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"Effect of dogs on communication and behavior patterns of adolescents/children in a residential treatment program"

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Effect of dogs on communication and behavior patterns of adolescents/children in a residential treatment program

1. Zusammenfassung

Es gibt heute viele Belege dafür, dass die Interaktion mit Hunden den Gesundheits- und Gefühlszustand von Menschen positiv beeinflussen kann. Dabei können Hunde als soziale Katalysatoren oder Eisbrecher wirken oder auch als soziale Unterstützer in belastenden Situationen dienen. In dieser Masterarbeit habe ich mich auf die Frage konzentriert, ob die Anwesenheit eines ruhigen und freundlichen Hundes die Interaktions- und Kommunikationsmuster von Kindern beeinflusst, die in einer Einrichtung für Jugendliche aus schwierigen Verhältnissen untergebracht sind.

“Lebensraum Heidlmair ®” ermöglichte es uns, zehn verschiedene Gruppen mit jeweils 9 bis 12 Mädchen und Jungen zwischen 5 und 17 Jahren mit individuellen Vorgeschichten mit Anpassungs- und Lernschwierigkeiten usw. zu beobachten. Die Daten wurden in Gruppensituationen während des Abendessens aufgenommen, wenn die meisten Gruppenmitglieder anwesend waren. Diese Situationen wurden in jeder Gruppe zweimal mit Hund (Testsituation) und zweimal ohne Hund (Kontrolle) gefilmt. In den vier Testsituationen wurden insgesamt 50 Kinder beobachtet, die immer anwesend waren. Mithilfe des Solomon Coder ® wurde das Verhalten dieser Kinder auf individueller Ebene (sprachliche Äußerungen, Bewegungen bzw. Anzeichen von Nervosität, Interaktionen, emotionaler Ausdruck), zusätzlich zu verschiedenen Beobachtervariablen (Lautstärke, Atmosphäre), kodiert. Außerdem ermittelten wir die Kortisolgehalte dieser 50 Kinder und deren Betreuer mit Hilfe eines Enzymimmunoessays (EIA). Hierfür nahmen wir Speichelproben vor und nach jeder Gruppensituation mit und ohne Hund, um die Werte vergleichen zu können.

In Anwesenheit des Hundes kommunizierten die Kinder mehr, während die Redezeit gleichmäßiger unter ihnen aufgeteilt war. Gleichzeitig hatten sie mehr Augenkontakt, statt nur mit ihrem eigenen Essen beschäftigt zu sein. Auch verringerte sich die Dauer aggressiven Verhaltens und es war mehr fröhliches, lustiges Verhalten beobachtbar. Die Anwesenheit eines Hundes führte zu weniger Angst, erleichterte soziale Interaktionen und entspannte die Kinder. Diese Effekte waren stärker bei Kindern zu beobachten, die jünger als 12 Jahre waren als bei älteren. Außerdem waren Atmosphäre und Lautstärke angenehmer als ohne Hund im Raum.

Im Gegensatz zu den klaren Verhaltenseffekten unterschieden sich die Kortisolwerte im Speichel der Probanden zwischen An- und Abwesenheit des Hundes nicht.

Kinder und Betreuer fühlten sich in der Anwesenheit eines Hundes unmittelbar wohler und die Kinder werden in dieser Atmosphäre ihre sozio-emotionalen Kompetenzen leicht verbessern können.

2. Abstract

Recent evidence indicates that interacting with dogs can significantly support human well-being and health. Dogs can function as social catalysts or ice-breakers as well as social supporters in potentially stressful situations. I presently focused on the question whether the presence of a calm and friendly dog would make a difference regarding interaction and communication patterns of children in a housing program for challenged juveniles.

The “Lebensraum Heidlmair ®” offered the possibility to investigate ten different co-housed groups of nine to 12 male and female children and adolescents aged of 5 to 17 years of age, socially challenged individual pre-histories of disorders in adjustment, conduct, learning, etc. Data was gathered in group situations during dinner, when most group members were present.

These situations were video-taped twice per group in the presence of a friendly dog (experimental situation) and twice in its absence (control). The footage of those 50 children present in all of the four situations video-taped during every observation was behavior-coded on an individual level (verbal expressions, sitting and signs of nervousness, interactions, emotional expressions) and observer-rated (noise level, social atmosphere) for more integrative variables with the help of the Solomon Coder ®. In addition, we measured cortisol levels of these 50 children and their educators in the four situations by an enzyme immunoassay (EIA) in saliva samples to compare the children's cortisol levels before and after every group situation in the dog and non-dog settings.

In the presence of a dog children communicated more and talking was more evenly distributed over the groups than without a dog. With the dog present children had more eye contact during conversation instead of just being busy with their food; the duration of aggressive behavior decreased, and cheerful behavior increased. The presence of a dog led to lower levels of anxiety. It facilitated social interactions and calmed the children down. Children sat in a relaxed way more often, erratic locomotion decreased, and they showed less signs of nervousness. These effects were stronger in children younger than 12 years of age compared to older children. This lead to a more pleasant social atmosphere in the group and lower noise levels than during the dog’s absence. Despite these clear behavior results, cortisol levels did not differ between the dog or non-dog condition.

The children as well as their care takers felt more comfortable in the presence of a dog. Thus, they will be able to improve their socio-emotional skills more easily in this atmosphere.

3. Introduction

The presence of animals can have remarkably positive effects on the physical and psychological state of human beings, via subconscious calming ("biophilia effect") and/or via emotional social support via activation of the oxytocin system (Julius et al. 2013). Particularly the impact of dogs has been investigated in recent years, and the findings indicate that interacting and living with dogs may enhance the well-being and health of humans (e.g. Beetz et al 2012).

3.1 Human-Animal-Relationship

It seems to be a unique feature of human beings to engage in social relationships with non-human animals (Podberscek et al. 2000, Robinson 1995, Serpell 1986, Wilson 1984). The possibility to socialize with other animals may root in a common "social-toolbox" (Kotrschal 2009, Julius et al. 2013), such as conservative brain structures, physiological mechanisms as well as evolutionary dispositions which are responsible for making social decisions (Goodson 2005, Julius et al. 2013, Kotrschal 2009). Vertebrates from fish to mammals share identical brain modules, particularly the "social network in the brain" (Goodson 2005), which are the most conservative brain areas from an evolutionary point of view (Nieuwenhuis et al. 1998, Welkner 1976). Hence, the brain centers for instinctive socio-sexual behavior have hardly changed over the last 400 Million years and also host the physiological mechanisms for bonding. We share evolutionary conservative emotional systems (Panksepp 2005) and mirror neurons that enable social animals to synchronize as a group (Rizzolatti & Craighero 2004, Rizzollatti & Sinigalia 2007). Furthermore, the prefrontal cortex represents the basis for learning aptitude in social responsibility (Julius et al. 2013, Kotrschal 2009). Other physiological functions such as the hypothalamic-pituitary-adrenal axis and sympathico-adrenergic stress axis are also a common basis of social systems (Kotrschal 2005, McEwen & Wingfield 2003). These similarities among vertebrates, owed to a common origin, provide the potential to develop truly social and individualized relationships between humans and their companion animals.

3.2 The role of dogs

The interspecific relationship between dogs and humans has developed over at least the last 30,000 years (Leonard et al. 2002, Jun-Feng Pang et al. 2009 Thalmann et al., 2013; Skoglund et al., 2015), rather than 100,000 years proposed more than a decade ago (Serpell 1995, Vilá et al. 1997, Savolainen et al. 2002). It cannot be excluded that living with dogs even contributed to the development of human social skills (Lorenz 1983, Schleidt and Shalter 2003).

Domestic dogs, as well as other companion animals with which humans engage in close social relationships (e.g. cats, Kotrschal et al. 2014), may assume socially supportive roles in potentially stressful situations. Stress is usually reduced on the psychological and physiological levels during interaction with a calm and friendly dog (Allen et al. 1991; Beetz et al. 2011; Julius et al. 2013; Nagengast et al. 1997). Particularly, body contact with the animal results in decreases in heart rate, blood pressure and the level of the stress hormone cortisol. Furthermore, the mere presence of a dog leads to lower levels of anxiety, loneliness and depression (Garrity at al. 1989; Folse et al. 1994) and simultaneously to increased self-confidence, supporting to feeling of competent and autonomous (Beck and Katcher 1983; Triebenbacher 1998 (a)). This is presumably possible because of human "biophila", the inherent love of humans to other animals and nature (Wilson, 1984), making it possible for animals to function as social supporters. In the context of trustful relationships the oxytocin-system gets activated and functions as the antagonist of the stress-systems. Thus, the mere presence of a dog can calm people down (Julius et al. 2013).

