

Visitor Circulation and Nonhuman Animal Welfare: An Overlooked Variable?

Gareth Davey

*Psychology Department
Bolton Institute*

Peter Henzi

*Psychology Department
University of Central Lancashire and
School of Psychology
University of KwaZulu-Natal*

This article investigates visitor circulation and behaviors within a gallery of primate exhibits in relation to their possible implications for nonhuman animal welfare. When entering a primate house, the majority of visitors (84%) turned right, a pattern upheld throughout all times of the day. These findings demonstrate the existence of the “right-turn” principle, a concept previously identified and investigated in the museum setting. The existence of this circulation pattern in zoos has important implications for the practical management of animal welfare issues because unbalanced or large numbers of visitors at specific enclosures could present a stressful influence. The “direction bias” could not be attributed to demographic or behavioral traits, therefore suggesting that the principle, like similar findings from museum research, generalizes across visitor populations and, therefore, zoos. A visitor sample at another exhibit (located outside the exhibit gallery) did not display a direction bias, suggesting that the marked circulation pattern may be specific to exhibit galleries. The article discusses the significance and consequences of visitor circulation with respect to visitor management and animal welfare.

Although it is obvious that unruly visitors at zoos and other zoological institutions are important challenges to nonhuman animal welfare provisions, research

since the 1970s (Hosey, 2000) has also established that the mere presence and behavior of people at zoo exhibits affect the behavior of captive animals. Moreover, this influence is generally considered to be stressful (Hosey, 2000). Many studies have demonstrated a positive correlation—increased aggressive and threatening behaviors—between increased visitor density and changes in animal behaviors indicative of stress; these visitor influences collectively are described as the “visitor effect” (Hosey, 2000).

If visitors present stressful variables for captive animals, then zoo managers must endeavor to understand, and also reduce, these stressful situations. One factor, overlooked and worth exploring further, is the pattern of visitors’ circulation and orientation (*circulation* refers to the patterns of visitors’ movements during their visits; *orientation* tends to focus on the ways visitors familiarize themselves within a setting; Martin & O’Reilly, 1982, 1989). In terms of animal welfare, understanding visitor traffic is imperative because popular exhibits are likely to receive increased visitor numbers and, therefore, more opportunities for visitor effects to occur.

Mitchell et al. (1990) first highlighted the relationship in their study of exhibit location and visitor attendance. They found that exhibits near the zoo entrance received significantly more visitors than did exhibits further away. These location effects persisted even when the animal inhabitants were swapped. They argued that these “location factors are critical” (p. 55) because large numbers of visitors at specific cages may affect the behavior of the captive animals and need to be considered in welfare initiatives (such as enrichment).

Other studies of visitor circulation have also shown that some zoo areas are visited more than others. Martin and O’Reilly (1982, 1989) described a situation in which the majority of people followed one path around a zoo’s boundary, resulting in their missing many exhibits. Following this, attempts were made, based on the most popular routes taken by visitors, to determine favorable places to locate exhibits (Martin & O’Reilly, 1989; Martin, O’Reilly, & Albanese, 1983).

Apart from these few studies, no other research has investigated visitor circulation and exhibit location effects in zoos in relation to animal welfare. In contrast, visitor circulation research currently is topical in museum research and has resulted in the identification of visitor circulation principles that may hold true in zoos. Consequently, this work is worth exploring to enhance our current understanding of zoo visitor effects on animals.

In the 1920s and 1930s, Yale University researchers conducted the earliest circulation research in museums (Melton, 1935; Robinson, 1931). One principle that emerged from their early work was the notion that the majority of visitors turn right when entering a gallery of museum exhibits (known as the “right-turn” bias). Indeed, Robinson stated, “we find this tendency to be so strong that left walls in long halls and galleries are markedly inferior to right walls as places of exhibition” (p. 422).

