KEEPING CIRCUS ELEPHANTS TEMPORARILY IN PADDOCKS – THE EFFECTS ON THEIR BEHAVIOUR

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The purpose of this study was to investigate the behavioural effects of keeping circus elephants in paddocks. Therefore some species-typical behavioural characters and the occurrence of stereotyped movements were observed and compared in unshackled paddock keeping versus shackled keeping. The investigation includes 29 elephants (19 Elephas maximus, *10* Loxodonta africana*) at four circuses located in Germany and in Switzerland.*

The results showed that paddocks offered more freedom for comfort, social and play behaviour since such activities were observed more frequently in paddocks than in shackled keeping. Also, stereotyped movements were nearly absent in paddocks and very frequent in shackled keeping. In comparison to shackled keeping, paddocks were more suitable for the needs of elephants.

Keywords: *circus elephant, comfort behaviour, paddock keeping, play behaviour, social behaviour, stereotyped movements.*

Introduction

Elephants have been kept shackled in stable tents since they have been presented in circuses. Today there are 305 elephants in European circuses (European Elephant Group 1993). Most of them are kept shackled. The chains of circus elephants are attached diagonally to one foreleg and one hind leg on the opposite side. This kind of fixation strongly restricts the freedom of movement to such a degree that these animals are not able to exhibit most of their species-typical behaviour. Wild elephants show various social, comfort and play behaviours, seeking physical contact with other members of the group, calming and protecting inexperienced young, taking a bath daily and wallowing in mud and dust to take care of their skin etc (Kurt 1986; Moss 1988). All of these activities are restricted when elephants are kept shackled. Stereotypies, also called 'weaving', are connected with unsuitable keeping systems (Kurt 1986; Poole 1988).

In 1990 guidelines for keeping, training and the use of animals at circuses and similar institutions were issued in Germany in connection with the Animal Welfare Act (BML 1990). For the first time these guidelines request that elephants be kept in unshackled groups in a paddock for at least one hour per day. A paddock in this sense is an enclosure which is limited by an electric fence. The purpose of this study was to ascertain the effects on the behaviour of circus elephants when kept unshackled in paddocks.

Materials

Subjects

The investigation included 29 female elephants, 10 African (*Loxodonta africana*) and 19 Asiatic (*Elephas maximus*), at four circuses located in Germany and Switzerland. The age of the animals ranged from 5 to 30 years. Table 1 gives details of the observed animals.

Table 1 **Observed animals.**
E – *Elephas maximus*, L – *Loxodonta africana*

Name	Species	Born	Origin	In circus since
Circus A				
Patma (P)	E	1961	India	1963
Siri (S)	E	1963	Thailand	1965
Delhi (D)	E	1968	Zoo Hannover	1970
Ceylon (C)	E	1971	India	1973
Rani (Ra)	E	1982	Burma	1990
Sabu (Sa)	E	1984	Burma	1990
Indi (I)	E	1986	Burma	1988
Ma Palay (Mp)	E	1986	Burma	1988
Circus B				
Maja (Mj)	E	1971*	Zoo Sweden	1976
Cita (Ci)	E	1971*	Zoo Sweden	1976
Circus C				
Baby (Ba)	E	1967*	Zoo	1977
Rita (R)	L	1971*	Africa*	1977
Kongo (K)	L	1974*	Africa*	1977
Beauty (Bt)	L	1981*	Africa*	1983
Didi (Di)	L	1981*	Zimbabwe	1983
Tanja (T)	L	1981*	Zimbabwe	1983
Circus D				
Berlinda (Br)	E	1968*	India*	1970
Pira (Pi)	E	1968*	India*	1970
Diana (Da)	E	1968*	India*	1970
Wicky (W)	E	1968*	India*	1970
Mary (My)	E	1968*	India*	1970
Digi (Dg)	E	1968*	India*	1970
Cindy (Cy)	E	1968*	India*	1970
Maja (Ma)	E	1974*	India*	1976
Siam (Si)	L	1976*	Africa*	1978
Samba (Sb)	L	1980*	Africa*	1982
Nady (N)	L	1980*	Africa*	1982
Lulu (L)	L	1980*	Africa*	1982
Sikim (Sk)	L	1980*	Africa*	1982

* year or origin uncertain

Shackled keeping

At all four circuses the elephants were kept shackled in stable tents for several hours a day (Table 2). The chains were 1 to 2m in length and were fixed to the boarded floor (Figure 1). Each elephant could use an area of 7 to 12m^2 (Table 2). When shackled the animals always had the same neighbours. They were ordered according to height, as during performances the elephants act in this order, so animals which work closely together had a chance to habituate to each other during their stay in stable tents.