Apart from such direct effects of domestic dogs on an individual, animals may be efficient agents for training prosocial behavior in children, they may play socializing roles and can function as social catalysts or "ice-breakers" by facilitating interpersonal interactions: "a large spectrum of social behaviors is influenced by the presence of dogs" (Gueguen and Ciccotti 2008). The company of a friendly dog makes others perceive their handlers as being more positive and rate them as more trustworthy (Wells 2004) and dogs can also open up patients/clients for communicating with therapists (e.g. Levinson 1964, Sams et al. 2006), in particular, children, but adults also. In a group/classroom setting the presence of a dog decreased aggressive behavior and hyperactivity in some children, improved social integration, attentiveness towards the teacher and motivation to attend school (Kotrschal and Oberbauer 2003). These findings, combined with those of Hergovich et al. (2002), showing a

better integration and at least a trend of fewer aggression amongst the children, imply that the atmosphere in these groups improved due to the presence of a dog. While girls were mostly more directly engaged with the animal present (Wedl and Kotrschal 2009), the animal effect on behavior was usually more pronounced in boys (Kotrschal and Ortbauer 2003). An invariable interest in animals is also a feature of toddlers in any culture and is one of the strongest indications of human biophilia (Julius et al. 2013).

It seems that growing up in the presence of a dog supports the development of social competence, primarily via increased general empathy in children growing up with companion animals in comparison to peers growing up without companion animals (Bryant 1985, Endenburg and Baarda 1995).

All these positive effects of dogs have led to their widely distributed employment in animal assisted therapies (Beetz et al. 2012 (a)). For instance, children with pervasive developmental disorders were able to develop a more playful mood, were better able to concentrate and had more awareness of their social environment through therapy session in the company of a therapy dog (Martin and Farnum 2002).

Humans are clearly social beings not only among themselves but also in their orientation towards other animals (De Loache et al. 2011, Kellert and Wilson 1993, Louv 2005, Wedl and Kotrschal 2009, Wilson 1984). In his attachment theory, Bowlby (1969) describes the need of children to develop a stable social and emotional system in the presence of at least one sensitive and reliable primary caregiver. Hence, socio-emotional development is influenced by relationships. In addition, stress regulation, also hormonal, depends on the quality of attachment representations (“Internal Working Model”; Bowlby 1969) between children and their primary caregivers, usually their parents. Insecurely attached children, for example, tend to exhibit significantly higher cortisol increases after exposure to fearful strange events compared to children with a secure attachment to their parents (Gunnar 1998). In the absence of reliable and sensitive caregivers children tend to develop insecure or even disorganized attachment representations, which increases the likelihood of suboptimal executive functions and a multitude of mental and behavioral disorders (Ainsworth 1979, Main and Solomon 1986, 1990).

3.3 What children need and possible support by dogs

It is suggested that attachment behavior results in attaining or maintaining proximity to a faithful figure, which in turn will enable the attachment behavioral system to be turned off and calm the child down (Ainsworth 1989). This is an important prerequisite for exploring the world and therefore, for cognitive development. A securely attached child is able to develop a positive perception of its social environment; insecure attachment patterns can reduce the ability to use the caregiver´s presence for stress regulation, which may impair the ability to explore and learn. Insecurely attached children show less well-developed interpersonal skills, empathy or strategies for conflict resolutions (Julius et al. 2013), which also affects their ability to engage in trustful new relationships.

"Lebensraum Heidlmair ®" is an organization hosting and working with vulnerable children, many of which are showing insecure attachment representation up to a level of 100 % in the beginning of their stay. The organization tries to support and facilitate behavior and attitudes of children by providing companionship of a dog (belonging to the staff). It is this aspect of human-dog relationship that will be analyzed in this study. The presence of a dog in this environment is very promising, because bad experiences in relationships with an attachment figure are transferred to other humans (so called "transmission of attachment" e.g. towards teachers, therapists, partners), but not, or to a much lesser degree, in spontaneous encounters to animals. Insecurely attached children are able to show secure attachment behavior towards animals and dogs have shown to dampen stress in a challenging situation for these children (Beetz et al. 2011, 2012 (b)). Furthermore, positive interaction with a dog may also stimulate attachment behavior towards humans and reduce stress (Julius et al. 2013). Different studies show that even companion animals can function as attachment figures to a certain degree (e.g. Kurdek, 2008). Thus, a dog may facilitate first approaches to building trust and social relationships (Levinson 1964). In addition, companion animals can fulfill the human need for a partner, who responds to good care with attention (Olbrich and Otterstedt 2003, Podberscek et al. 2000, Serpell 1986). Relationships with companion animals might also be facilitated by the fact that animals do not have the same needs and requirements as human partners. Their love and affection is more uncompromising and more asymmetric than most of conspecifics could or would give and companion animals do not judge the human partner, making the relationship less complicated (Watanabe and Kuczaj 2013). These are very good preconditions for children with adjustment disorders to make the first step to find a way back

to normal social life with the help of a dog via improving their social skills and thus their behavior.

3.4 Purpose and hypothesis

Remarkable effects of dogs on humans have been shown in previous studies (e.g. Allen et al. 1991, Beetz el al. 2011, Beetz et al. 2012 (a), Levinson 1964, Sams et al. 2006, Wells 2004). In order to evaluate the underlying mechanisms and causality of these findings, we analyzed communication and behavior patterns of children in a group situation in the presence or absence of a friendly dog. Contrary to our null-hypothesis that the dog has no influence on children's behavior, our working hypothesis was that parallel to the findings of Kotrschal and Ortbauer (2002) or Beetz et al. (2012) the presence of a dog improves the atmosphere and influences social and communication patterns beneficially.

In our setting, the possibility for children to interact with the dog present was limited. Nevertheless, we predict that the presence of a calm and friendly dog influences the communication patterns in a way that both the rates of communication as well as positive social interactions increase due to the biophilia-effect (Julius et al. 2013). Furthermore, we anticipate that both sex and age of the children influence the dimensions of change in behavior through the impact of the dog, with the impact being more distinctive in boys (Kotrschal and Ortbauer 2003) and younger children (Julius et al. 2013, Wedl et al. 2009). As the people’s interest in animals becomes more differentiated the older they get, a high interest was being expected in nearly all of the younger children. Based on the findings of Kotrschal and Ortbauer (2003) as well as Hergovich et al. (2002) we predict a better atmosphere in the group in which the dog is present due to both a reduced aggressiveness and hyperactivity. Amongst others, this could be due to the children becoming more calm and relaxed and their mood will improve with the help of social support by a dog. In addition to behavioral effects, we also predict a reduction of physiological stress, as measured in lower levels of salivary cortisol in the presence of the dog.

4. Methods

4.1 Subjects

Ten different groups, each made up of 9 to 12 male and female children (aged between 5 and 17) living the organization “Lebensraum Heidlmair ®” located in Upper Austria, Lower Austria and Burgenland were investigated together with their pedagogues. In the groups we focused on 50 of these children (22 female, 28 male) which were present during every observation. All children had adjustment disorders and or were diagnosed with further disorders, such as conduct or learning disorders. They were from difficult family situations; some parents sent their children into the welfare accommodation on a voluntary basis, others were forced to due to the child's welfare being threatened. The length of stay in the accommodation at the time of our recordings varied from three months to seven years, with an average of three years. Regular visits home are aspired to, but 20 % of the children met their family less often than once a month. Pedagogues cared for the children and accompany them from kindergarten to school until they complete an apprenticeship to enable them to live independently in their own home.

Two dogs (1 female, 1 male) were employed. Both of them were adopted as puppies by their owners. The female dog, a Labrador Retriever, was eight years of age, spayed and a certificated therapy dog. She was employed in one of the ten groups, which consisted of six children. The male dog was a crossbreed of Border Collie and Munsterlander, uncastrated and seven years old. He was not a trained therapy dog, but behaved children-friendly and was evaluated as kind and friendly to humans. He was present in nine groups with 44 children whose behaviors were coded.

4.2 Procedure

A few days before the project started, the children were introduced to the dogs and allowed to play or train with them and feed them if they did not know the dogs before and we made sure that there were no children with a phobia of dogs. Video-recordings were made by two different persons, who also introduced themselves a few days before the observations. Fourty one of the 50 children were used to the situation of having a dog present, either because an educator’s dog was present in the group on a regular basis or because their parents owned a

dog. This means that only the filming was new for most of them and not the fact that a dog was present. Therefore we assume that results are really influenced by the dog.

Consent for participation in the study was given either by the children's parents or their legal guardian, who was their social worker in most cases; they were informed about the procedure of the research, with the proviso that they were not told about the exact research question in order to keep them free from bias.

