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The behavior of circus tigers during transport

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Abstract

The behavior of two tigers (*Panthera tigris*) individually caged and transported once for 4.25 h and the behavior of four tigers that were transported twice for 4.2 and 4.5 h while caged as a group was analyzed. The tigers were videotaped during transport and the amount of time spent pacing, lying, and standing and walking was determined. Environmental conditions encountered during the trips, as well as tiger body temperature, were recorded at 5 min intervals during transport. Tigers that had access to an exercise pen and performed previous to transport spent most of their transport session lying down. Only toward the end of the trip did they exhibit pacing behavior. In contrast, those tigers that had not performed within a half day before transport and had no access to an exercise pen exhibited more frequent pacing behavior throughout transport. While slight rises in body temperature did coincide with some instances of pacing, increases in body temperature by one degree or more were most likely attributable to exertion during performances before transport.

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1. Introduction

Life in the circus is defined by travel. Travel from one destination to another can occur weekly, if not daily. As an integral part of many circus acts, tigers are also subject to frequent travel. Efficient transport mandates that circus tigers have to be kept in somewhat small cages to allow them to be easily moved from one location to another. While stopped at a venue, some tiger trainers provide their animals with exercise pens, allowing them time out of their smaller cages to play and interact with other tigers.

In captive situations where there is less space available, an animal must compromise and truncate its normal activity patterns, resulting in a reduced behavioral repertoire. This

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sort of restriction of movement often leads to stereotypy development (Dantzer, 1986). In captive tigers, pacing in a straight line is the simplest form of stereotypic behavior exhibited, and it also proves to be the one most commonly observed (Meyer-Holzappel, 1968). There are many hypotheses regarding the motivation behind pacing, but several attribute it to a restriction of normal locomotor activity (Wechsler, 1991). Studies on the effects of enclosure size on the development of stereotypic behaviors almost unanimously conclude that larger pens reduce the frequency of stereotypic behavior (Hediger, 1968; Lyons et al., 1997).

Studies on other frequently transported animals have found that some species are very limited in their behavior during actual movement of the vehicle. Herbivores such as cattle (Friend et al., 1981), horses (Stull, 1999; Friend, 2000) and elephants (Toscano et al., 2001) will stand throughout transport, lying down only when fatigue becomes extreme. The inability of horses to lay down and rest during long trips was one of the factors behind the Safe Commercial Transport of Equine to Slaughter Act (sections 901–905) that was passed as part of the 1996 US Farm Bill. This act established limits on the duration that slaughter horses may be transported in the US. Pigs, however, are capable of more variation in behavior and will generally lie down after a trip has commenced (Hicks et al., 1998), but more pigs will remain standing during a journey over rough roads (Bradshaw et al., 1996).

Confinement in cages or trailers for an extended period of time is just one aspect of transport. Before transport, many cages and trailers require preparation and loading. Loading often involves work crews shouting to each other trying to coordinate efforts, or loud tractors to load cages into trailers or onto flatbed trucks. Circus tigers sometimes react to the presence of work crews or tractors by growling or swiping with their paws. Compared to livestock transport, though, the whole experience appears less stressful to circus animals for which it is a way of life (Kiley-Worthington, 1990).

Currently, there are no descriptions in the literature regarding the behavior of tigers while they are being transported. In order to determine this, the behavior of tigers during three separate transport sessions was videotaped and their body temperatures recorded. The amount of time that the tigers spent either pacing, lying, and standing and walking during transport was determined.

