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Elephant-Facilitated Psychotherapy – A Clinical Evaluation

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Introduction

Although animal-assisted therapy is recorded in the science literature since the 1960s, very few if any, reported clinical evaluations that reflect neurochemical changes. The reasons are, firstly, it is difficult to standardise clinical settings to such an extent that experimental work can be done, and secondly, it is often difficult to collect meaningful data that would be acceptable to clinicians (Johnson, Odendaal, Meadows, 2002). Clinical parameters that were suggested for animal-assisted therapy were determined in healthy people who interacted positively with dogs as a measurement for affiliative behaviour (Odendaal and Meintjes, 2003). The challenge is thus to apply such physiological parameters to a clinical situation.

A Model was suggested, which would link the neurochemicals involved during positive human-animal interaction, and consequently, that could serve as a rationale for animal-assisted therapy. The Model is based on literature in the field of affiliative behaviour and is supported by theories on affiliation among humans and animals. It deals with the normal need of social beings to seek attention in a positive way between con- and interspecifics, and the need is described as attentionis egens (Odendaal, 2002). The Model is presented in Fig.1.

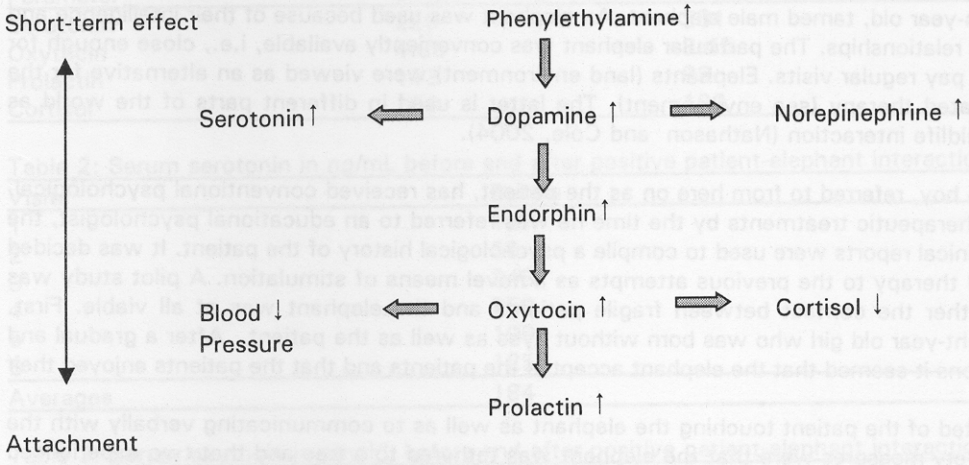

Fig. 1: A neurochemical model for affective behavior

According to Liebowitz (1983), a pioneer in affective neurochemistry, phenyethylamine is responsible for the feeling of attraction or positive interaction. Although controversial at that time, this role of phenyethylamine is now widely accepted, so much so that the molecule's molecular shape was determined for possible therapeutic use (Godfrey, Hatherley, Brown, 2003). It is a short-term reaction of exhilaration and apprehension, which is followed by neurochemicals such the monoamines: serotonin associated with tranquillity (Ratey, 2003), dopamine associated with pleasurable experiences (Brown, 1991), norepinephrine that could inhibit or excite (Overall, 1997). Norepinephrine could contribute to an increase sense of well-being and contentment, but is a difficult parameter to measure due to its short action and sudden changes (Odendaal, 1999). Endorphins are associated with feelings of comfort and security (Liebowitz, 1983) and act as endogenous opoids (Bloom and Lazerson, 1998). Beta-endorphins are stimulated by serotonin and norepinephrine release (Brown, 1994) and it is associated with grooming during affiliative and sexual behaviour (Keverne, Nevison, Martel, 1997). One of the two oxytocin binding sites is associated with sexual and grooming behaviour as well as social communication (De Wied, Diamant and Fodor, 1993). Gingrich, Huot, Wong and Insel (1997) found that oxytocin is involved in the formation of affiliative bonds and this was confirmed by Uvnäs-Moberg (1997) who confirmed that oxytocin facilitate attachment in various animal models. Hatfield and Rapson (1993) also associate oxytocin with the promotion of close intimate