Recordings were then made to collect behavioral data on an individual basis to understand how a dog influenced the behavior and communication of the children. The children were observed in a group situation during dinner, when mostly all members of the group were present and tended to spend some time together. This monitoring occurred twice in the presence of a dog and twice in its absence, in a counterbalanced way. In half of the groups we started the observations with a dog, in the other half without. At least two days were planned between two successive observations per group (one with dog, the other one without) and about one week before a repetition of the same setup (both either with dog or without).

We decided to employ these two conditions (with and without dog) during dinner and not to add a third one with a toy dog as was done in other studies (Hergovich et al. 2002, Beetz et al. 2012 (a)) to avoid overburdening the children with too many appointments.

To create situations that were as standardized as possible, children and educators were asked to organize all dinners in similar ways, which meant seating arrangements between children were the same. Furthermore, in every group, dishes and food were arranged on the table before eating and then the recording started.

Depending on the group size one to two HD video cameras (Everio, JVC, GZ-EX215) were set up on tripods in the prepared room. They were fixed in such a way that every group member was visible on the screen and nobody concealed another person. Once the children and their educators had sat down, saliva samples were taken from them (below), then the recording started. In sessions with a dog present, its owner was inside the room as well, but was not involved in the dinner or the conversations and interactions between the children and educators. The dog was free to move wherever it wanted to, but nobody was allowed to feed the dog from the table unless everyone had finished dinner. Furthermore, children were generally not allowed to touch the dog during dinner for hygienic reasons.

In sessions without a dog, another person of the research staff replaced the dog handler in the room to control for the presence of an unfamiliar person in the dog situation, but was also not involved in the interaction in order to achieve comparable conditions.

As expected, dinners varied in duration. In any case, the camera was stopped after 20 minutes of recording. If dinner finished earlier, participants were asked to remain seated at the table until these 20 minutes were over. After a short time lag and after participants had rinsed their mouths with some fluid, a second saliva sample was taken from each child.

4.3 Saliva samples

We took two saliva samples of the participants every time they were filmed, resulting in a total of eight samples from each person, to assess the concentration of cortisol and thereby their stress level. Saliva was collected via standardized Salivettes (Salivette Cortisol, Sarstedt), small cotton cylinders that need to be kept in the mouth for one minute and then put back into a plastic tube. The first samples were taken right before the camera started filming, the second approximately 30 minutes after the first. We tried to keep the time lags of equal length but had to put up with the fact that they differed a little from group to group or from evening to evening. We focused instead on creating a relaxed atmosphere and did not want the children to become impatient if they had to wait too long after dinner or to rush them if they had not finished early enough. We waited for at least 10 minutes after dinner and let the children rinse their mouths with the grape juice as they had for the first sample. Saliva samples were frozen at -20°C immediately after every session until analysis in the laboratory.

4.4 Analysis of saliva samples

The cortisol level in the saliva samples was analyzed via an enzyme immunoassay (EIA) at the Department of Behavioral Biology at the University of Vienna as described by Palme and Möstl (1997).

4.5 Questionnaires

Demographical data of the children were collected through a standardized questionnaire including sex, age and background information such as length of residence in the residential treatment program, how often they met their family and whether the children were used to a dog being present in general, both at home and in the accommodation.

Furthermore we asked the children and their educators to evaluate their relationship by answering questions concerning trust, treatment, esteem or how much they like and know each other. The answers were to be given on a 5-level Likert scaling and were not used for statistical analyses later. It turned out that not all the children answered the questionnaires regarding their favorite and closest educator and hence the answers were not comparable. But the procedure of obtaining the answers was important to establish contact with the people and win their trust. As most children were not able to read or understand the questions, the person who filmed them during the study took some time to help them answer the questions. Neither the children nor the educators were allowed to see the answers of the others.

4.6 Video analysis

Videos were analyzed with the program Solomon Coder© (Version: beta 14.10.04), starting at 00:00:30 and stopping at 00:20:00, to obtain a total of 19.5 minutes observation time for each child. The main observer was Katrin Martens and a few randomly chosen sequences were cross-checked by Katharina Hutter for inter-observer reliability. The correlation coefficient of inter- and intra-observer reliabilities was 0.996.

We applied the focal sampling method, meaning that we observed one particular child on the video and coded the predefined behavioral categories to gain a detailed idea of the individual behavior.

Three classifications were coded via continuous recording and measured in duration:

1. Verbal expressions:

   These were coded in three different categories:

   a) Communication: Telling/asking/answering something, making noises (“hm, mhm...”) which some consider an answer; singing understandable texts, not just humming; voice is not agitated and at a normal volume.

   b) Aggressive: Answering in a really unfriendly, loud, impatient voice, using invective language or saying mean things, hitting others

   c) Funny/Cheerful behavior: Just laughing or telling something while the child is laughing or smiling

2. Sitting:

   This classification includes four different possibilities of behavior while sitting, with one of them being coded at any one time:

   a) Sitting in an unsettled manner: Restless leg, moving the body back and forth, extreme head shaking, more than one change in position within five seconds, scratching really badly, playing with objects
   b) Sitting in a relaxed manner: Normal movement while eating, including reaching for food and all movements that are necessary to reach any wanted object
   c) Sitting calmly: Nearly no movement, eyes "stare," apparent "daydreaming," also when ticks occur
   d) Standing up: When children stand up and either leave the table or stay. Only coded when standing up is not necessary to reach something. For example standing while making a sandwich.

3. Interactions

   Interactions could occur between two persons or in the whole group:

   a) Between two persons: The children might have interacted among each other or with their educator. Actions such as giving somebody food or anything else directly into the other's hands and body contact with somebody else were coded for the one who initiated the interaction. Aggressive interactions (hitting) were also coded as aggressive behavior at the same time.
   b) Group-interaction: This was coded when 3 or more children/educators showed the same behavior simultaneously, for example a ritual before dinner or singing together.

One classification was recorded continuously, but the frequency rather than the duration was counted.

1. Signs of nervousness

   Every time when any sign of nervousness occurred it was coded. If the same sign happened two times in a row (meaning less than five seconds in between) it was only

coded once. If it was interrupted by any other nervous indication, three signs were counted. Signs of nervousness included:

Touching legs, face or head, scratching, putting finger into mouth (without food), shaking cutlery, rubbing hands/fingers, putting hands together, shaking head vigorously or as in a movement to get hair out of the face, blinking an eye very often in a short time (more than usual), adjusting glasses, making grimaces, pressing lips together, playing with objects or food, moving objects back and forth, sniffing, clearing the throat or coughing.

Three other parameters were coded instantaneously at specific moments. Every 30 seconds, we evaluated the child's expression. Additionally, we evaluated noise level and atmosphere in the whole group.

1. Emotional expression: Eight different expressions were defined
    a) Listening: The child looked at the others and seemed to be attentive and interested in the events, while telling something or listening to others talking. This was also coded when the child obviously turned around to listen to somebody else and the face was not visible any more.
    b) Neutral: The child was busy with his/her own food or just looked at the table. He/she seemed to be quite impassive and did not participate in the conversation.
    c) Laughing: The child laughed about other's comments or about those he/she made.
    d) Smiling: The corners of the mouth were upturned, the expression indicated amusement, pleasure or favor. No typical laughing noises were audible.
    e) Sad: The child looked obviously sad, because he/she cried had just experienced something sorrowful. To code this expression, it was really necessary to follow the background conversation.
    f) Nervous: When any sign of nervousness as described above arose at a particular time, this expression was coded.
    g) Angry: The child showed anger, characterized by mean and angry words or shouting loudly.

h) Bored: The child rested his/her head on their hands, yawned, picked at the food with the cutlery and was absolutely not interested, let alone willing to participate in the conversation of the others.

In addition to recording the individual behavior we wanted to survey the behavior of the whole group. Therefore we used scan sampling and rated both noise level and atmosphere for the whole group at certain moments.

2. Noise level

We rated the noise level in the group on a scale of one to three every 30 seconds.

(1) It seemed that nobody knew what to say and it was really quiet in the room. It might also have been the case that it were always the same two people who talked while the others were not involved and were busy with something else and just asked for food or the like in between. When this lasted for more than one minute, the noise level was rated with one. Another possible situation for this rating was when educators talked only with each other while the children were not involved and did not make any comments.

(2) The parameter for the second level of intensity was an ongoing conversation at a normal volume. Nobody had to raise their voice for others to be able to understand them.

(3) We chose the last level of intensity on the scale when it was rather noisy in the room and therefore hard to understand what people said. When this was the case, many different people were talking and different topics were being discussed at the same time. An additional criterion was when the educator announced that it was too noisy in the room.

3. Social atmosphere

We rated the atmosphere on a scale of one to three every 30 seconds just as we had done for the noise level.