Remarkably, 75% of visitors entering a gallery of exhibits turned right, and more than 50% viewed only the objects along the wall of the direction in which they turned (Melton, 1935). Could this visitor behavior principle exist in zoos? The existence of marked patterns in visitor circulation at zoo exhibits could pose considerable implications for zoo and animal welfare management. In the context of the visitor effect (Hosey, 2000), this principle has important implications because some areas of exhibit galleries may receive much larger numbers of visitors. In addition, given that visitors typically view the first exhibits they encounter in a zoo gallery for longer periods than subsequent exhibits (Bitgood, Patterson, & Benefield, 1988; Marcellini & Jenssen, 1988; Phillpot, 1996) it is reasonable to assume that the first exhibit on the right side of a gallery will receive more visitor attention than the exhibits on the left.

Despite these important implications, there is no published attempt to explore the right-bias principle in a gallery of zoo exhibits. It seems that zoo audience researchers have overlooked this early concept. This could be due to the scarcity of studies or, perhaps, to the possibility that museum-based, early visitor studies were not readily encountered by zoo researchers.

In addition, several unanswered questions offer opportunities for further research. No attempts have been made to investigate whether people who turn in different directions display distinguishable demographic or behavioral characteristics. Furthermore, no studies have explained why the majority of visitors turn in a specific direction or how the principles can be counteracted to reduce effects on animal welfare.

This article describes a study aimed at investigating the existence of the right-turn principle in a sample of zoo visitors who entered a gallery of primate exhibits. It compares the results with those of a sample of visitors who approached another exhibit located outside the gallery. The article discusses the results in their relation to animal welfare. In addition, an analysis of the demographic and behavioral characteristics of visitors characterizes those who turned in particular directions.

METHOD

In July 2002, the Blackpool Zoo Park, a 32-acre zoo in the northwest of England, conducted visitor studies. A study unobtrusively observed a random sample of 271 visitors entering the small primate house. The primate house was a wooden building that housed a gallery of eight primate exhibits; one door served as both the entrance and exit of the house. Most exhibits had only a view of visitors in front of their space, although some exhibits had a view of the entire room.

The study recorded the visitors' demographic characteristics and the direction in which they turned when they entered the gallery. To investigate each visitor's

subsequent behavior, the study viewed people while they visited one exhibit, Grey Mouse Lemur (*Mircocebus murinus*), in the primate house. The frequency and duration of peoples' visits, viewing periods, and stopping periods were recorded (Table 1). To provide more detailed data collection, the study used a camcorder to make visual recordings of visitor behavior. A random sample of 189 visitors was observed at the White-faced Saki (*Pithecia pithecia*) exhibit; the observation area was situated outside the primate house and was not part of an exhibit gallery. This article will refer to these exhibits as Exhibit 1 and Exhibit 2, respectively. Observations took place during seven time-periods (10 to 10:55 a.m.; 11 to 11:55 a.m.; 12 to 12:55 p.m.; 1 to 1:55 p.m.; 2 to 2:55 p.m.; 3 to 3:55 p.m.; 4 to 4:55 p.m.).

RESULTS

The majority of visitors (84%) turned right when they entered the small primate house (Figure 1). This pattern appears to be relatively constant throughout dif-

TABLE 1
Definitions of Behavioral Categories Used to Describe and Analyze Visitor Behaviors

<i>Behavioral Characteristic</i>	<i>Definition</i>
Visit duration	The length of time people stayed at the exhibit. The observation zone extended from one end of the exhibit to the other.
Viewing behaviors	A <i>viewing event</i> was defined as an occasion when a visitor looked in the direction of the exhibit. The duration of a viewing event was classed as <i>viewing duration</i> .
Stopping behaviors	A <i>stopping event</i> was defined as an occasion when a visitor came a standstill (ceased walking) with both feet placed on the ground. The cumulative duration of events was labeled as <i>stopping duration</i> .

