11.13330)

Marine Grandgeorge
 Martine Hausberger
 Christine Heyraud
 Astrid Hirschelmann

Spatial distribution and physical contact

Subjects spent most of the duration of the session in direct contact or close proximity (i.e. < 2 arms lengths) with their allocated dog that was almost exclusively the only partner with whom they had any physical contact (Kruskal Wallis test $H=33.11$, $p < 0.001$). Subjects kept farther away from the other dogs, mainly at medium distance (Friedman test $=22.44$, Kendall $W=0.762$, $p < 0.001$) and from their closest inmates (medium: $44.22 \pm 6.88\%$, and farthest: $35.77 \pm 8.23\%$, Friedman test $=23.48$, Kendall $W=0.58$, $p < 0.001$). In addition, inmates kept far from the dog handler (farthest: $69.76 \pm 7.07\%$, Friedman test $=28.92$, Kendall $W=0.749$, $p < 0.001$)



DISCUSSION

Their allocated dog appeared to be a privileged partner for the inmates, as their dog was their most frequent visual and vocal target, and was almost exclusively the only partner with whom they had any physical contact. Thus, our results support our second hypothesis: inmates seemed to interact significantly more with their own dogs to the detriment of interactions with other dogs and or humans (supposed throughout few gazes and vocalizations). Thus, the hypothesis that a dog could be a social catalyst (Messent, 1983) especially dogs trained for being service dogs (Eddy et al., 1988) seemed not supported by our data.

That dogs can be privileged partners of interactions (i.e. vocal utterances, gazes and physical contact) is not specific to our study. Indeed, dogs are powerful attractive partners and can be a source and centre of attention (Brickel, 1982). During their first encounter where several species were present, young children are attracted to the dog, seek physical contact with it and address it vocally (Nielsen & Delude, 1989). When they have the choice, children with ASD interact more frequently and for longer with an unknown dog than with an unknown human or toy (Prothmann et al., 2009). Nevertheless, the dog handler was a target of some inmates' behaviours. One may argue that the social catalyst effect of a dog could then be involved (McNicholas & Collis, 2000). However, we must keep in mind the distinctive position of the dog handler, i.e. the person who knows the dogs and the inmates. Being familiar with them could provide an optimal opening for inmates to exchange about the dogs and to interact better with the dogs. The other humans were not the target of such behaviours, as it would have been the case if the dog played the role of social catalyst. If the dog played the role of social catalyst the other humans would have been the target of similar behaviours, but this was not the case here.

Our study focused on the first AAI session, when all participants first met each other, the dogs and other humans in this context. This is first step in group building when affiliative dyads are created (Hinde, 1979). Here, at the beginning of AAI one inmate was attributed one dog that became his "own dog". One could imagine that once, AAI session after AAI session, a subject-dog relationship is established, interactions and then relationships with other individuals would develop more easily, group cohesion would become stronger, even at a triadic level (Simmel & Wolff, 1964), as observed in other animal groups (Mason, 1976; Matsuda et al., 2012). If inmates and dogs synchronize their behaviours during AAI, gaze to each other and be in physical contact, humans may benefit from these interactions (Duranton & Gaunet, 2016; Nagasawa et al, 2009; Pirronne et al., 2017). Nevertheless, we could not be sure that the relationship network never got beyond a strong dyadic level between one inmate and his own dog as, for example, no specific competition appears between them (e.g. social rivalry, Grandgeorge et al., 2017; Schneider & Krueger, 2012).

The composition of a group is crucial for the development of social skills. Even if the mother remains the first social model for many animal species to help learn social rules, other members of the group also appear important and so is



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
[doi:10.21071/pbs.vi11.13330](https://doi.org/10.21071/pbs.vi11.13330)

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



the adult/young ratio (Bertin et al., 2007; Bourjade et al., 2009). One could argue that the animal/human ratio would have a crucial influence on the quality and quantity of interactions. For example, the results of an AAI with one dog and several elderly people indicated that direct physical contact with the animal remained limited but elicited other behaviours, i.e. gazing at the dog and at the other human participants as well as increased vocal exchanges between humans (Olsen et al., 2016).