(1) There was a tense and aggressive atmosphere and the children talked in a rude tone.

(2) Normal conversations at a normal volume were being carried out, no special events occurred such as aggressive behavior or comments.

(3) More than half of the group members laughed together.

4.7 Statistical analysis

Data were analyzed with IBM SPSS Statistics 22.0. Both behavioral data and cortisol levels of saliva samples were not normally distributed (Kolmogorov-Smirnov Test). Therefore the non-parametric Wilcoxon-Test for dependent data and the Mann-Whitney-U-Test for independent data were used. All significances ($p<0.05$) are given two-tailed. The measured frequencies and durations of different behavior were compared between the two conditions with and without a dog present, while the change of cortisol levels during the course of one observation was calculated as difference between the second and the first sample.

5. Results

5.1 Individual behavior parameters/duration

5.1.1 Verbal expressions

On average, children talked statistically more when a dog was present (Wilcoxon Z=-2.6, p=0.01). They talked 11.7 % (SD± 6 %, 1,1 % - 50.5 %) of the time when a dog was present and 10 % (SD± 6.1 %, 0.4 % - 29.2 %) when no dog was in the room (Fig. 2). Thirty two individuals (14 female, 18 male) talked more (longer duration), whereas 18 individuals (eight female, ten male) talked less in this situation (Fig. 1).

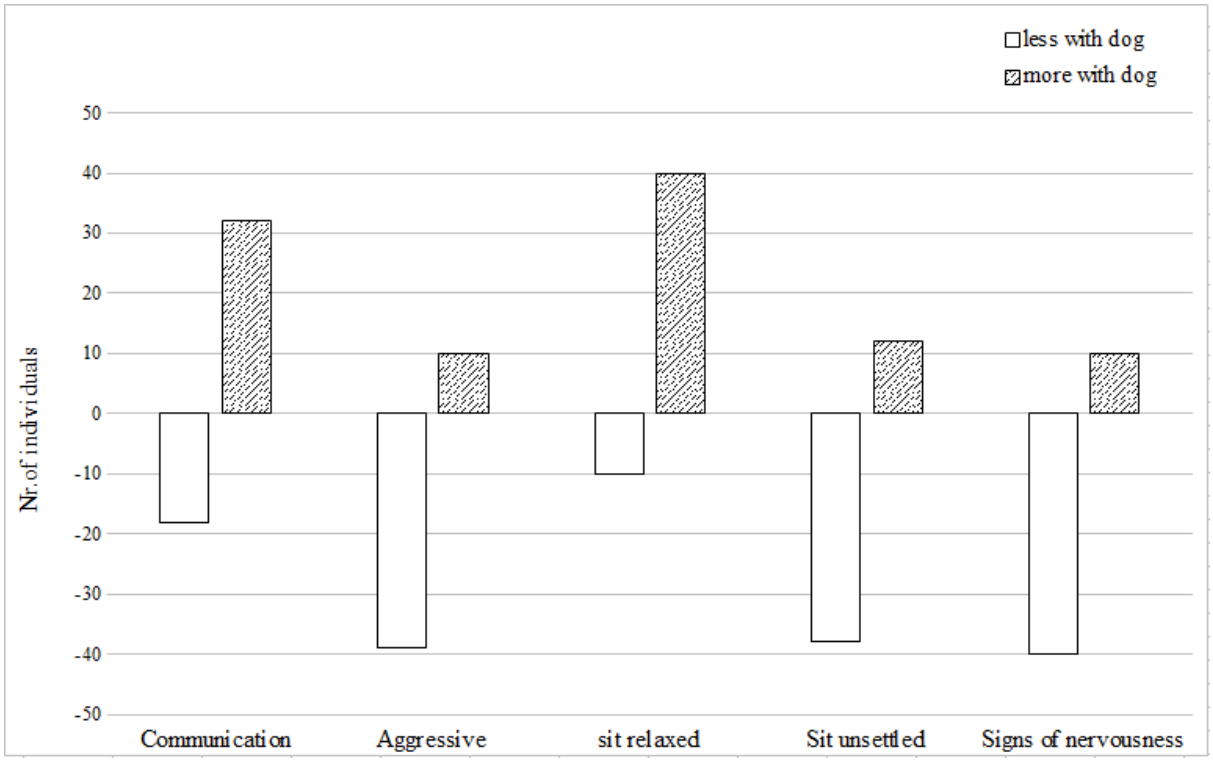

Fig. 1: Individual differences per behavioral parameter. It is shown how many individuals influenced the statistical differences of some selected behavioral parameters and whether one behavior occurred more or less often per individual with a dog present compared to no dog in the room.

5.1.2 Aggressive and cheerful behavior

With a dog present in the room children spent significantly less time with aggressive behaviors (Wilcoxon Z=-4.6, p<0.0001). On average, aggressive behavior was shown 0.4 % (SD± 0.4 %) of the time when a dog was in the room as compared to 1 % (SD± 1.3 %) without a dog. The highest values were 1.9 % with a dog present and 6.8 % without a dog (Fig. 2). Thirty-nine children (16 female, 23 male) showed less, ten (six female, four male) more aggressive behavior in the presence of the dog (see Fig. 1). Furthermore, seven children showed no sign of aggressiveness in the presence of a dog compared to two children in the no-dog condition.

Cheerful behavior or laughing occurred more often with a dog present (Wilcoxon Z=-2.09, p=0.037; Fig. 2), on average 4 % (SD± 3.5 %) of observation time with a dog and 2.73 % (SD± 2.4 %) without. The longest duration an individual spent laughing when a dog was present was 17 % compared to 11 % when no dog was present. Thirty children (12 female, 18 male) laughed more when a dog was present and 20 children (ten female, ten male) laughed less (similar to communication, Fig. 1).

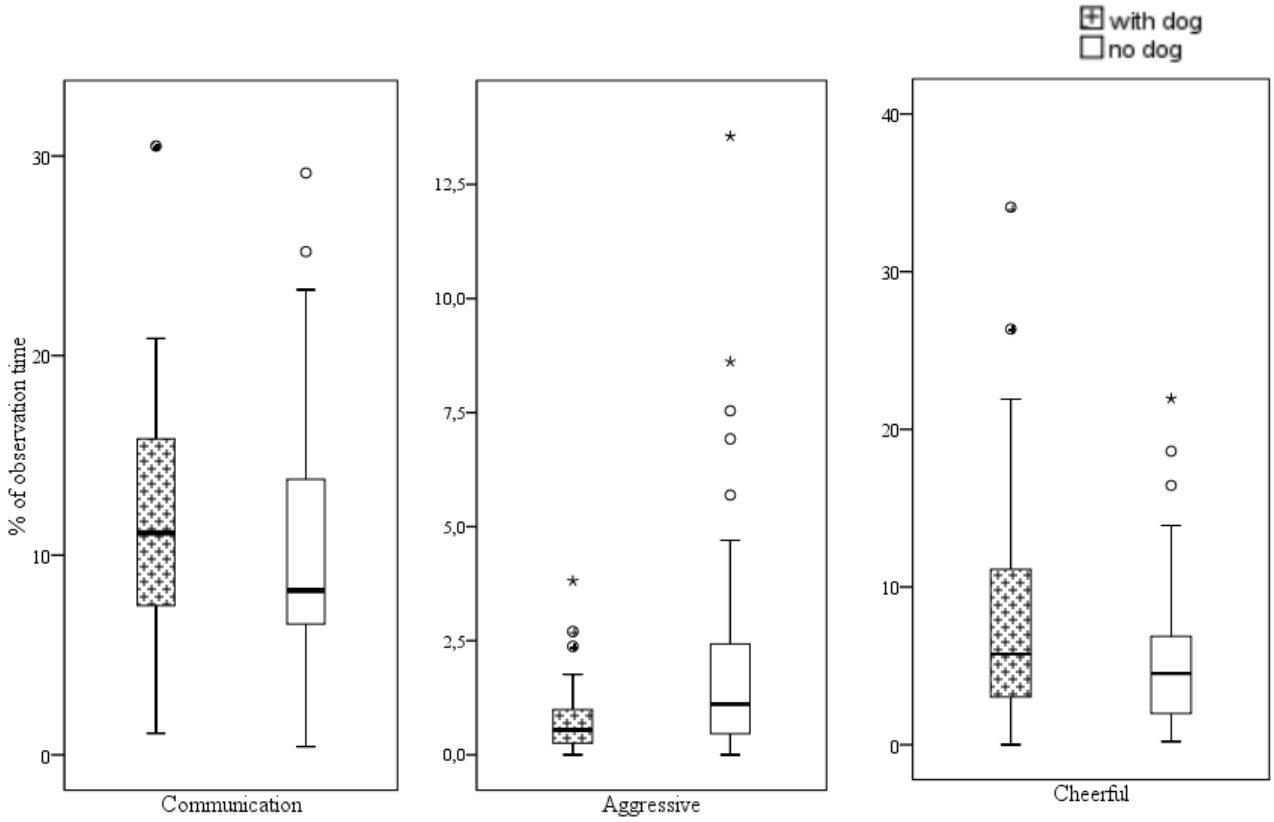

Fig. 2: Comparison of three categories in verbal expressions. Children communicated more (Wilcoxon Z=-2.6, p=0.010) (left hand side), showed less aggressive behavior (Wilcoxon Z=-4.6, p=0.000) (middle) and laughed more instead (Wilcoxon Z=-2.09, p=0.037) (right hand side) when a dog was present.