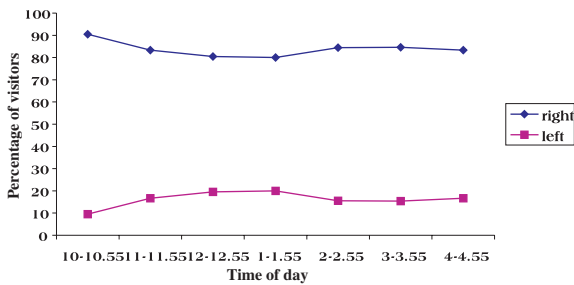


FIGURE 1 The relative proportions of visitors who approached Exhibit 1 from the right or left directions during different times of the day.

TABLE 2
Demographic and Behavioral Characteristics of Visitors Who Turned Left or Right When They Entered the Exhibit Gallery and Approached Exhibit 2

<i>Characteristic</i>	<i>Exhibit 1</i>		<i>Exhibit 2</i>	
	<i>Right^a</i>	<i>Left^b</i>	<i>Right^c</i>	<i>Left^d</i>
Gender ^e				
Male	114	20	55	44
Female	113	24	47	43
Age groups				
1 to 10	43	11	20	19
11 to 20	29	5	21	12
21 to 30	22	11	6	7
31 to 40	58	11	30	21
41 to 50	40	3	8	15
51 to 60	12	0	8	2
61 to 70	16	2	6	8
71 to 80	7	1	3	3
Group size				
One	37	7	9	6
Two	90	13	34	24
Three	45	16	28	20
Four	25	2	16	21
Five and above	4	3	8	11
School group	26	3	7	5
Visit durations				
<i>N</i>	227	44	102	87
<i>Mdn^f</i>	8.82	8.66	16.87	22.54
Range	59.24	49.44	90.81	127.58
Viewing behaviors				
% of visitors that looked	94	95	90	93
<i>Mdn</i> viewing time	8.80	8.43	14.09	17.72
Range	59.02	49.90	92.68	123.57
Stopping behaviors				
% of visitors that stopped	66	73	70	70
<i>Mdn</i> stopping time	10.17	7.79	12.25	16.26
Range	52.97	30.69	62.45	120.53

^aVisitors that turned right when entering the primate house. ^bVisitors that turned left when entering the primate house. ^cVisitors that approached Exhibit 2 from the right. ^dVisitors that approached Exhibit 2 from the left. ^eGender, age, and group size differences represent the overall characteristics of the visitor sample and do not present differences between right- or left-turning visitors. ^f*Mdn* = median time durations (measured in seconds) of each visitor behavior.

ferent times of the day, with a peak of 90% of visitors approaching from the right between 10 and 10:55 a.m. (Table 2). In contrast, the approaching direction of visitors at Exhibit 2 followed a different pattern: Most visitors initially approached the exhibit from the left, but the proportion of visitors doing so decreased during the day (Figure 2). Specifically, 80% of visitors approached from the left side during the first hour; this proportion decreased to almost 50% during the second hour and then decreased further and remained constant (at approximately 40%) for the next 3 hours. During the penultimate hour the percentage of visitors approaching from the left fell to 10%, and during the last hour no individuals approached from the left.

The proportions of visitors in each gender, age, and party group of right- and left-turning visitors resembled the overall visitor population determined in an earlier study. Nearly equal proportions of male and female visitors approached the exhibits from different directions. Because of the marked bias of people approaching from the right, there were low frequencies of left-approaching visitors, and this limited the types of statistical analyses that could be employed. However, there were no obvious differences in the proportions of the various age groups and group sizes and the overall sample characteristics.

At Exhibit 1, (Table 2) left- and right-approaching visitors did not differ significantly in their visit durations ($U = 4655.500$, $N_1 = 227$, $N_2 = 44$, $p = .477$, two-tailed) nor in the frequency or periods of time they viewed the exhibit ($U = 4413.500$, $N_1 = 214$, $N_2 = 42$, $p = .854$, two-tailed).