Table 2 **Available area in paddock and stable tent and hours per day the elephants spent in each keeping system and in training and performing.** E – *Elephas maximus*, L – *Loxodonta africana*

Circus	A(E)	B(E)	C(E/L)	D(E)	D(L)
Shackled keeping					
hour/day	12.6	16.4	15.2	22.7	23.2
area/elephant (m^2)	10.0	12.0	7.0	8.6	8.6
Paddock					
hour/day	8.2	6.7	8.1	1.2	0.3
area/elephant (m^2)	38.0	72.0	22.7	35.4	22.7
Training and performing					
hour/day	2.1	0.5	0.3	-	0.3

Figure 1 **Shackled keeping in stable tent. The chains are attached diagonally to one foreleg and one hind leg.**

Unshackled keeping

At circuses A, B and D the paddocks were limited by an electric fence (Figure 2) and at circus C by a fence made out of metal bars. At circus A the fence was 150cm high, at circus

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B 130cm, at circus C 140cm and at circus D 80cm. The size of the paddocks varied between 114m^2 and 304m^2. This corresponds to areas from 22.7m^2 to 72.0m^2 per elephant (Table 2). The surface of the paddocks depended on the site. At circus A it was asphalt covered wih sand, at the other circuses it was gravel.

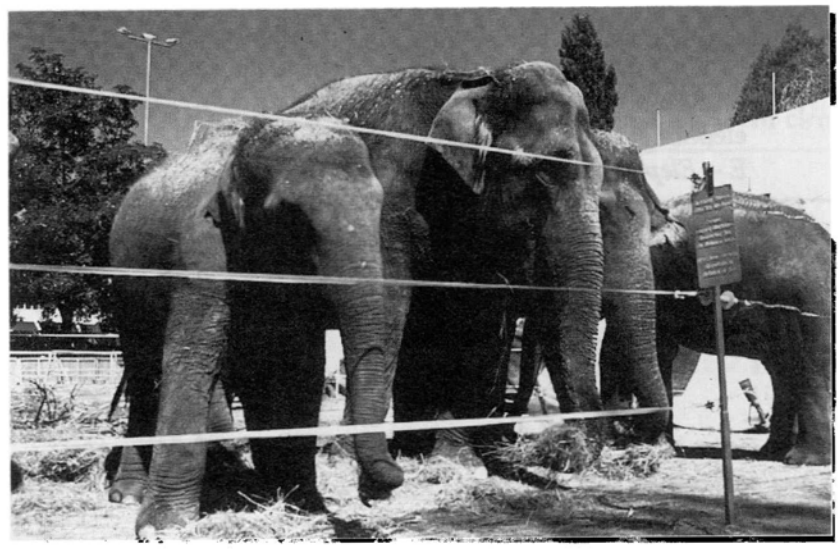


Figure 2 **A paddock at a circus. The elephants are enclosed by an electric fence.**

The elephants of the four circuses were kept in paddocks from 0.3h to 8.2h per day (Table 2). For the remainder of the day the elephants were kept shackled in stable tents, except for the time they spent training and performing. Training and performing took between 0.3h and 2.1h (Table 2) at the several circuses. At circus D it was not possible to keep the eight Asiatic elephants together in one paddock because of incompatibilities between several individuals. So they were kept in the paddock in three alternating groups, first a group of five animals (Berlinda, Pira, Wicky, Mary and Maja) and afterwards two groups of two animals each (Cindy and Diana, and Cindy and Digi).

Other keeping conditions

At circus A and B every morning dirty areas on the skin were brushed off with soft soap and then hosed with water. During the day the animals were sprayed with water several times. The frequency of spraying depended on weather conditions, on hot days it occurred more often than on cold days. Additionally the elephants at circus A took a daily bath in a pool at the site. At circuses D and C no skin care took place. At all circuses the nails were filed periodically.

The main food at all circuses was hay. Additionally branches, vegetables, fruit and bread were fed. At circuses A, B and C cereals mixed with water were offered every morning.