5.1.3 Sitting relaxed, unsettled or uninvolved

As indicated by each of the three defined behaviors concerning relaxation or nervousness, the children seemed to be more relaxed with dog present than without, which is supported by how they were sitting in the two conditions (Fig. 3).

With a dog in the room children spent on average 87.4 % (SD± 6.9 %) of their time sitting relaxed, but only 79.9 % (SD± 11.15 %) when no dog was present (Wilcoxon $Z=-4.80$, $p<0.001$; Fig. 3). The time spent in a relaxed posture ranged from min 71.5 % to max 99 % with a dog present and from min 55.7 % to max 98 % without. In total, 40 children (16 female, 24 male) sat in a more relaxed manner and ten children (six female, four male) showed less relaxed sitting postures in the with-dog-condition (Fig. 1).

Children sat in an unsettled manner for a longer time and showed more stress symptoms, such as jerky legs when no dog was present (Wilcoxon $Z=-4.36$, $p<0.001$; Fig. 3). With a dog present the average duration of sitting in an unsettled manner was 9.14 % (SD± 6.9 %, 0 % - 25.7 %). Without a dog present the average was 13.8 % (SD± 9.7 %, 0.6 % - 41.9 %). Thirty eight children (17 female, 21 male) sat in a less unsettled manner during the with-dog condition while 12 children (five female, seven male) sat in a more unsettled manner (Fig. 1).

The amount of time children seemed to be uninvolved and stared into the room instead of participating in the conversation was less when a dog was in the room (Wilcoxon $Z=-2.14$, $p=0.032$; Fig. 3). On average, this behavior occurred 1.3 % (SD± 2.27 %, 0 % - 12.7 %) of the time with a dog and 2.27 (SD± 3.15 %, 0 % - 13.77 %) without a dog. The result is mainly due to 25 children (13 female, 12 male) who sat extremely calmly less often and 18 (eight female, ten male) who did so more often when a dog was present. The remaining seven children showed no difference.

Only the length of time when children stood up and left the table for a while did not differ.

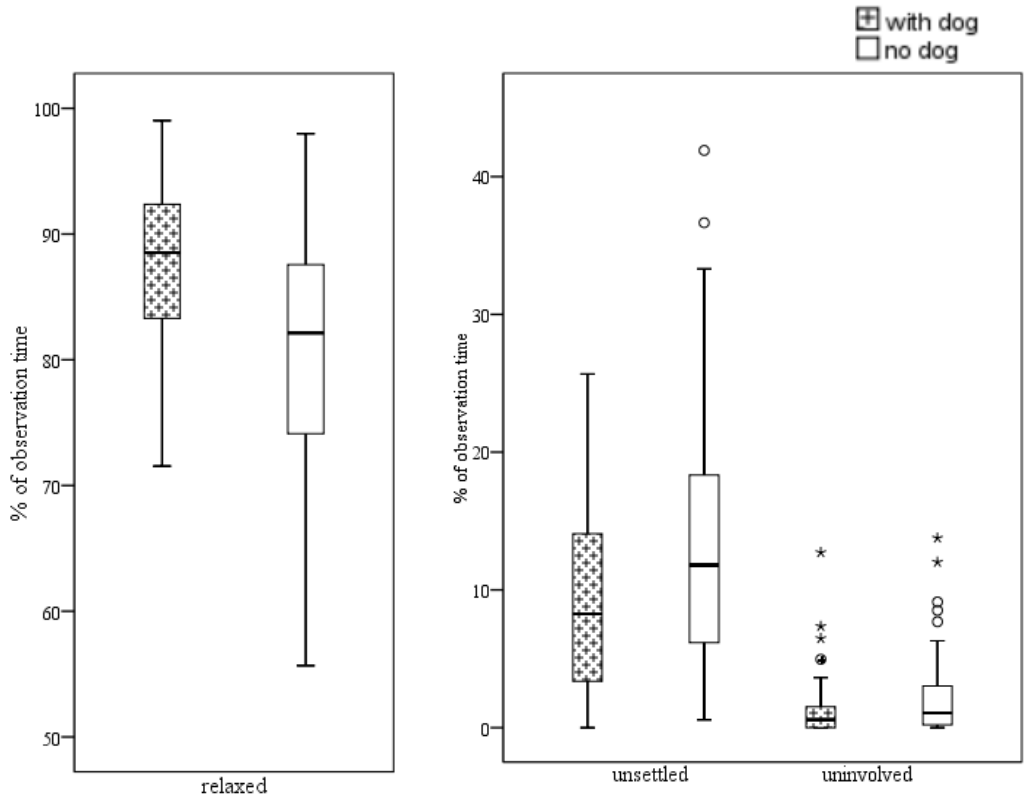

Fig. 3: Comparison of three categories in sitting behavior. Children sat in a more relaxed manner (Wilcoxon Z=-4.80, p<0.0001) in a less unsettled manner (Wilcoxon Z=-4.36, p=0.0001) and in a less uninvolved manner (Wilcoxon Z=-2.14, p=0.032) when a dog was in the room.

5.1.4 Standing up

As a trend children stood up less from the table with the dog present than without (Wilcoxon Z=-1.88, p=0.06). The highest percentage of time standing up and leaving the table was 9.8 % with a dog and 31.1 % without a dog.

5.1.5 Interaction

Children interacted physically with their educator for longer periods of time when a dog was present (Wilcoxon Z=-3.1, p=0.002). With a dog, the interaction time was on average 0.5 % (SD± 0.9 %, 0 % - 6 %) and without a dog 0.3 % (SD± 0.35 %, 0 % - 1.4 %). However, interaction time among children and within the entire group were not significantly different (Wilcoxon Z=-1.067, p=0.286; Z=-0.051, p=0.959).

5.1.6 Signs of nervousness

Children showed significantly fewer signs of nervousness when a dog was present (Wilcoxon Z=-4.12, p<0.0001). Forty children (19 female, 21 male) displayed fewer and ten children (three female, seven male) more of the predefined signs (Fig. 1).

5.1.7 Facial expressions

Expressions of positive emotions occurred more often when a dog was present. The children looked more attentive and more as if they were listening (Wilcoxon Z=-5.32, p<0.0001), smiled (Wilcoxon Z=-2.41, p=0.016) and laughed more often (Wilcoxon Z=-2.16, p=0.031). At the same time their expressions were less often neutral and uninvolved (Wilcoxon Z=-3.44, p=0.001). Moreover, nervous (Wilcoxon Z=-4.092, p<0.0001) or angry (Wilcoxon Z=-3.07, p=0.002) expressions occurred less often when a dog was present.

There was no significant difference in the number of sad (Wilcoxon Z=-0.43, p=0.669) or bored (Wilcoxon Z=-1.67, p=0.095) expressions.

Fig. 4 shows how many individuals had different expressions more or less often with a dog present. If the sum is smaller than 50, the respective expression occurred with the same frequency.