bonds. Bekkedal and Panksepp (1997) reported that prolactin could be involved with social bonding, other than maternal behaviour. Serotonin and endorphins stimulate the secretion of prolactin (Meyer, Mey and Meyer, 1997) and could interact inter alias with cortisol and oxytocin (Brown, 1994). Oxytocin could stimulate prolactin release (Carter and Altemus, 1997) and lower blood pressure as well as cortisol plasma levels (Uvnäs-Moberg, 1998).
Despite the support in the literature of the proposed Model, the actual linkages that are taking place in the brain are much more complicated. Complexity relates not only to the interactions as such, but it is also of critical importance that the Model should only be applicable within a specific context. Changes could occur in the same direction in either negative or positive experiences. Too much serotonin is associated with aggression; too much dopamine with mania and stress; and too much norepinephrine or norepinephrine acting for too long, is also associated with mania and stress (Ratey, 2003). Increased endorphins are associated with painful or uncomfortable experiences, because it is the body's natural painkiller (Brown, 1991); oxytocin (Engelmann; Ebner; Landgraf and Wotjakl, 1999) and prolactin increase with stress (Caldeira and Franci, 2000); and blood pressure can decrease during shock reactions (Berne and Levy, 1998). Results should thus always be interpreted considering external variables as well as the person's life-experiences on the moment of measurement. It is comparable to a behavioural pattern such as laughter, which could indicate enjoyment as well as anxiety (Ratey, 2003).
In an experiment where dog lovers (n = 18) interacted with their own and unfamiliar dogs, it was found that the results fit the Model, except that serotonin was not tested and norepinephrine's results were inconclusive with no significant difference between Before- and After-intervention measurements. From the results it seemed that there exists a difference between a positive interaction and bonding, because significant differences were recorded between participant interacting with their own and unfamiliar dogs with regard to beta-endorphin, oxytocin and prolactin and the same tendencies were found between dog interaction and quiet book-reading which was used as a control (Odendaal, 1999).
With this background knowledge, it was decided to test aspects of the Model in an unusual clinical situation. A 14-year old boy, suffering from cerebral palsy and receiving psychotherapy, was exposed to animal-facilitated therapy sessions with a ten-year old, tamed male elephant. An elephant was used because of their intelligence and caring nature in their social relationships. The particular elephant was conveniently available, i.e., close enough for practitioner and patient to pay regular visits. Elephants (land environment) were viewed as an alternative for the well-known dolphin-facilitated therapy (sea environment). The latter is used in different parts of the world as another positive human-wildlife interaction (Nathason and Cole, 2004).