Methods

The behaviour of shackled elephants was observed for a total of 72h, the behaviour of unshackled elephants for a total of 89h. The period of observation started in August 1991 and ended in January 1992. Observation at the four circuses varied from four to eleven days (Table 3) and covered, in effect, the period starting in the morning with the beginning of keepers' work and ending in the evening with preparations for the night, feeding hay and spreading straw.

Table 3 Observation data.

Circus	Observation period	Days of observation	Hours of observation	
			a) shackled	b) paddock
A	August 1991	9	16	36
B	September 1991	5	13	21
C	October 1991	4	9	19
D	January 1992	11	34	13

Activities were classified into social, comfort and play behaviour. Social behaviour was subdivided into attractive, cohesive and repulsive behaviour. Attractive social behaviour consists of short (1–3 seconds) contact between animals in a friendly way. Cohesive social behaviour is as for attractive, but with a longer period of contact (greater than three seconds). Repulsive social behaviour is aggressive contact. Table 4 describes the behaviour patterns recorded for each of the three subdivisions of social behaviour. From the extensive activities of play behaviour, this investigation only included object play.

For both keeping systems and for each animal the frequencies of activities were recorded by all-occurrence sampling, the observer watched the whole group of subjects and recorded all the occurrences of certain classes of behaviour by the group (Altmann 1974). At circus D the elephants were observed in four groups in a paddock: three groups of Asian elephants, one of five and two of two individuals (Cindy was a member of both pair-groups) and one group of five African elephants. In the shackled situation the group of Asian and the group of African elephants were observed separately.

At the same time, the occurrence of stereotyped movements was recorded by scan sampling in both keeping systems, the whole group of subjects being rapidly scanned at regular intervals (10min) and the performance of stereotyped movements by each individual recorded (Martin & Bateson 1986).

Weaving was defined as a swinging to-and-fro movement of the front part of the body or as a nodding movement of the head. Movements of the elephant's forelegs were often part of weaving. The forelegs were lifted according to the rhythm of the swinging fore-body or the nodding head. The trunk swung slackly according to the rhythm of the body or was collecting food.

Table 4 Activities of social, comfort and play behaviour.

1. **Social behaviour**

a) *Attractive social behaviour*
- trunk contacting face, genitals or another part of the body of an individual for a short* time.
- putting the head on to the body of another individual for a short* time
- two animals leaning against each other for a short* time
- smelling different parts of the body of another individual without touching

b) *Cohesive social behaviour*
- two animals entwining their trunks
- trunk contacting face, genitals or another part of the body of an individual for a long** time
- rubbing the head or flank of another individual
- putting the head on to the body of another individual for a long** time
- two animals leaning against each other for a long** time
- climbing on to an individual which is in a recumbent position

c) *Repulsive social behaviour*
- pushing another individual with trunk, head or tusks
- kicking another individual
- biting another individual
- threat: ears spread, head high

2. **Comfort behaviour**
- throwing sand, sawdust or food on to the body
- scratching with the trunk
- scratching with tools held in the trunk
- scratching with the legs
- wiping the skin with grass or hay held in the trunk
- spraying water on to the body
- rubbing a part of the body against an object
- wallowing

3. **Play behaviour**
- playing with objects

* short = 0–3 seconds, ** long = greater than 3 seconds

Statistical analysis

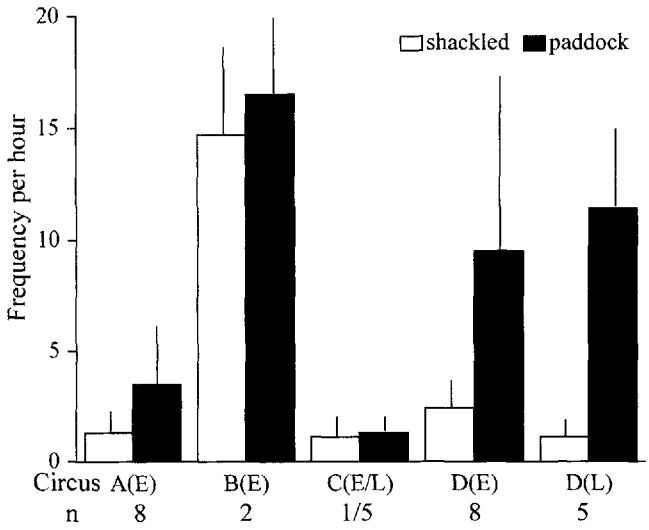
Non-parametric statistics were used. To properly assess the difference between shackled and unshackled keeping, it was necessary to consider the data for each circus separately. The different conditions at each circus may also influence the behaviour of the elephants, for example the time elephants spent training and performing, the relationship between keepers and animals, food, skin-care etc. Thus the different conditions at each circus are confounding factors. The technique of separately investigating the primary question to allow for confounding factors is known as stratifying the data (Matthews & Farewell 1988). Thus the data were stratified by circuses and analysed using a stratified Wilcoxon-test.