2. Materials and methods

2.1. *Dr. Josip Marcan tigers (Ringling Bros., Barnum & Bailey, Blue Unit)*

During this study, the tiger act belonging to Dr. Josip Marcan was traveling with the Blue Unit of Ringling Bros., Barnum & Bailey. The act consisted of seven Bengal tigers, and two were chosen for observation. One 5-year-old female white Bengal tiger (Tora) and one 5-year-old male white Bengal tiger (Tibet) were continuously videotaped during transport from San Antonio, TX to Houston, TX in July 2001. When not performing, the cats were housed in cages in the “beast wagon” trailer in which they are transported, but also had access to a round exercise pen approximately 10 m in diameter. One hour after the final evening performance, the tigers were towed in their cages by tractor to the parking lot where they were loaded onto a flatbed truck. The interval between the end of the performance and the beginning of transport was 2 h and 12 min. During transport, each cat was held singly

in a 1.5 m long \times 2.5 m wide portion of the wagon. One camera (Panasonic WV-BP312) was mounted on top of each cage in which the tigers were transported. The cameras were focused through the barred ventilation ports located in the ceiling above each cat's cage in the trailer, and fed to a time-lapse recorder (Panasonic AG-1070) inside the cab of the truck set to record 24 h of observations on a 2 h videotape. The cameras and cables needed to be removed immediately upon arrival Houston, TX in order for the wagons to be unloaded.

Data was quantified using the Etholog program (E.B. Ottoni, Sao Paulo, Brazil). The percentage of time that each tiger spent pacing, lying down, or standing and walking was determined during intervals representing significant events during transport. The thirteen minutes after loading while the cats sat in their trailer awaiting transport was analyzed initially.

Because the two tigers showed slight increases in body temperature during the early part of transport, the first 30 min of transport was partitioned out to determine if the increases in body temperature were due to increases in activity or pacing frequency. For consistency, the first 30 min was also partitioned out in the following two trials. The rest of this trip was divided into the span of time before a refueling stop, the time during the refueling stop in which the trucks carrying the cats were not moving, and the span of time remaining until arrival in Houston.

The temperature inside the beast wagons, along with relative humidity, was recorded at 5 min intervals using "HOBO" model H8 dataloggers (Onset Computers, Pocasset, MA) mounted in the cages. During this trip, both cats were also fed miniature Thermochron dataloggers (DS1921-F5, Dallas Semiconductors, Dallas, TX) to record body temperature at 5 min intervals as they passed through the cats' digestive systems during transport. After the loggers were excreted in the feces, they were recovered and their data was downloaded and graphed.

2.2. *Vincent von Duke tigers (Vazquez Bros. Circus)*

2.2.1. *Ft. Worth, TX to Houston, TX*

When this study was conducted, the Vincent von Duke cat act was traveling with the Vazquez Bros. Circus. The act was comprised of six lions and four tigers. The four cats observed during transport were all 4-year-old Bengal/Sumatran crosses. They were transported as a group in a 2.3 m long \times 2.5 m wide cage that was built into the trailer. The same video equipment used to record behavior previously with the Marcan tigers was also used to record behavior in this study. Both the camera and recorder were mounted in a small storage compartment at the back of the trailer next to the cage in which the tigers were being transported. A small hole was cut into the wall separating the compartment and the cage to allow the camera to focus into the cage, but still keep it protected from the cats.

When not performing during the day, the cats had access to an exercise pen approximately 5 m in diameter. The evening before transport, they had two performances. After performing that evening, the cats were loaded into their cages. Although the trip to Houston began at 2:00 h the following morning, the trailer stopped 2 h later for an overnight rest. Actual videotaping did not begin until 10:00 h when the trailer departed for the rest of the trip after the rest stop. For consistency with the other shipments, the first 30 min of transport was partitioned out. There was no mid-trip fueling stop, so the rest of this trip was divided into periods approximating the main portion (0:31–2:40) and the last 30 min (2:41–4:10).

Videotaping continued until arrival in Houston, TX at 14:30 h. Body temperature and environmental temperatures were collected in the same manner as with the Marcan tigers. Dataloggers were fed to and recovered from three of the four tigers.

Data was quantified from the videotape using scan sampling at 5 min intervals. This method is the most efficient for quantifying behavior when dealing with a group of almost identical animals where identification of specific individuals is not possible. At the 5 min intervals, each cat was determined to be either pacing, lying, or standing and walking.