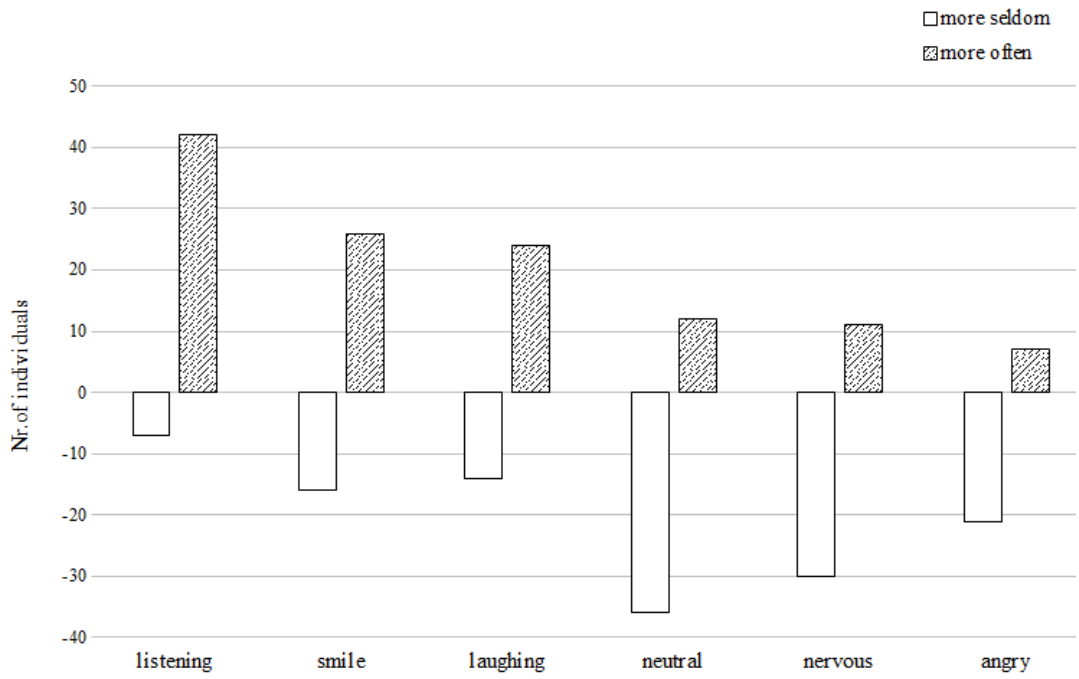

Fig. 4: Number of individuals who showed different facial expressions more or less often with a dog present.

5.2 Group behavior

5.2.1 Behavior of female and male children

No significant difference in the behavior of girls and boys was identifiable regardless of whether or not a dog was in the room.

5.2.2 Behavior of different ages

We divided the children into one group younger than 12 years old and another with children of more than 12 years of age. Each of these groups consisted of 25 children. There was no correlation between age and length of stay in the accommodation group. The older children communicated more, regardless of whether a dog was present or not (With dog: Mann-Whitney U=-2.78, p=0.006, no dog: Mann-Whitney U=-3.24, p=0.001), but there was no difference within the older group between the two conditions. The average duration of communication was 14.1 % (SD± 6 %, 4.7 % - 30.5 %) with dog and 12.7 % (SD± 6.4 %, 4.1 % - 29.2 %) without dog during the observed period of time. By contrast, the younger children communicated longer when a dog was present (Wilcoxon Z=-2.22, p=0.026). On average, their communication time was 9.3 % (SD± 5 %, 1.1 % - 18.6 %) when a dog was in the room and 7.3 % (SD± 4.4 %, 0.4 % - 18.7 %) when no dog was present (Fig. 5).

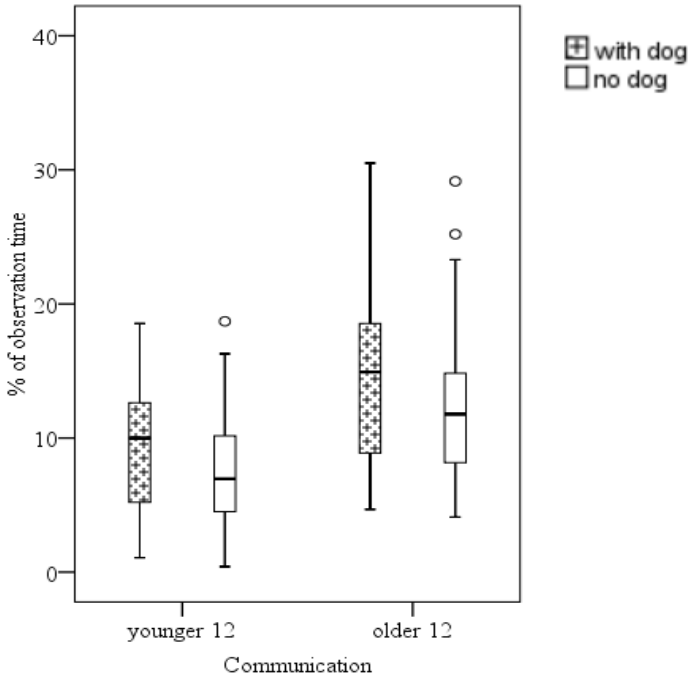

Fig. 5: Duration of communication in children younger and older than 12 years, with and without a dog present. Altogether older children communicated more (With dog: Mann-Whitney U=-2.78, p=0.006, no dog: Mann-Whitney U=-3.24, p=0.001). There was a difference in the younger group, depending on whether a dog was present (Wilcoxon Z=-2.22, p=0.026). No significant difference was found in the older group.

The older children sat in a relaxed manner for a longer time (Mann-Whitney U=-3.48, p<0.0001) and in a less unsettled manner (Mann-Whitney U=-3.36, p=0.001) than the younger ones when a dog was present. They also sat in a more relaxed manner when no dog was present (Mann-Whitney U=-2.03, p=0.043). In both cases, sitting in a relaxed or unsettled manner, there were differences within the two age groups between the with-dog and the no-dog condition. Juveniles spent more time sitting relaxed in the presence of the dog (Wilcoxon Z=-3.83, p<0.0001) (90.7 %) (SD± 6.1 %, 71.5 % - 99 %) than without the dog (83 %) (SD± 10.6 %, 55.7 % - 97.1 %). In the younger group (Wilcoxon Z=-2.95, p=0.003) children sat in a relaxed manner for 84.1 % of the time with a dog (SD± 6.2 %, 73.2 % - 94.9 %) and 76.8 % (SD± 11.06 %, 58.1 % - 95.1 %) without a dog. Furthermore, both the older children (Wilcoxon Z=-3.78, p<0.0001) and younger children (Wilcoxon Z= -2.27, p=0.23) sat in an unsettled manner for a shorter period with a dog in the room (Fig. 6).

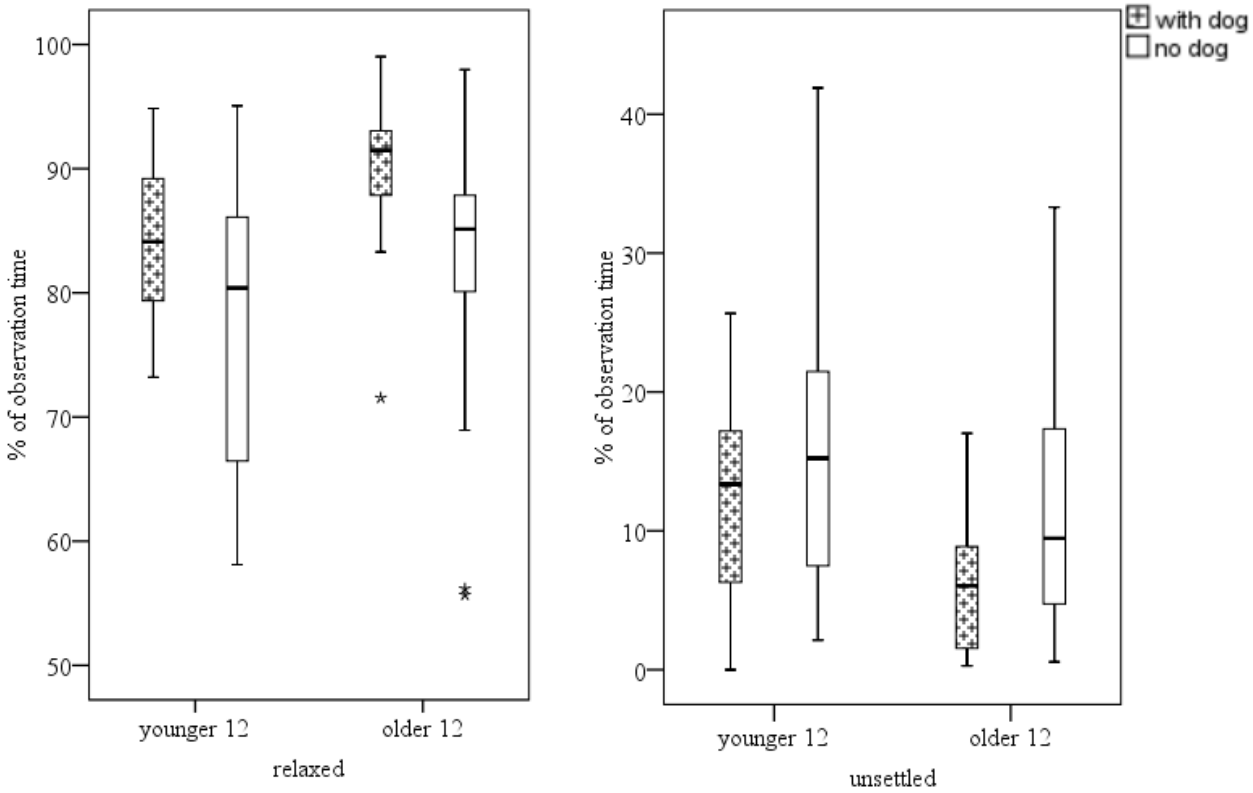

Fig. 6: Sitting behavior of children younger and older than 12 years, with and without a dog present. With a dog, older children sat in a relaxed manner for a longer time (Mann-Whitney U=-3.48, p=0.000) and in a less unsettled manner (Mann-Whitney U=-3.36, p=0.001). They also sat in a more relaxed manner without a dog (Mann-Whitney U=-2.03, p=0.043). There were differences within the groups: Both the younger and older children sat in a more relaxed manner (Wilcoxon Z=-2.95, p=0.003; Z=-3.83, p=0.00) and in a less unsettled manner (Wilcoxon Z= -2.27, p=0.23; Z=-3.78, p=0.00) with a dog.