Results

Comfort behaviour

Overall circuses, elephants showed comfort behaviour more frequently in paddocks ($P<0.05$) (Figure 3). Paddocks offer more freedom for comfort behaviour; the elephants were able to

wallow; to throw dirt or sand on to their bodies, which was scratched off with their nails; and to find stones and sticks to scratch their skin. Shackled keeping limited their movement so they could not perform these activities or reach the materials necessary for comfort behaviour.

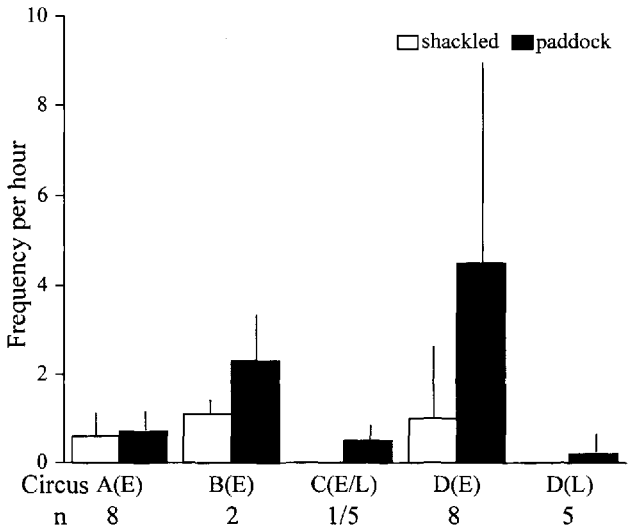


E – *Elephas maximus*, L – *Loxodonta africana*, n – number of elephants

Figure 3 **Frequency of comfort behaviour per hour and per elephant for each circus (mean and SEM).**

Play behaviour

At all circuses play behaviour with objects rarely occurred, but most often in paddocks ($P<0.05$) (Figure 4). Similar to comfort behaviour, elephants used the variety of materials available in paddocks for playing: sticks, stones, papers and other objects.



E – *Elephas maximus*, L – *Loxodonta africana*, n – number of elephants

Figure 4 **Frequency of playing with objects per hour and per elephant for each circus (mean and SEM).**

Social behaviour

The results of attractive and repulsive social behaviours showed no clear difference between the two keeping systems (Figure 5). Sometimes there were more activities in paddocks, sometimes more in shackled keeping ($P>0.05$). On the contrary, in four of the five groups cohesive social behaviour was observed more frequently in paddocks ($P<0.05$) (Figure 5).