2.2.2. *College Station, TX to Dallas, TX*

Videotaping and data collection methods used for the trip from Ft. Worth, TX to Houston, TX were repeated for the trip from College Station to Dallas. The day before the trip, the trailer carrying the cats had separated from the circus and arrived at Texas A&M University's College of Veterinary Medicine to deliver a lion that travels with the act for surgery. As the cats would only be staying for the day, the exercise pen carried by von Duke was not erected and the cats remained in their cages. The next morning, the cats departed to rejoin the circus in Dallas. As with previous transport sessions, in addition to dataloggers that recorded environmental conditions, dataloggers were fed to the tigers before transport to record body temperature at 5 min intervals. Single dataloggers were fed to all four tigers, but only three were recovered.

Video recording began approximately 40 min before transport at 10:00 h and continued for another 45 min after arrival in Dallas. For consistency with the other shipments, the first 30 min of transport was partitioned out. There was no mid-trip fueling stop, so the rest of the time on the road was divided into two approximately equal periods (0:31–2:15 and 2:16–3:55). When the truck reached the lot in Dallas, it could not pull into its normal spot next to the circus tent because other equipment was blocking its access. The truck was parked on the road until its spot was cleared. The behavior of the tigers during this time was quantified separately from the transport session itself, and is labeled "arrival and spotting of truck".

2.3. *Behavior definitions*

2.3.1. *Pacing*

A cat was considered to be pacing if it walked repetitively on a fixed route within its cage. A minimum of two consecutive laps or cycles between the same two points in the cage was necessary to be considered pacing.

2.3.2. *Lying*

A cat was considered to be lying if it assumed sternal or lateral recumbency. Any eating or grooming done while in a sternal or lateral recumbent position was also considered to be part of lying. If the cat rose to sit on its haunches, this was still considered lying until it supported itself on all four legs.

2.3.3. *Standing and walking*

Because standing would often occur as a very short event between a bout of walking, the two were scored together. The cat was considered to be standing if it supported itself on all four legs without locomotion. The cat was considered to be walking when it propelled itself

in a four-beat gait in a non-stereotypic manner. This often occurred when the cat would reposition itself in the cage by standing, taking a few steps, and then lying back down.

Any activity carried out while standing (e.g. elimination) was placed into the category of standing. The cats also sometimes stood on their hind legs and support themselves against the wall with their fore legs (rearing up). This was often done in what appeared to be an effort to sample scent marks. The occurrence of rearing up behavior was recorded, but because it often occurred as an instantaneous event and required little time, the time spent performing such behaviors was considered to be a form of standing.

3. Results

3.1. *Dr. Josip Marcan tigers (Ringling Bros., Barnum & Bailey, Blue Unit)*

Results were based on observations taken 13 min before departure as the cats sat in their cages after being loaded onto a truck, and from the subsequent 4 h and 15 min transport session (Table 1). During the course of this trip, ambient exterior temperatures peaked at 33.6 °C, with the corresponding temperature inside the wagon being half a degree lower. Throughout the trip, both interior and exterior temperatures decreased to approximately 27.0 °C.

Having just performed, both tigers had increases in body temperature; one from 36.5 to 38.0 °C (Tora) and the other from 37.0 to 38.5 °C (Tibet) at loading. During loading and the first 30 min of transport, the tigers carried out little activity. Tora paced 8.43% of the time between 0:31 and 1:50, while Tibet spent the entire time lying down. Neither tiger paced at loading or during the refueling stop when the truck carrying their trailer was not moving. Most activity occurred during the final part of the trip when Tibet paced for 6.6% and Tora paced 14.9% of that 2 h and 10 min time period.