As imprisonment is a highly stressful event (Holmes & Rahe, 1967) that can lead to “a variety of health problems, injuries, and selected symptoms of psychological distress” (Bonta & Gendreau, 1990), we could expect that time spent in prison or at least length of sentence would have an effect on inmates’ behaviours. However, this was not the case here, only inmates’ age had an effect on gazes and spatial distribution. Older inmates focused more on their own dog and less on the environment (including observer), suggesting that – for them – their own dog was a more important source and a centre of attention (Brickel, 1982). This is interesting as, when adults encounter an unknown cat, seeking physical contact is not the only way to interact (Mertens & Turner, 1988), but strategy could depend of the animal species (Nielsen & Delude, 1989).

To conclude, these direct observations are the first step towards understanding the potential processes associated with benefits of AAI in jail (for reviews see Cooke & Farrington, 2016; Duindam et al, 2020). To our knowledge, nothing is known about differences of benefits between AAI performed in a group or individually, or about the influence of the animal/human ratio or species chosen. Should each inmate be attributed one particular dog so as to develop a specific bonding with it or should the sessions be centered on one dog “shared” by a group of inmates? Here, it appears that the ratio one inmate/one dog elicited more interspecific than intraspecific attention from the inmate point of view.

Although the question of whether AAI strengthens the social bond remains unresolved, the mediated relationship with an animal may have a greater impact on psychological well-being, which is part of the individual's primary needs. In this respect, this research opens up prospects for accompanying the period of execution of sentences that are in accordance with the Good lives model theories that emphasize the involvement of all external and internal elements that strengthen human capital and make desistance a positive and consciously formulated life choice (Ward & Brown, 2004). In this context, the “Programme de prévention de la recidive” (Criminal recidivism prevention program), published by the French prison administration, invites to build prevention programs which consist in bringing together a group of persons (convicted or pre-trial) presenting a common problem, linked to the type of offence committed. The aim is to use group dynamics and the use of educational tools to make participants think about the consequences of their behaviour, get them to know themselves better and give them the opportunity to adapt their behaviour to the rules of life in society. Initiatives that enhance the quality of exchanges with others are all the more important because life in jail is characterised, amongst other aspects, by spatial and social restrictions (or overcrowding). At last, the AAI may contribute to enabling the individual to invest the animal and through it a positive identity by opening up a field of



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



possibilities towards the achievement of its fundamental needs. Helping the individual to achieve his or her primary goods would therefore allow the individual to flourish and achieve a higher level of psychological well-being, which is not a neutral effect given the prison context.

We agree that our study has limitations (e.g. sample size, no longitudinal observations, no video recordings) that could not be overcome as they are inherent to prison conditions. For example, we were unable to study synchrony between inmates and dogs, as well as with others partners (both other dogs and humans) – or at least the cooperation and social interaction of the inmate with each other and with the dog. Further studies need to be developed in the prison context as well as with other populations with disorders. Nevertheless, extended contacts that can develop positive relationships are the best way to yield benefits from AAI as well as from human-pet bonds (Melson, 2005).

DECLARATIONS

Funding

Not applicable

Conflicts of interest/Competing interests

The authors declare that they have no competing interests.

Availability of data and material

Not applicable

Code availability

Not applicable

Authors' contributions

A.H., C.H., M.G. designed the experiment, C.H. organized the population recruitment, C.H. collected the data, M.G., C.H. performed the analyses, M.G. and M.H. contributed to the statistical analysis, M.G., C.H., A.H., M.H. wrote the manuscript.



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann

ACKNOWLEDGEMENT

We are grateful to the staff of both the Handi'chiens association and the French jail unit at Condé-sur-Sarthe. We thank the participants, the Foundation Adrienne & Pierre Sommer for their support, Veronique Guyot for statistical help and the French GIS CCS (Groupement d'Intérêt Scientifique - Comportement Cerveau et Société). We are grateful to Ann Cloarec for the

English improvement. In memory of Sophie Lasne, our dog handler.