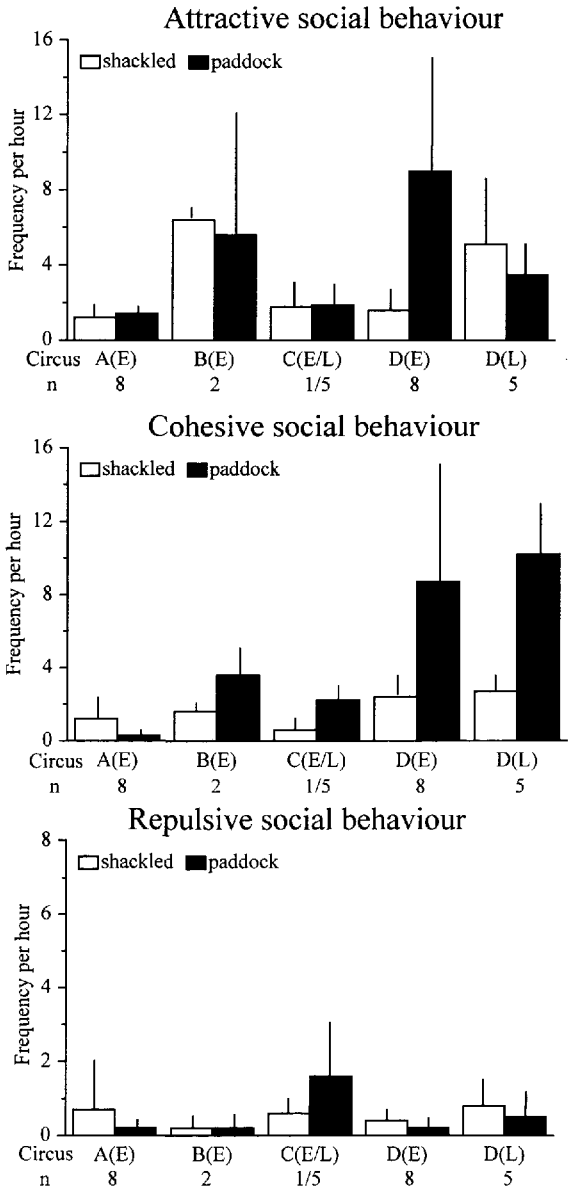


Figure 5 **Frequency of social behaviour per hour and per elephant for each circus (mean and SEM).**
E – *Elephas maximus*, L – *Loxodonta africana*, n – number of elephants

To analyse the choice of social partners, sociograms were constructed for each individual showing the percentage of social contacts for individual members of a group in both keeping conditions. Figure 6 exemplarily shows the sociogram of the African cow Rita at circus C and of two Asian cows, Delhi and Rani at circus A. The elephants when shackled confined their social contacts to the neighbouring cows. In the paddocks they extended their social contacts to all members of the group (Figure 6).

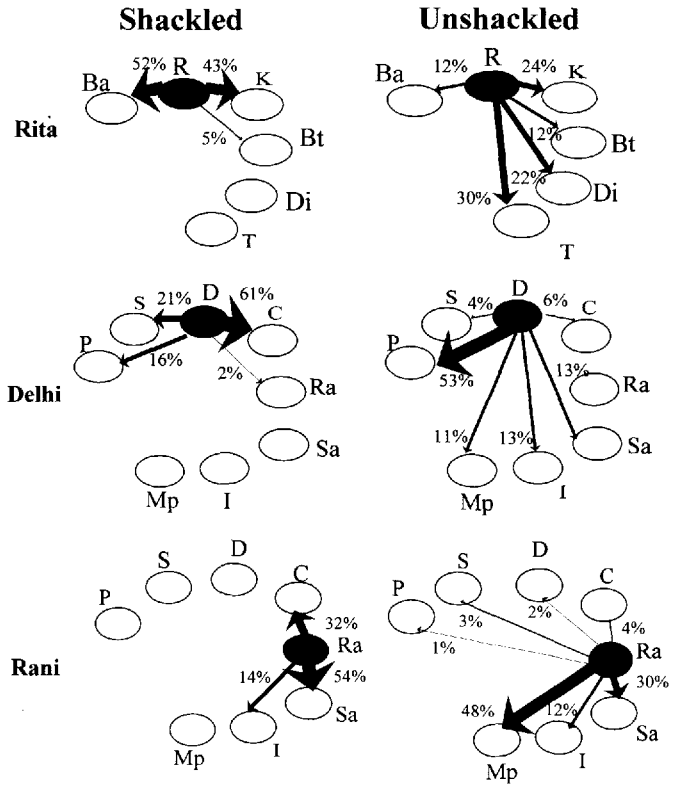


Figure 6 **Sociogram of Rita (R), Delhi (D) and Rani (Ra) in shackled and unshackled keeping. The focal animal is represented by a black circle, the other elephants are arranged according to their positions in shackled keeping (abbreviations Table 1). The social contacts are shown by arrows. Thickness of arrows represents frequency of social contacts. Additionally the percentage of social contacts to each animal is given.**

Like Rita, Delhi and Rani, when kept in a paddock 20 out of 24 elephants studied used the chance to contact all members of their group. Figure 7 shows the average number of social partners for each circus in the two keeping systems. At circus D it was only possible to analyse the social contact of the two groups of five individuals which were kept together in the paddock. The two pair-groups of circus D and the two elephants of circus B were excluded from the analyses, because it made no sense to analyse the choice of social partners when there is only one possibility. Figure 7 demonstrates that at circuses D and C all

elephants had contact with all members of their respective group in the paddock. At circus A, four of the eight individuals also contacted all possible members of the group, whilst the other four individuals contacted only six of the seven possible partners in the paddock. So the average which is shown in Figure 7 is 6.5 individuals.