3.2. *Vincent von Duke tigers (Vazquez Bros. Circus)*

3.2.1. *Ft. Worth, TX to Houston, TX*

The trip from Ft. Worth, TX to Houston, TX lasted a total of 4 h and 10 min. Temperatures outside the trailer during transport peaked at approximately 36.5 °C, while temperatures

Table 1

Percentage of time that tigers belonging to Dr. Josip Marcan (Ringling Bros., Barnum & Bailey, Blue Unit) spent performing various behaviors during transport from San Antonio, TX to Houston, TX, 321 km

Relevant transport events (h:min)	Percentage of observations spent pacing		Percentage of observations spent lying		Percentage of observations spent standing and walking	
	Tibet	Tora	Tibet	Tora	Tibet	Tora
Loading –0:13–0:00	0.0	0.0	100.0	100.0	0.0	0.0
First 30 min of transport 0:01–0:30	0.0	0.0	100.0	100.0	0.0	0.0
Transport 0:31–1:50	0.0	8.4	100.0	88.5	0.0	3.1
Refueling stop 1:51–2:05	0.0	0.0	100.0	100.0	0.0	0.0
Transport 2:06–4:15	6.6	14.9	88.4	79.0	5.0	6.1

Table 2

Percentage of time that tigers belonging to Vincent von Duke (Vazquez Bros. Circus) spent performing various behaviors during transport from Ft. Worth, TX to Houston, TX, 876 km

Relevant transport events (h:min)	Percentage of observations spent pacing	Percentage of observations spent lying	Percentage of observations spent standing and walking
Loading –1:00–0:00	25.0	59.6	15.8
First 30 min of transport 0:01–0:30	25.0	75.0	0.0
Transport 0:31–2:40	28.9	69.2	1.9
Transport 2:41–4:10	12.5	82.5	5.0

inside the trailer only peaked at 32.0 °C. On average, each tiger paced 27.2% of all observations, and spent 67.2% of the observations lying down. Standing and walking only occurred an average of 5.6% of all observations.

Overall, activity was highest during the first 2 h of transport. During the initial part of the trip, from 30 min to 2 h and 40 min, the pacing frequency peaked at 28.9% (Table 2). At that time, one of the tigers that had body temperature recorded, Sasha, showed an increase from 37.5 to 38.5 °C. Only one of the cats did most of the pacing in the group while the others spent most of the time lying down. Another tiger did not move throughout the trip after lying down once the transport had commenced. For the last 1 h and 30 min, pacing frequency decreased to its lowest point, 12.5%.

3.2.2. College Station, TX to Dallas, TX

Actual transport lasted 3 h and 55 min, but taking loading before transport and spotting the truck after transport into account, total observation time was 4 h and 35 min. Upon departure, exterior temperature was 32.8 °C, with a corresponding temperature inside the trailer of 27.1 °C. Throughout the trip, both exterior and interior temperatures increased. When the cats arrived in Dallas, the exterior temperature was 38.8 °C and interior temperature was 34.0 °C. The cats paced an average of 22.8% of the observations, while lying down occurred 60.3% of the observations. Standing and walking made up 16.9% of all behaviors during transport.

Before transport, no pacing was observed, and standing and walking only occurred 25% of the time (Table 3). The rest of the time was spent lying down. For the first 30 min of

Table 3

Percentage of time that tigers belonging to Vincent von Duke (Vazquez Bros. Circus) spent performing various behaviors during transport from College Station, TX to Dallas, TX, 283 km

Relevant transport events (h:min)	Percentage of observations spent pacing	Percentage of observations spent lying	Percentage of observations spent standing and walking
Loading –0:40–0:00	0.0	75.0	25.0
First 30 min of transport 0:01–0:30	33.3	41.7	25.0
Transport 0:31–2:15	31.3	62.5	6.3
Transport 2:16–3:55	18.8	72.9	8.3
Arrival and spotting of truck 3:56–4:35	35.8	32.1	32.1

transport, two of the three tigers that had their body temperatures recorded during transport showed a 0.5 °C increase in body temperature; one from 37.5 to 38 °C and the other from 38 to 38.5 °C. During that period, the tigers were looking out the windows of the trailer and paced with an increased frequency. Toward the end of the trip, more of the tigers began to lie down. Once the truck arrived in Dallas, as it waited to be spotted, the tigers again showed increased activity. While waiting, the tigers paced more frequently, spending 35.7% of the observations for that period engaged in the behavior, in addition to looking out the windows of the trailer. Equal amounts of time, 32.1%, were spent lying and standing and walking. During the period of increased activity, all of the tigers that had body temperatures recorded showed an increase of 0.5 °C; one from 37.0 to 37.5 °C, one from 37.5 to 38.0 °C, and one from 38.0 to 38.5 °C.