The older children smiled (Mann-Whitney U=-2.41, p=0.013) and laughed (Mann-Whitney U= -3.23, p=0.001) more often and for longer periods of time. These significant differences between the two age groups did not occur when a dog was present. Whether or not a dog was present had no significant effect on the older children, but on the younger ones, who laughed more when a dog was present (Wilcoxon Z=-2.45, p=0.014; Fig. 7).

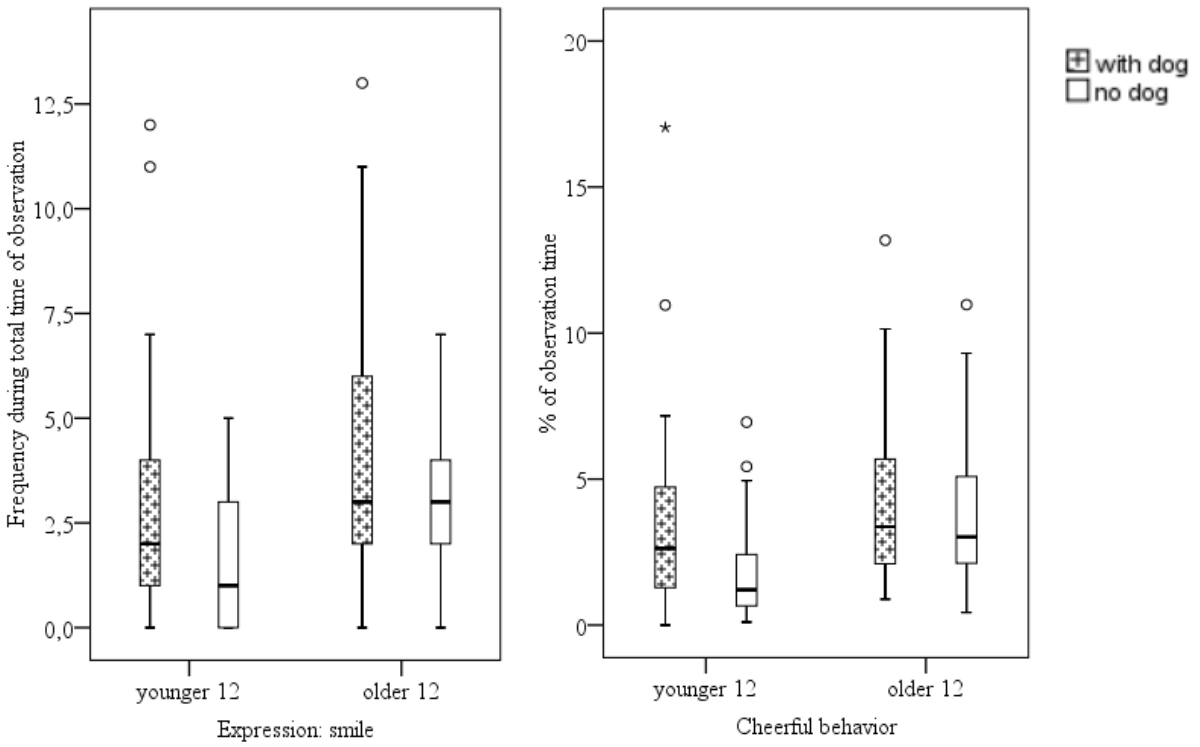

Fig. 7: Facial expression "smile" and duration of laughing/cheerful behavior of children younger and older than 12 years. The older children smiled and laughed more than the younger ones when no dog was present (Mann-Whitney U=-2.41, p=0.013; U= -3.23, p=0.001). The younger children laughed more when a dog was present (Wilcoxon Z=-2.45, p=0.014).

5.2.3 Noise levels

How often a normal ongoing conversation at an appropriate noise level was observed as opposed to an unpleasant level of noise differed depending on the presence of a dog. When a dog was present a pleasant noise level occurred more frequently (Wilcoxon Z=-2.49, p=0.013) and an unpleasant level less frequently (Wilcoxon Z=-2.09, p=0.037). No difference was observed in the third category with everyone talking at the same time, making it difficult to understand anybody due to the noise (Wilcoxon Z=-1.06, p=0.29).

5.2.4 Social atmosphere

A tense atmosphere in the group was observed less often when a dog was present (Wilcoxon Z=-2.53, p=0.011). Whether or not a dog was present made no difference for a relaxed or humorous atmosphere (Wilcoxon Z=-1.48, p=0.139; Wilcoxon Z=-0.82, p=0.411).

5.3 Saliva samples

Differences between the two saliva samples for each session were calculated for the with-dog and the no-dog conditions. Negative results showed a decrease, positive ones showed an increase of the stress hormone cortisol. There was no significant difference in the change of the children's cortisol level when a dog was present or absent (Mann-Whitney U=-0.38, p=0.712). In addition, the educator's cortisol level did also not change significantly (Mann-Whitney U=418, p=0.657).

Furthermore neither age nor sex had a significant influence on the change of cortisol levels.

In general there were no differences in the measured cortisol levels irrespective of the fact of whether a dog was present or not (children: Mann-Whitney U=-0.41, p=0.682; educators: Mann-Whitney U=1710.5, p=0.457) but children had a lower cortisol level at the end of observation period than at the beginning (Mann-Whitney U=-2.93, p=0.003).

5.4 Differences between the two dogs

The influence of the two dogs differed in regard to certain facial expressions. In the presence of the male dog, the children showed more often neutral facial expressions (Mann-Whitney U=19, p<0.001) instead of listening and with eye-contact (Mann-Whitney U=40.5, p=0.004) as opposed to with the female dog. Signs of nervousness (ticks) occurred less often in the presence of the male dog (Mann-Whitney U=64.5, p=0.042) and children also showed nervous expressions more rarely (Mann-Whitney U=61, p=0.033). Most of these differences also occurred between the children when no dog was present (neutral: Mann-Whitney U=30.5, p=0.003; listening: Mann-Whitney U=44.5, p=0.009; nervous: Mann-Whitney U=61, p=0.035). The number of ticks did not differ when no dog was present.

Loudness and atmosphere were not comparable, because they were always assessed for the whole group and the female dog was only present in one group, which is not representative.

6. Discussion

The mere presence of a dog improved most of the observable behavioral categories. The social interplay between the children was characterized by more cheerful and less aggressive behavior. The children were more attentive and concentrated, while they were encouraged to communicate more, resulting in a homogeneous conversation which included mostly all of the group members. At the same time less signs of nervousness were displayed. The children created a more relaxed and comfortable atmosphere with an appropriate noise level, with the impact of a dog. The impact of a dog was measurable in most of the children (Fig. 1 & 4), but higher on children younger than 12 years (Fig. 5, 6 & 7). The strong influence was even more surprising since due to the relatively strict setting (dinner at the table) contact and individual interactions of children were restricted. Just the presence of the dog and thus an impact mainly via the biophilia-effect or preconditioned positive effects (previous contact with the dog which led to positive reactions, which then were again triggered just by seeing the dog) (Julius et al. 2013) occurred though no physical interaction with the dog was possible. This is also probably the reason for no measurable physiological effects, as the cortisol values did not differ in the presence or absence of a dog.

More specific, the presence of a dog improved communication patterns, i.e. increased the duration of talking, laughing and cheerful behavior and decreased the total duration of aggressive behavior. Children who were very silent without a dog now were encouraged to talk more and made the whole conversation more homogeneous. This might be due to the fact that the time for talking was more evenly distributed among the children. At the same time their levels of attention were raised. Similar to the results of Kotrschal and Ortbauer (2003), the dog increased children's attentiveness, in this case not towards a teacher, but towards the whole conversation and other persons in general. Once more, the dog evidently functioned as a "social lubricant" (Messent, 1983, Wells 2004). It was not the dog who attracted all the attention but it rather functioned as a social catalyst and supported the children's concentration on their environment and participation in social interaction. Hediger and Turner (2014) reported that the presence of a dog supported children's attention and concentration performance and did not distract them from tasks.