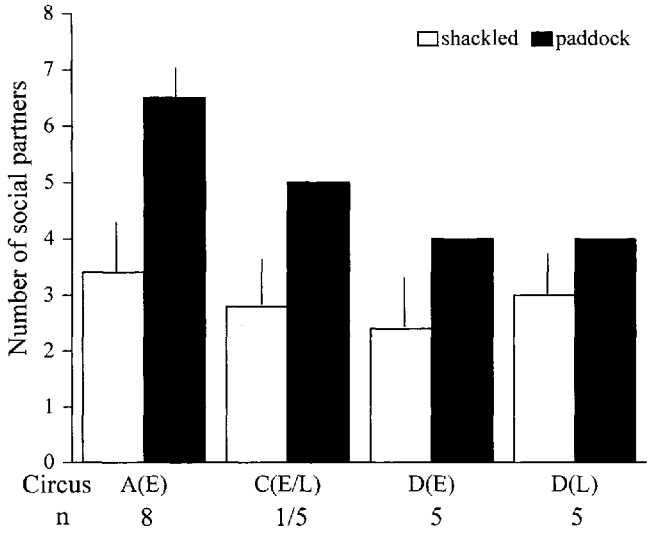


Figure 7 **Number of social partners when shackled or in a paddock for each circus (mean and SEM, SEM of C, D (E) and D(L) for paddock = 0).**
E – *Elephas maximus*, L – *Loxodonta africana*, n – number of elephants

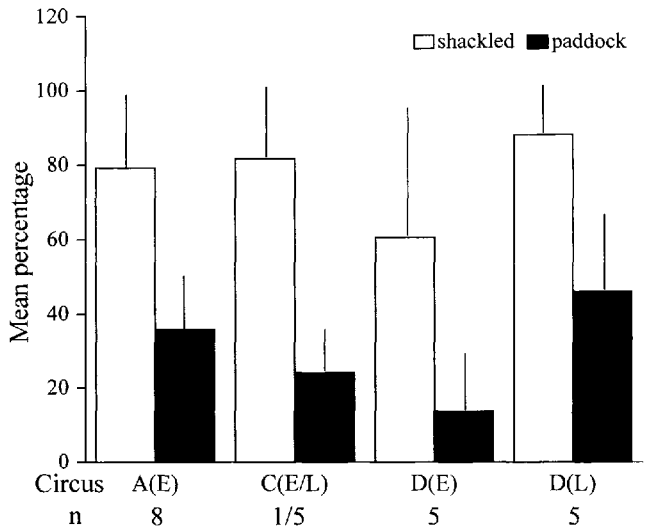


Figure 8 **Percentage of social contact exchanged with chain neighbours when shackled or in a paddock for each circus (mean and SEM).**
E – *Elephas maximus*, L – *Loxodonta africana*, n – number of elephants

In the paddock Rita and Rani favoured an animal they could not reach for social contact whilst shackled. In the paddock Delhi preferred Patma (P), an animal she could only reach with difficulty while shackled, as she stood two places away from her. When shackled in the stable tent all three animals had most contact with one of their chain neighbours, on the right or left side. In Figure 8 the percentage of social contacts the elephants exchange with their chain-neighbours in the two keeping systems is compared for each circus. For all circuses the elephants reduced their social contacts with their chain-neighbours when kept in paddocks. An analysis of their main social partners in the paddock demonstrates that 17 out of 24 elephants do not choose a chain neighbour as the primary social partner in the paddock.

Stereotyped movements

All 29 elephants studied showed the stereotyped movements called weaving. Each elephant showed a specific weaving pattern. For example Nady, an African elephant from circus D, put her left foreleg one step in front of her right one while nodding continually. When she bowed her head, she lifted the back part of the sole of her left foreleg. Lifting her head she bent the knee of her right hind leg. Her trunk swung slackly in synchrony with her head.