Also, (Table 2), the frequency and periods of stopping events did not differ ($U = 2028.500$, $N_1 = 150$, $N_2 = 32$, $p = .170$, two-tailed). At Exhibit 2, left-approaching visitors spent significantly more time visiting the exhibit ($U = 3613.500$, $N_1 = 87$, $N_2 = 102$, $p = .028$, two-tailed). However, there were no differences in viewing frequencies and durations ($U = 3470.500$, $N_1 = 81$, $N_2 = 92$, $p = .430$, two-tailed) or stopping frequencies and durations ($U = 1789.500$, $N_1 = 61$, $N_2 = 61$, $p = .716$, two-tailed).

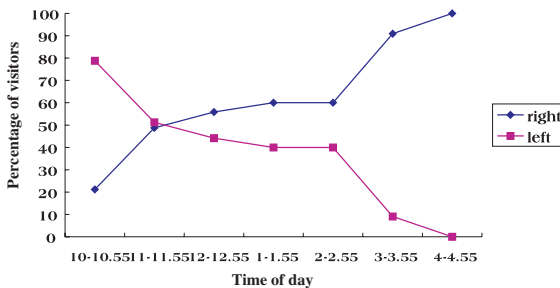


FIGURE 2 The relative proportions of visitors who approached Exhibit 2 from the right or left directions during different times of the day.

DISCUSSION

The majority of visitors turned right (84%) when they entered the gallery of primate exhibits, and this pattern was consistent throughout the day. These results suggest that the right-turn principle, previously documented in the museum literature, exists within zoos.

The existence of the right-direction bias in the zoo setting could have important implications for the provision of adequate animal welfare. If most people turn right when entering a gallery of zoo exhibits, animals located on the right side—especially those encountered first—will receive greater numbers of visitors than those located in other areas. This is worrisome because a developing body of literature has shown that the presence of visitors—and their behavior—is associated with undesirable changes in animal behavior (Chamove, Hosey, & Schaetzel, 1988; Hosey, 2000). Therefore, large numbers of people at the right side of exhibit galleries could threaten animals and compromise their welfare, whereas animals on the left may remain relatively unvisited. The work presented here, in combination with the work of Mitchell et al. (1990), demonstrates that the location of exhibits in a zoo could have consequences on their welfare provision.

It is difficult to explain why the majority of people turned right. It is plausible that people with identifiable demographic or behavioral attributes turned in different directions. However, no significance can be attached to this hypothesis because there was no demographic or behavioral difference between left- and right-turning visitors. Previous work appears to support this view. Although similar work from zoos is lacking, the direction bias has been shown to generalize across a range of museums; therefore, it is not specific to certain visitor samples.

What are the practical implications of such visitor circulation patterns for animal welfare professionals? If the direction bias presents a possible stressful situation for captive animals, then the next step is to consider ways of reducing the bias or dampening the possible visitor effects. This would require further work at specific zoos, particularly to determine if visitor effects actually exist alongside the direction effect. There are several possible solutions that could be developed further. First, it could be possible to counterbalance the direction tendency by placing popular exhibits (those housing popular animals or exhibit designs) in less-visited areas. Another possible solution is to consider housing species that typically are less responsive to visitors where visitation rates are higher. Margulis, Hoyos, and Anderson (2003) found that felid activity was not affected by visitor presence, presumably because the animals are largely inactive and nonresponsive to visitor disturbance or efforts to engage. Third, but practically difficult, animal inhabitants in a gallery of exhibits could be rotated regularly throughout the gallery (although rotating animals could increase the risk of disease transmission).

Other possibilities include (a) one-way viewing glass, (b) signage to direct visitors, and (c) a barrier to direct traffic flow. In light of the results presented in this

article, we encourage placing extra emphasis on monitoring the stress indicators of captive animals in specific hotspots within galleries of zoo exhibits.

What reasons could account for the direction bias? Previous museum work about the turning tendencies of visitors has not provided convincing explanations for the concept. It has been suggested that the position of the entrance and exit within an exhibit gallery determines visitor circulation and, therefore, influences visitor patronage (Melton, 1935; Mitchell et al., 1990). However, this suggestion requires further study. This hypothesis was not investigated in this study, and it is plausible that the entrance and exit locations in this study could account for the direction biases. This is an interesting avenue for further work.