Therapeutic Approach: The boy, referred to from here on as the patient, has received conventional psychological, medical and occupational therapeutic treatments by the time he was referred to an educational psychologist, the primary author. Previous clinical reports were used to compile a psychological history of the patient. It was decided to add elephant-facilitated therapy to the previous attempts as a novel means of stimulation. A pilot study was initiated to establish whether the contact between fragile patients and the elephant was at all viable. First, interaction was with an eight-year old girl who was born without eyes as well as the patient. After a gradual and controlled interaction sessions it seemed that the elephant accepted the patients and that the patients enjoyed their contact with the animal.
Interaction sessions consisted of the patient touching the elephant as well as to communicating verbally with the animal in a gentle way. Safety measures were that the elephant was tethered to a tree and that two experienced handlers were present during the session, ensuring to be in complete charge of the elephant if the elephant's behaviour should indicate any change from a positive interaction. The parents of the patient gave written consent for these therapy sessions. People present during the interaction were the patient, the therapist, the owner of the elephant and two handlers. No force was used to establish an interaction. The contact between patient and elephant was allowed to develop in a natural way.
The behavioural principle that was applied was that the positive interaction should serve as an enjoyable award for progress in behavioural changes achieved at school and at home. These changes were set as specific goals in liaison with the parents who had to report on the success or failure in achieving the goals. Positive behavioural changes, including emotional behaviour, were then reinforced by elephant interaction sessions, which the patient was looking forward to in anticipation. The conditioning programme was thus that expected behaviour would be reinforced with an elephant-visit as a reward. Overt behavioural activities by the patient during the interaction were recorded on videotape.
According to the reports on improvements related to overt behaviour, i.e., achieving set goals, it was decided to test the affective behaviour neurochemical Model for this case study. Neurochemical changes could thus serve as a clinical/physiological evaluation of the interaction sessions. Patient profile values were determined at the patient's home with no interaction at all, with a 20-minute period between two measurements. The research Model was to determine Before-interaction values from the patient, and After-elephant-facilitated therapy as an intervention. Baselines were determined as a Before-interaction value for every visit. After-interaction values were determined

after a 20-minute contact session. The elephant interaction visits were repeated six times to increase reliability of the results. Based on the affective behaviour neurochemical Model, the following parameters were chosen: serotonin, oxytocin, prolactin and cortisol. Blood was collected from the right arm by using a vacu-tube containing heparin. After collection, samples were identified as either Before-interaction or After-interaction for Visits 1 to 6. Visits were three to four weeks apart at times when it suited everybody involved to be present. Blood collection was done as far as possible before 10:00 in the morning in order to avoid the effects of circadian decreases of cortisol. Interaction time was, after the patient had settled down with the elephant (±5 minutes), about 20 minutes. Interaction was terminated when the patient indicated that he is tired. Blood collection for the Before-interaction values was done about ten minutes before the interaction started, and for the After-interaction values, immediately after the interaction. After blood was collected by a registered nurse, samples were cooled to 4°C and centrifuged in a pre-cooled centrifuge for transport to the accredited clinical laboratory of Du Buisson, Kramer and Bruinette Inc. Serum levels of the above-mentioned neurochemicals were determined by standard methods: cortisol and prolactin by chemiluminescence, and oxytocin and serotonin by radioimmune assay.

Results

The statistically differences between the 'Before'- and 'A fter'-values were determined by using the two-tailed t-test for the four parameters. Although p-values are better applicable to population studies than case studies, statistics were done in order to determine whether serum levels could change significantly. Despite dealing with only one patient and six visits, serotonin came close to a statistically significant change, viz $p = 0.06$. The other changes were for oxytocin ($p = 0.74$), prolactin ($p = 0.16$) and cortisol ($p = 0.53$). Changes in serum levels of the neurochemicals will thus be evaluated as tendencies and not as statistically significant.

Table 1: Home profile of neurochemical serum levels used as parameters for a patient, before elephant-facilitated psychotherapy started

Parameter	Before	After 20 minutes	Profile (Averages)
Serotonin	229	231	230
Oxytocin	4.05	3.45	3.76
Prolactin	113	89	107
Cortisol	184	199	192

Table 2: Serum serotonin in ng/mL before and after positive patient-elephant interactions (n = 6)

Visits	Before	After
1	127	422
2	36	321
3	348	368
4	359	259
5	109	165
6	125	601
Averages	184	356

Table 3: Serum oxytocin in pmol/L before and after positive patient-elephant interactions (n = 6)

Visits	Before	After
1	4.21	2.04
2	0.75	0.78
3	1.48	1.25
4	0.44	0.79
5	1.28	5.41
6	1.29	1.03
Averages	1.58	1.88

Table 4: Serum prolactin in mIU/L before and after positive patient-elephant interactions (n = 6)

Visits	Before	After
1	64	52
2	94	83
3	105	82
4	67	57
5	92	66
6	59	56
Averages	80	66