Nineteen of the 29 elephants performed their weaving pattern in both keeping conditions, the remaining 10 performed this behaviour only when they were kept shackled. However, shackled elephants spent much more time weaving than elephants in paddocks ($P<0.05$) (Figure 9). For example the elephants of circus B spent 55 per cent of their time weaving when shackled and only 9 per cent when in a paddock.

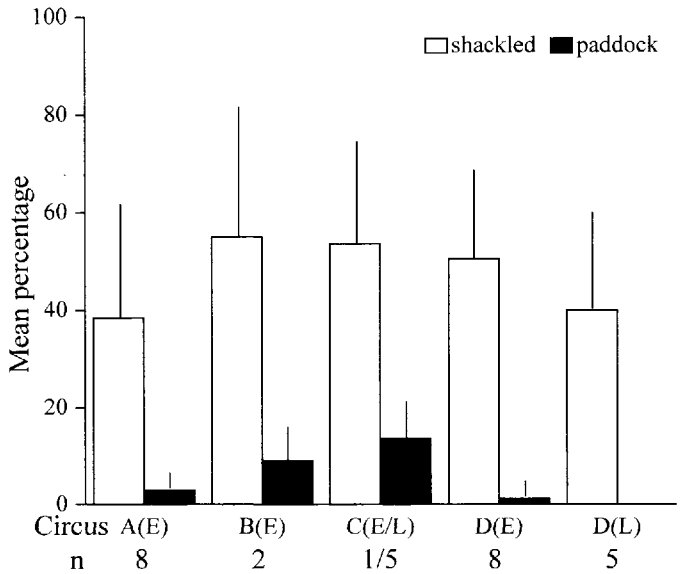


Figure 9 **Percentage of time elephants spent in stereotyped movements during a day for each circus (mean and SEM).**
E – *Elephas maximus*, L – *Loxodonta africana*, n – number of elephants

Discussion

Play and comfort behaviour

Free-living elephants show various play activities; running play, play-fighting and playing with objects (Moss 1988). Investigations of captive elephants show their large interest in manipulating objects and exploring their environment (Adams & Berg 1980; Chevalier-Skolnikoff & Liska 1993). Shackled elephants have few possibilities to carry out these activities. In contrast to shackled keeping, paddocks offer more opportunities for exploration, manipulation and consequently play behaviour. Furthermore, paddock keeping also offers more possibilities for comfort behaviour. Shackled circus elephants have little opportunity for comfort activities. Skin care is carried out by keepers periodically hosing and brushing the animals. Taking a bath daily, wallowing, dust-bathing, rubbing against trees or termite-hills, and scratching with tools held in trunks, are elements of comfort behaviour in wild elephants (Douglas-Hamilton & Douglas-Hamilton 1975; Kurt 1986). These activities are also observed if elephants are kept in zoos and safari parks with appropriate enrichment facilities, eg wallows, possibilities for rubbing, sand or dirt for dust-bathing and water holes (Kühme 1961; Adams & Berg 1980; Chevalier-Skolnikoff & Liska 1993). Skin irritations, often caused by poor skin care, can be reduced by making such facilities available for elephants (Schulze 1986; Kuntze 1989; Rüedi 1990).

Only paddocks provide the variety of materials which elephants may use in play and comfort behaviour. Perhaps the elephants would show the same amount of these behaviours if the same material could be offered during shackled keeping. But this is not possible because of the daily routine at circuses. Shackled or unshackled are not the only factors which separate the two keeping systems. There are many other factors which can influence the behaviour of the animals, eg different materials available for play and comfort behaviour, closer contact to visitors, exposure to weather conditions. To find the causal factors for the behavioural differences between the keeping systems, more detailed investigations are necessary. This study cannot suggest the causal factors. However, the results clearly show that the elephants had more possibilities to exhibit comfort and play behaviour when kept in paddocks. So paddock keeping should be the favoured keeping system at circuses and shackled keeping should be reduced as much as possible.

Social behaviour

In the wild, elephants live in groups which consist of related females and their offspring (Sukumar 1989; Moss 1988). The bonds between members of the family groups are maintained by various social contacts. Therefore, elephants spend much time exhibiting social behaviour. For example in Yala National Park (Sri Lanka) this behaviour takes 20 per cent of the elephants' time (Kurt 1986). If we are keeping elephants in captivity we should consider their needs for social contact even when the groups are not family groups. Investigations of captive elephants living in groups of arbitrary composition show that there are various social behaviours and social bondings between the animals (Adams & Berg 1980; Garai 1992).