Previous museum work has shown that the direction bias does not exist at all exhibits but is specific to galleries of exhibits. Support for this view is provided in this study because the direction bias evident at the gallery of primate exhibits was not upheld at Exhibit 2 (located away from a gallery). However, it is important to point out that Exhibit 2 existed in a different location in the zoo with a different set of variables that may have influenced visitors' turning tendencies; the second exhibit was not located near restrooms, food services, or obvious intersections that could have had a major impact on visitor direction during the day. The study at Exhibit 2 showed that the time of day at which observations take place influences the proportions of people who turn right or left. Therefore, it is reasonable to suggest that the time of day at which observations take place could influence whether a researcher concludes that a direction bias exists and also could pose another visitor factor influencing animal welfare.

CONCLUSIONS

Although results indicate that a direction bias exists in the visitor sample, this study has limitations. First, the study was site specific and conducted in a small gallery of primate exhibits. Second, it is not clear whether the bias exists in other areas of the zoo or generalizes to other zoos. This requires further study. In addition, there was no attempt to elucidate the relationships between visitor circulation patterns and associated changes with animal behavior or physiology. Therefore, more work is needed to determine the precise effects of direction biases on animal welfare. Whether the visitor effect is stressful or enriching requires further investigation (Hosey, 2000; Moodie & Chamove, 1990). In addition, traffic approaching an exhibit from opposite directions, rather than a direction bias, possibly upsets some animals more than others. There are many unanswered questions. We hope this study will act as a primer for further work.

ACKNOWLEDGMENT

Kenneth Shapiro provided helpful comments on an earlier draft of this article.

REFERENCES

- Bitgood, S., Patterson, D., & Benefield, A. (1988). Exhibit design and visitor behavior: Empirical relationships. *Environment and Behavior*, *20*, 474–491.
- Chamove, A., Hosey, G., & Schatzel, P. (1988). Visitors excite primates in zoos. *Zoo Biology*, *7*, 359–369.
- Hosey, G. (2000). Zoo animals and their human audiences: What is the visitor effect? *Animal Welfare*, *9*, 343–357.
- Marcellini, D., & Janssen, T. (1988). Visitor behavior in the National Zoo's reptile house. *Zoo Biology*, *7*, 329–338.
- Margulis, S., Hoyos, C., & Anderson, M. (2003). Effect of felid activity on zoo visitor interest. *Zoo Biology*, *22*, 587–599.
- Martin, J., & O'Reilly, J. (1982). Designing zoos for children: An alternative approach. *Knowledge for Design: Proceedings of Environmental Design Research Association*, *13*, 339–346.
- Martin, J., & O'Reilly, J. (1989). The emergence of environment–behavior research in zoological parks. In I. Altman & E. Zube (Eds.), *Public places and spaces—Human behavior and environment* (Vol. 10, pp. 173–192). New York: Plenum.
- Martin, J., O'Reilly, J., & Albanese, C. (1983). Master plan and exhibit development plan. Tuscon, AZ: Brooks.
- Melton, A. (1935). Problems of installation in museums of art. *New Series, Monograph No. 14*, Washington, DC: American Association of Museums.
- Mitchell, G., Obradovich, S., Sumner, D., DeMorris, K., Lofton, L., Minor, J., et al. (1990). Cage location effects on visitor attendance at three Sacramento Zoo mangabey enclosures. *Zoo Biology*, *9*, 55–63.
- Phillpot, P. (1996). Visitor viewing behavior in the Gaherty Reptile Breeding Centre, Jersey Wildlife Preservation Trust: A preliminary study. *The Dodo, Journal of the Wildlife Preservation Trusts*, *32*, 193–202.
- Robinson, E. (1931). Exit the typical visitor. *Journal of Adult Education*, *3*, 418–423.