Table 5: Serum cortisol in nmol/L before and after positive patient-elephant interactions (n = 6)

Visits	Before	After
1	144	128
2	173	136
3	174	167
4	130	229
5	200	155
6	162	83
Averages	164	150

Table 6: Patient profile compared to normal ranges and to before- and after- interaction averages of serum oxytocin, serotonin, prolactin and cortisol

Parameter	Home Profile	Normal ranges	Before interaction	After interaction	Tendencies
Serotonin	230	90-385	184	355	93% Up
Oxytocin	3.76	2.58-3.37	1.58	1.88	19% Up
Prolactin	107	45-375	80	66	17% Down
Cortisol	192	119 - 618	164	150	9% Down

Tendencies were reflected in % and compared to the home profile and normal ranges of the parameters. The laboratory supplied the ranges and they noted that adult ranges for oxytocin could be different for children.

Discussion

It is clear that the tendency for serotonin was to increase notably after positive elephant interaction. Serotonin has a positive effect on emotions and feelings. The increase after elephant interaction is even higher than the home profile, showing an increase of 144% from the home profile. Due to the correlation between observations by the psychologist of the overt behaviour of the patient, his own verbal expressions of the interaction and the changes of the serotonin levels, the effect could be described as therapeutic of nature. The interaction made the patient feel better and the experience was measurable by a physiological parameter.

Oxytocin is associated with bonding that develops during positive interaction. Despite a slight increase in serum levels the results do not support a bonding effect. The patient had only sporadic contact with the animal and emotional bonding is thus not expected. According to the results there has to be one interaction, near the end, that elicited a bonding effect. It is thus possible that when more interactions following closer on each other, they could indicate greater increases of oxytocin. The oxytocin levels during elephant interaction were lower than the home profile where a feeling of bonding is expected, and apart from the one experience, also lower than the normal range.

Although prolactin is also associated with bonding during positive interaction, such experiences would include aspects of nurturing. If an emotional bond was not formed as indicated by the oxytocin results, the lack of bonding is even clearer from the prolactin results, because the patient was not in charge of any of the care and welfare of the elephant. As expected, the home profile where the patient experiences nurturing showed higher values for prolactin than with the elephant interaction.

Cortisol decreased and was also lower than the home profile. This does not mean that the home situation is stressful in a negative sense, because it was the first time that blood was collected from the patient. The relative decrease of cortisol during positive interaction is an indication that stress was reduced, and that is an expected result. It also correlates with the overt behaviour and verbal reports by the patient.

If the results are viewed in terms of the proposed neurochemical Model for affective behaviour (Fig. 1) the results are within expectations. Although one case study using only a few of the parameters from the Model maybe not enough to confirm the Model the results are encouraging. Neurochemical action is a complicated web in behaviour. The intervention involved two biological entities interacting in an open system. Taken all possible variables into consideration the fact that the results were predictable is an indication that further research in this area of affective behaviour is justified. The neurochemical home profile as well as the tendencies of the neurochemicals fell mostly within normal ranges. This may indicate a safe, and sometimes preferable effect, on a patient's mood. Drug treatment may in some cases have undesirable side-effects compared to the effects of natural positive interaction.

References

Bekkedal, M. Y. C. and J. Panksepp, 1997. Prolactin and modulation of social processes in domestic chicks. In: Carter CS, Lederhendler II and Kirkpatrick B. Eds. The integrative neurobiology of affiliation. The New York Academy of Sciences Annals, 807:472-474.

Berne, R. M., M. N. Levy, B. M. Koeppen and B. A. Stanton, 1998. Physiology. 4th Ed. Mosby, St Louis: 501-511.

Bloom, F. E. and A. Lazerson, 1998. Brain, mind and behavior. 2nd Ed. WH Freeman and Co., New York.