One can assume that a more relaxed child is able to take part more intensively in a

conversation than a nervous child. Both the more relaxed sitting behavior and fewer signs of nervousness point towards a positive influence of the dog's presence on children's levels of nervousness. This is in accordance with previous research documenting that human-animal interactions reduced restlessness and tension (Crowly-Robinson et al. 1996, Filan and Llewllyn-Jones 2006, Perkins et al. 2007). Possible reasons for the results in the subjects with regard to more relaxed body language might be reduced levels of anxiety as an immediate effect of the dog's presence. The anxiety-reducing effect of dogs (Barker et al. 2003, Cole et al. 2007, Wilson 1991) may have played a greater role for the younger children, who felt safer with a dog and dared to communicate more. Another mechanism why a dog led to more communication in a group situation might be due to the emerging of new topics for conversation such as the dog itself or other animals. In this study, we did not analyze the contents of the conversations, but it would be an interesting topic for further studies. Complementary to these findings that the children dared to communicate more were the observer ratings of an appropriate noise level which occurred more often with a dog instead of an uncomfortable silence, occurring less often. These ratings also support the assumption that more topics were discussed and children were more encouraged to say something rather than remain silent.

Reduced anxiety might also be responsible for the difference in sitting behavior in children both older and younger than twelve years. The older ones might have felt safer and thus were less nervous, recognizable in their sitting behavior and also in their facial expressions. The older children laughed and smiled more both when a dog was present, and when no dog was present, which can be categorized as an expression of comfort. The duration of cheerful behavior during the dog's presence was significantly longer in the younger group, while there was no difference in the older group, meaning that again the dog had a greater effect on the younger children, as they were shorter on experiences with unusual situations than the older ones in general.

Moreover, the extended interaction time between children and educators when a dog was present supports the hypothesis that an animal can enhance and facilitate social interaction. Several studies showed that the presence of a dog without any physical interaction facilitated social interaction (Beetz et al. 2011, Hergovich et al. 2002, Kotrschal and Ortbauer 2003, Sams et al. 2006), which seemed to be the case here, too, as the children talked more in the presence of a friendly dog, while the older children talked more in general.

In addition to the change of verbal communication patterns, lower levels of aggressiveness and more cheerful behavior such as laughing were displayed when a dog was present. The assumption that animals can reduce human violence is quite common. A number of animal-assisted intervention programs exist (Furst 2006, Turner 2007), aiming to reduce aggressive or violent behavior especially in children or adolescents, although this effect is hardly evaluated. Hergovich et al. (2002) and Kotrschal and Ortbauer (2003) showed reduced aggressive behavior in first graders in the presence of a dog. This supports our explanation. However, the possibilities for the children in our study to show anger in form of violence were rather rare. The table was a physical barrier which minimized the potential for conflicts from the very beginning, children mostly sat directly next to others who they were sympathetic to and connected with. This might be the main reason why aggressive behavior did not occur frequently, independent of the presence of a dog. Nonetheless, consistent with the former, the coders rated the atmosphere as tense less frequently with a dog present.

The communication behavior and behavioral patterns as well as cortisol levels did not differ between boys and girls. Kotrschal and Ortbauer (2003) mentioned a bigger potential for a change in boy's behavior caused by a style of play which is of a more rough nature (Grammer 1998, Eibl-Eibesfeldt 1997). The experimental design utilized for this study did not enable such potential and hence did not fit the known gender differences, as children were observed while sitting around a table where the possibilities to change behavior were relatively similar for boys and girls and thus produced similar results.

Nearly all observed positive changes in behavior and communication patterns were independent of which of the two dogs was present. The only differences we found between the two dogs also occurred without a dog present. But as the number of children meeting the two dogs was not equal, further studies would be necessary to evaluate whether the kind of dog is a decisive factor or not.

Besides the evaluated behavioral effects, studies investigating the indicators of the dog's stress reducing effect mostly listed the associated physical parameters such as a reduced blood pressure (Friedman et al. 1983, Grossberg and Alf 1985), reduced heart rate (Kaminski et al. 2002) or reduced cortisol levels (see "Saliva samples and cortisol level"). In studies in which no direct human-animal contact was possible, the effects on these parameters were weaker, but a trend confirming the above existed (De Schriver and Riddick 1990). When no body contact occured between the dog and child, the release of oxytocin was lower in comparison

to situations with body contact and consequently its positive effects decreased (Odendaal 2000, Odendaal and Meintjes 2003, Julius et al. 2013, Romero et al. 2014). These physical parameters could not be measured in this study, but a reduced activity of the autonomic nervous system (Oostermann et al. 2010) could be a possible explanation for the children showing more relaxation with a dog in the room.

We measured the physical parameter of cortisol in saliva samples, but could not find results that supported our observed behavior parameters. The presence of the dog did not have a significant influence on the cortisol levels of the children and staff in our study. Several other studies came to contrary results and showed that the presence of a dog lead to significantly lower levels of salivary cortisol and/or higher oxytocin levels (Barker et al. 2005, Beetz et al. 2011, Handlin et al. 2011, Odendaal and Meintjes 2003, Viau et al. 2010). However, in these studies the participants had the possibility to interact physically with the dog, to establish body contact via petting. It had been documented that the amount of physical contact of children undergoing a stressful task with a friendly dog was strongly correlated with lower cortisol levels (Beetz et al. 2011). In our study, the dog was present during dinner and the children were not allowed to touch the dog in this special situation due to rules regarding hygiene in the institution. Hence, the oxytocin system could not have been stimulated via tactile interaction (Uvnäs-Moberg and Petersson, 2011) and reduced the cortisol levels. Thus, our results confirm that the mere presence of a dog does not significantly reduce physiological stress parameters but that petting and body contact are probably necessary for such a physiological reaction.

The lack of changes in the cortisol levels might also be due to other methodical reasons which render the samples not one-hundred per cent meaningful/significant. The time of intervention was probably too short, as human salivary cortisol usually peaks 10-30 minutes after a challenge (Kalman and Grahn 2004). Eventually a reduction of cortisol levels could have been measured, if it had been possible to take a third Salivette ten minutes after the second. But it was reported by educators that it was already a stressful situation for the children to sit and eat together in a group. Asking them to remain seated for a longer time, plus to spend their leisure at the same time would have increased their stress level.

Furthermore, some children (about 30 % regularly, the others as required) were on medications, such as antidepressants, medication against ADHD or pain relievers, which may

have had an influence on their cortisol level (Granger et al. 2009). For example, children taking antipsychotic medications had flat cortisol diurnal rhythms (Hibel et al. 2007). Hibel (2006) also found that the stress-related cortisol activity was less pronounced in children taking acetaminophen (a pain reliever and a fever reducer). Thus, an influence due to medications cannot be excluded.

Finally, taking into consideration the variable situations and life stories of the children the diversification of individual behavior is perspicuous. Their age classes, length of stay in the accommodation and family situations differed greatly. Some of the children met their parents every weekend, others only once a month for a couple of hours. Some children went to school, others already went to work. Hence, the high variabilities in behaviors, like talking time for example, are not unexpected. But in spite of their diverse backgrounds and circumstances of living, the presence of a dog had a positive influence on most observable behavioral categories of the whole group.

7. Conclusions

The mere presence of a dog had a number of immediate effects on the behavior and communication patterns of the children. The changed patterns may ameliorate and remove the tension of diverse situations in the children's and staff's everyday life. A more pleasant atmosphere with children who feel comfortable can develop and with it more interactions can take place. Thereby, they learn to improve their socio-emotional competence as these situations occur more often. This is very important for every child in this program as they are all experiencing social problems.

Resulting long-term effects would be an improvement of children's behavior in general and advancement of positive relationships with peers and caretakers.

In addition, it should be considered that the dog might have had an even larger effect had the setting not been restricted. More individually designed settings with more body contact confirm this hypothesis (e.g. Barker et al. 2005, Beetz et al. 2011). Our results might be considered as even more surprising since the dog was only present and no direct interaction was possible and yet it had a significant positive effect.

8. Acknowledgments

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Apprenticeship

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University:

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Since 03/2014	Elaboration of Diploma thesis “Effects of dogs on communication and behavior patterns of adolescents/children in a residential treatment program” Supervisor: Univ. Prof. Mag. Dr. Kurt Kotrschal, Department of Behavioural Biology, University of Vienna, IEMT Austria

Working experiences

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Congress contributions:

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