REFERENCES

Albrecht, H-J., Walsh, M., & Wienhausen-Knezevic, E. (2019). Desistance process among young offenders following judicial interventions. Berlin: Duncker & Humblot.

Allen, R. E., & Oliver, J. M. (1982). The effect of child maltreatment on language development. *Child Abuse Neglect*, 6, 299-305.

Altmann, J. (1974). Observational study of behaviour: Sampling methods. *Behaviour*, 49, 227-267.

Andrews, D., Bonta, J., & Wormith, S. J. (2006). The recent past and near future of risk and/or need assessment. *Crime & Delinquency*, 52(1), 7-27.

Bertin, A., Hausberger, M., Henry, L., & Richard-Yris, M. A. (2007). Adult and peer influences on starling song development. *Developmental Psychobiology*, 49(4), 362-374.

Beynon, J., & Drew, N. (2001). Mental health and prisons. Retrieved from Geneva, Switzerland:

Blois-Heulin, C., & Girona, B. (1999). Patterns of social visual attention in the red-capped mangabey (*Cercocebus torquatus torquatus*) in the context of food competition. *Folia primatology*, 70, 180-184.

Bonta, J., & Gendreau, P. (1990). Reexamining the Cruel and Unusual Punishment of Prison Life. *Law and Human Behaviour*, 14(4), 347-372.

Bourjade, M., des Roches, A. D., & Hausberger, M. (2009). Adult-Young Ratio, a Major Factor Regulating Social Behaviour of Young: A Horse Study. *Plos One*, 4(3).

Brickel, C. M. (1982). Pet-Facilitated Psychotherapy - A Theoretical Explanation Via Attention Shifts. *Psychological Reports*, 50(1), 71-74.

Camus, S. M. J., Blois-Heulin, C., Li, Q., Hausberger, M., & Bezar, E. (2013). Behavioural Profiles in Captive-Bred *Cynomolgus* Macaques: Towards Monkey Models of Mental Disorders? *Plos One*, 8(4), e62141.

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).

Cousillas, H., George, I., Mathelier, M., Richard, J. P., Henry, L., & Hausberger, M. (2006). Social experience influences the development of a central auditory area. *Naturwissenschaften*, 93(12), 588-596.

Duindam, H., Asscher, J.J., Hoes, M., Stams, Jan, G., Stams, J.M., & 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.



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



Durantou, C., Bedossa, T., & Gaunet, F. (2018) Pet dogs synchronize their walking pace with that of their owners in open outdoor areas. *Animal Cognition*, 21 (2), 219-226.

Durantou, C., & Gaunet, F. (2015). Canis sensitivus: affiliation and dogs' sensitivity to others' behavior as the basis for synchronization with humans? *Journal of Veterinary Behavior: Clinical Applications and Research*. 10, 513–524

Durantou, C., & Gaunet, F. (2016). Behavioural synchronization from an ethological perspective: short overview of its adaptive values. *Adaptive Behaviour*, 24(3), 181–191.

Eddy, T. J., Hart, L. A., & Boltz, R. P. (1988). The effects of service dogs on social acknowledgments of people in wheelchairs. *The Journal of Psychology*, 122(1), 39-45.

Feh, C. (2005). Relationships and communication in socially natural horse herds. In S. M. D. Mills (Ed.), *The domestic horse. The evolution, development and management of its behaviour*. Cambridge: Cambridge University Press.

Fureix, C., Jégo, P., Henry, S., Lansade, L., & Hausberger, M. (2012). Towards an ethological animal model of depression? A study on horses. *Plos One*, 7(6), pp.e39280.

Fureix, C., & Meagher, R. K. (2015). What can inactivity (in its various forms) reveal about affective states in non-human animals? A review. *Applied Animal Behaviour Science*, 171, 8-24.