4. Discussion

4.1. *Dr. Josip Marcan tigers (Ringling Bros., Barnum & Bailey, Blue Unit)*

There were very few bouts of pacing during transport, and those mostly occurred toward the end of transport (Table 1). Both tigers had just finished performing only 2 h and 12 min before transport. It is possible that exercise from performing may have increased the motivation of the cats to lay down while in transit. Overall, instances of pacing increased in these cats as transport duration increased. By comparing video to corresponding body temperature data, the increases in body temperature that were observed in both tigers at the onset of transport were not related to increased activity of the cats during transport. It is more likely that the increases in body temperature observed were due to exertion during the performance that occurred one to 2 h earlier, and as a result of their prior exercise and elevated body temperature, the tigers were lethargic during transport.

4.2. *Vincent von Duke tigers (Vazquez Bros. Circus)*

4.2.1. *Ft. Worth, TX to Houston, TX*

While this group of tigers appears to have paced more often than those transported with Ringling's Blue Unit, the percentages can be misleading due to the sampling method used for this group of tigers. Individual tigers showed remarkably distinct behavior patterns. One of the four cats accounted for the vast majority of the pacing during this trip. This is evident when pacing is examined over the course of transport. The occurrence of pacing remained steady at 25.0% throughout loading and a half hour into transport, indicating that only one tiger was pacing (Table 2). That value rose slightly toward the middle of transport as more tigers began to pace, but had dropped by more than half by the end of the transport session.

4.2.2. *College Station, TX to Dallas, TX*

As with the journey from Ft. Worth to Houston, the tigers were more active during the initial part of transport, with the frequency of pacing decreasing towards the end of the actual transport session. During instances where the tigers appeared to be pacing while observing

the activity outside of their trailer when the trailer was stopped, the tigers experienced an increase in body temperature of 0.5 °C. At the end of the trip, increases in body temperature also occurred in conjunction with an increased frequency of pacing. Compared to the other transport session, there was a slight increase in the activity of the tigers during this trip. This may be because, in addition to being caged a majority of the previous day without performing or having access to an exercise pen, at its highest, the temperature inside the trailer peaked 2 °C cooler than during the trip to Dallas.

4.3. General

Whether circus tigers should be transported in groups or singly is a complex issue. Group housing always provides more opportunity for large cats to interact resulting in an enriched environment. However, adult tigers in the wild are solitary, and not members of social groups. Most trainers do prefer to house their tigers in groups when possible, but mature tigers that have not been raised together are difficult to combine and if they do fight, severe injury may result within seconds. The tractor trailers transporting the wagons in which the Marcan cats were transported were independent contractors not affiliated with the circus. Although the head trainer followed the tractor trailers in an automobile, the tractor drivers would not be likely to tell if the cats were beginning to act up or fight due to the weight of the trailer and wagons, and the lack of experience of the drivers. Hence, these cats were transported in individual cages to assure there could be no fighting. The von Duke cages were built into the aluminum trailer. Major movement by the cats could be felt by the driver in the tractor, and the driver was always Vincent von Duke or his wife. Although von Duke first assembled the group of tigers that we studied when the tigers were cubs and they did not display aggression toward each other, if a fight did start while the tigers were being transported, the driver would feel it in the cab and a sudden application of the brakes would cause the tigers to cease until the truck could be stopped and the cats separated.

5. Conclusions

Compared to the behavior of other animals that have been examined during transport, tigers showed a wide range of behaviors while in transit that allowed for increased variation in coping strategies. Those tigers that had access to an exercise pen and performed in the act 2 h before transport exhibited an increased frequency of lying down during transport. Instances of increases in body temperature by one degree or more at the onset of transport appear to be attributable more to exertion during performances and activity before transport than to behavior associated with the onset of transport.

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