The investigation of attractive and repulsive social behaviour of the elephants at the circuses showed no difference between the keeping systems. In contrast, cohesive social behaviour was observed more frequently in paddocks than in shackled keeping (Figure 5). Perhaps this result was caused by the restricted freedom of movement in shackled keeping

because long contacts were only possible in uncomfortable positions. This may be the reason why attractive and repulsive social contacts were observed in both keeping systems with nearly the same frequency.

In shackled keeping, contacts between animals were restricted to the two neighbouring elephants and the order of the animals was always the same when kept shackled. So the social partners did not change. Out of all this, one question arises: Is the less cohesive social behaviour of shackled elephants caused by the physical restrictions of the shackles or by the restricted number of social partners? It is possible that the elephants did not like to have cohesive contacts with the individuals shackled next to them, but would prefer contact with individuals which were out of reach because of the chains. The sociograms showed that elephants in paddocks preferred to have most contact with an animal which was not a well-known chain neighbour. So in paddocks elephants have the chance to choose their social partners depending on their friendliness to single individuals. Therefore the less cohesive social behaviour of shackled elephants could be caused by their dislike of the elephants next to them.

Perhaps it would be possible to increase cohesive social behaviour in shackled keeping if the order of elephants was changed, corresponding to the preferences of animals. However, the sociograms of the elephants show that they had contact with all members of their group if kept in a paddock. Therefore, changing only the order of shackled elephants would not be sufficient for the social needs of these animals. They need the chance to contact all members of their group and only the unshackled keeping in paddocks grants this. In paddocks elephants have the chance to spend almost as much time exhibiting social behaviour as wild elephants do.

Stereotyped movements

Stereotyped movements have been observed in many captive animals, eg horses, bears and various Canidae (Holzapfel 1938; Carlstead *et al* 1991; Wechsler 1991). These movements are abnormal behaviours connected with unsuitable keeping systems (Poole 1988; Mason 1991). Investigations of several species show that improvements of keeping systems reduce stereotyped movements. These improvements are natural enrichments, opportunities to be occupied with food or objects, and natural social environments (Poole 1988; Carlstead *et al* 1991). Consequently, the animals would receive adequate stimuli to cover their needs.

This study of 29 circus elephants showed that stereotyped movements were clearly reduced in paddocks. Obviously elephants could find sufficient substrates and stimuli for their needs in paddocks rather than in shackled keeping in stable tents. As the investigation shows, elephants had more opportunities for comfort, play and social behaviour with a corresponding reduction in stereotypies when kept in paddocks.

Welfare implications

Paddock keeping offers more opportunities to satisfy the behavioural demands of elephants, and it represents a clear improvement in conditions for these animals in the special situation of a circus. The reduced stereotypies in the unshackled situation underline this fact.

Chaining of elephants is an old tradition in keeping these animals. It is defended as the best method to grant security for keepers, visitors and the elephants themselves and provides the animals with an undisturbed sleeping place (Schulze 1986). Dittrich (1988) describes

chaining as a possibility for the keeper to demonstrate his dominant position every day. Today some zoos keep their elephants without any chains (eg Chester, Münster, Rotterdam) and have had no problems so far. Only for medical treatment and foot care is it a great advantage to have the elephants shackled. So elephants should learn to stay on chains but shackled keeping in daily routine should be reduced as far as possible in zoos and also in circuses. Today the best method for circuses is to use paddocks.

In addition to the advantages shown here, paddocks can offer further variety for elephants. Sand or sawdust strewn into paddocks allows dust-bathing as in the wild. One part of a paddock could be sprayed with water for mud-bathing and wallowing. Toys like old car tyres could be used to offer variation and occupation.

Travelling from site to site is another form of variation for circus elephants. At one site the surface of a paddock is gravel at another site grass, sometimes there are trees or big stones, and also the surroundings around the paddock change from site to site, there are other noises and other smells etc. The elephants always receive new stimuli. Stable tents, on the contrary do not offer such variation. Keeping circus elephants in paddocks is a great welfare improvement.

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