Garrity, T., Stallones, L., Marx, M., & Johnson, T. (1989). Pet ownership and attachment as supportive factors in the health of the elderly. *Anthrozoös*, 3(1), 35-44.

Grandgeorge, M., Gautier, Y., Brugaillères, P., Tiercelin, I., Jacq, C., Leuret, M. C., & Hausberger, M. (2017). Social rivalry triggers visual attention in children with autism spectrum disorders. *Scientific Reports*, 7(10029), 1-8.

Grandgeorge, M., & Hausberger, M. (2011). Human-animal relationships: from daily life to animal-assisted therapies. *Annali dell'Istituto Superiore di Sanità* 47(4), 397-408.

Grandgeorge, M., Tordjman, S., Lazartigues, A., Lemonnier, E., Deleau, M., & Hausberger, M. (2012a). Does pet arrival trigger prosocial behaviors in individuals with autism? . *Plos One*, 7(8), e41739.

Grandgeorge, M., Hausberger, M., Tordjman, S., Lemonnier, E., & Deleau, M. (2012b). The Strange Animal Situation: application to autistic children. *Interaction Studies*, 13(2), 165-188.

Hausberger, M., & Cousillas, H. (1995). Categorization in birdsong: From behavioural to neuronal responses. *Behavioural Processes*, 35(1-3), 83-91.

Hill, L.B. (2018). Becoming the person your dog thinks you are: An assessment of Florida prison-based dog training pro-grams on postrelease recidivism. *Corrections: Policy, Practice, and Research*, 5(3), 149-169



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann



- Hinde, R. (1979). *Towards Understanding Relationships*. London: Academic Press.
- Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*, 11, 213-218.
- Hunt, S. J., Hart, L. A., & Gomulkiewicz, R. (1992). Role of small animals in social interactions between strangers. *The Journal of social psychology*, 132(2), 245-256.
- Kaler, S. R., & Freemann, B. J. (1994). Analysis of environmental deprivation: cognitive and social development in Romanian orphans. *Journal of Child Psychology and Psychiatry*, 35(769-781).
- Lemasson, A., Gautier, J. P., & Hausberger, M. (2003). Vocal similarities and social bonds in Campbell's monkey (*Cercopithecus campbelli*). *Comptes Rendus Biologies*, 326(12), 1185-1193.
- Lutz, C., Well, A., & Novak, M. (2003). Stereotypic and self-injurious behavior in rhesus macaques: a survey and retrospective analysis of environment and early experience. *American Journal of Primatology*, 60, 1-15.
- Mason, W. A. (1976). Primate social behavior: pattern and process. *Evolution of brain and behavior in vertebrates*, 425-455.
- Matsuda, I., Zhang, P., Swedell, L., Mori, U., Tuuga, A., Bernard, H., & Sueur, C. (2012). Comparisons of Intraunit Relationships in Nonhuman Primates Living in Multilevel Social Systems. *International Journal of Primatology*, 33(5), 1038-1053.
- McNicholas, J., & Collis, G. M. (2000). Dogs as catalysts for social interactions: Robustness of the effect. *British Journal of Psychology*, 91, 61-70.
- Melson, G. F. (2005). *Why the wild things are; animals in the lives of children*: Harvard University Press.
- Mertens, C., & Turner, D. C. (1988). Experimental analysis of human-cat interactions during first encounters. *Anthrozoös*, 2(2), 83-97.
- Messent, P. (1983). Social facilitation of contact with people by pet dogs. In A. Katcher & B. AM (Eds.), *Perspectives on our Lives with Companion Animals* (pp. 45-67). Philadelphia: University of Philadelphia Press.
- Mills, D. S., & McDonnell, S. M. (2005). *The Domestic Horse: The Origins, Development and Management of its Behaviour*: Cambridge University Press.
- Nagasawa, M., Kikusui, T., Onaka, T. & Ohta, M. (2009) Dog's gaze at its owner increases owner's urinary oxytocin during social interaction. *Hormones and Behavior*, 55, 434-441
- Nielsen, J. A., & Delude, L. A. (1989). Behavior of young children in the presence of different kinds of animals. *Anthrozoös*, 3(2), 119-129.
- Nimer, J., & Lundahl, B. W. (2007). Animal assisted therapy: A meta-analysis of effects across the life span. *Anthrozoös*, 20(3), 225-238.