Brown, A. G., 1991. Nerve cells and nervous systems – an introduction to neuroscience. Springer-Verlag, London.

Brown, R. E., 1994. Introduction to neuroendocrinology. Cambridge University Press, Cambridge.

Caldeira, J. C. and C. R. Franci, 2000. Prolactin and corticosterone secretion in response to acute stress after paraventricular nucleus lesion by ibotenic acid. Brain Research Bulletin, 52:483-489.

Carter, C. S. and M. Altemus, 1997. Integrative functions of lactational hormones in social behavior and stress management. In: Carter CS, Lederhendler II and Kirkpatrick B. Eds. The integrative neurobiology of affiliation. The New York Academy of Sciences Annals, 807:164-174.

De Wied, D., M. Diamant and M. Fodor, 1993. Central nervous system effects of neurohypophyseal hormones and related peptides. Frontiers in neuro-endocrinology, 14 :251-301.

Engelman, M., K. Ebner, R. Landgraf, F. Holsboer and C. T. Wotjak, 1999. Emotional stress triggers intrahypothalamic, but not peripheral release of oxytocin in male rats. Journal of Neuroendocrinology, 11:867-872.

Gingrich, B. S., R. L. Huot, Z. Wang and T. R. Insel, 1997. Differential fos expression following micro-injections of oxytocin or vasopressin in the prairie vole brain. In: Carter CS, Lederhendler II and Kirkpatrick B. Eds. The integrative neurobiology of affiliation. The New York Academy of Sciences Annals, 807:504-505.

Godfrey, P., L. Hatherley and R. Brown, 2003. The love drug. University of Monash. Accessed on 18 March 2004 at:http://www.monash.edu.au.pubs/montage/Montage_96-01/lovedrug.html.

Hatfield, E. and R. L. Rapson, 1993. Love, sex and intimacy – their physiology, biology and history. Harper Collins College Publishers, New York.

Johnson, R. A., J. S. J. Odendaal and R. L. Meadows, 2002. Animal-assisted intervention research: issues and answers. Western Journal of Nursing Research, 24:422-440.

Keverne, E. B., C. M. Nevison and F. L. Martel, 1997 Social learning and the social bond. In: Carter CS, Lederhendler II and Kirkpatrick B. Eds. The integrative neurobiology of affiliation. The New York Academy of Sciences Annals, 807:335-337.

Liebowitz, M. R., 1983.The chemistry of love. Little, BROWN and Co. Ltd., Boston: 61-127.

Meyer, B. J., H. S. Meij and A. C. Meyer, 1997. Human physiology: chemical, physical and physiological principles. 2nd Ed. Kenwyn-Juta, Pretoria.

Nathason, D. and D. M. Cole, 1998. Dolphin therapy. Dolphin-Human Therapy, Miami. Accessed on 23 March 2004 at:http://www.thepeacefamily.force9.co.uk/dolphins.html.

Odendaal, J. S. J. and Meintjes, 2003. Neurophysiological parameters for affiliation behaviour between humans and dogs. The Veterinary J., 165:296-301.

Odendaal, J. S. J., 1999. A physiological basis for animal-assisted psychotherapy. PhD thesis, University of Pretoria, Pretoria: 121 and 157-159.

Odendaal, J. S. J., 2002. Pets and our mental health – the Why, the What, and the How. Vantage Press, New York: 44-57.

Overall, K. J., 1997. Clinical behavioural medicine for small animals. Mosby, St Louis: 297-300.

Ratey, J., 2003. A user's guide to the brain. Abacus, London: 222-251.

Uvnäs-Moberg, K., 1997. Physiological and endocrine effects of social contact. In: Carter CS, Lederhendler II and Kirkpatrick B. Eds. The integrative neurobiology of affiliation. The New York Academy of Sciences Annals, 807:146-163.

Uvnäs-Moberg, K., 1998. Antistress pattern induced by oxytocin. News: Physiological Science, 13:22-26.