Pet Behaviour Science
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann





This paper has been published by
Pet Behaviour Science

under a Creative Commons license
4.0 Non-commercial - Share Alike - Attribution

As an open access journal, it is free of charges for
both authors and readers

www.petbehaviourscience.org

Olsen, C., Pedersen, I., Bergland, A., Enders-Slegers, M. J., & Ihlebæk, C. (2016). Engagement in elderly persons with dementia attending animal-assisted group activity. *Dementia*, 1-17.

Pirronne, F., Ripamonti, A., Garoni, E.C., Stradiotti, S., & Albertini, M. (2017). Measuring social synchrony and stress in the handler-dog dyad during animal-assisted activities: A pilot study. *Journal of Veterinary Behavior*, 21, 45-52.

Perret, A., Henry, L., Coulon, M., Caudal, J. P., Richard, J. P., Cousillas, H., George, I. (2015). Social visual contact, a primary "drive" for social animals? *Animal Cognition*, 18(3), 657-666.

Prothmann, A., Ettrich, C., & Prothmann, S. (2009). Preference for, and responsiveness to, people, dogs and objects in children with autism. *Anthrozoös*, 22(2), 161-171.

Rochais, C., Henry, S., Fureix, C., & Hausberger, M. (2016). Investigating attentional processes in depressive-like domestic horses (*Equus caballus*). *Behavioural Processes*, 124, 93-96.

Schneider, G., & Krueger, K. (2012). Third-party interventions keep social partners from exchanging affiliative interactions with others. *Animal behaviour*, 83, 377-387.

Schnittker, J., & John, A. (2007). Enduring Stigma: The Long-Term Effects of Incarceration on Health. *Journal of Health and Social Behavior*, 48(2), 115-130.

Seyfarth, R. M. (1977). A model of social grooming among adult female monkeys. *Journal of Theoretical Biology*, 65(4).

Siegel, S., & Castellan, N. J. (1988). Nonparametric statistics for the behavioral sciences (2nd ed.). New York: McGraw-Hill.

Simmel, G., & Wolff, K. H. (1964). *The Sociology of Georg Simmel*. London: Collier-Macmillan.

Søndergaard, E., & Ladewig, J. (2004). Group housing exerts a positive effect on the behaviour of young horses during training. *Applied Animal Behaviour Science*, 87, 105-118.

Stern, D. N., Hofer, L., Haft, W., & Dore, J. (1985). Affect Attunement: The sharing of feeling states between mother and infants by means of inter-modal fluency. In Field, T. M. & Fox, N. A. (Eds.), *Social Perception in Infants* (249-268). Norwood, New Jersey: Ablex Publishing Corporation

Tronick, E. Z., & Cohn, J. F. (1989). Infant-mother face-to-face interaction: age and gender differences in coordination and the occurrence of miscoordination. *Child Development*, 60, 85-92

Wanser, S., MacDonald, M., & Udell, M.A.R. (2021) Dog-human behavioral synchronization: family dogs synchronize their behavior with child family members. *Animal Cognition*, 24, 747-752.

Ward, T., & Brown, M. (2004). The good lives model and conceptual issues in offender rehabilitation. *Psychology, Crime & Law* 10, 3, 243-257.



**Pet
Behaviour
Science**
open access journal

Pet Behaviour Science
2021, Vol. 11, 1 - 14
doi:10.21071/pbs.vi11.13330

Marine Grandgeorge
Martine Hausberger
Christine Heyraud
Astrid Hirschelmann

