

Individual and environmental factors associated with stereotypic behavior and fecal glucocorticoid metabolite levels in zoo housed polar bears

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Abstract

Polar bears (*Ursus maritimus*) are known to exhibit repetitive pacing behaviors, usually described as stereotypic, in zoo environments. However, little quantitative information exists about the prevalence of pacing in the zoo population. Similarly, large, multi-institutional studies conducted to determine the relationship between stereotypic behavior in zoo polar bears and environmental/husbandry variables using corticoids as a measure of stress are lacking. The study reported here includes data from 55 bears housed in 20 North American zoos. Individual and zoo characteristics were collected and behavior and fecal glucocorticoid metabolites (FGM) were measured over a one-year period. Using an epidemiological approach, individual and facility level multiple linear regression models were constructed to determine the nature, strength and significance of environmental/husbandry variables and temperament (measured using a standardized novel object behavior test) on stereotypic pacing and FGM. We found zoo polar bears performed stereotypic pacing behavior during 14% of the day; the proportion rose to 22% when expressed as a percentage of time engaged in locomotory behavior. However, considerable variation in proportion of stereotypy was observed. Variables associated with reduced pacing at zoos were: enrichment, number of bears in the group, and bears having a view out of their exhibit with a strong suggestion that the existence of a positive reinforcement training program may also be important. Among individuals, bears whose temperament measured high on the “interest” axis (defined in terms of behavior directed toward the novel object) tended to display less stereotypic behavior and those that scored high on the “slow to approach” axis displayed more pacing. We found higher FGM levels were associated with higher proportions of stereotypic pacing, lower levels of the temperament variable “interest” and smaller dry land exhibit area. These results support other studies suggesting polar bears are particularly prone to stereotypic pacing behavior in zoos and that there is a link between stress (measured as FGM) and pacing in zoo polar bears. These findings also suggest that some easily available tools, namely environmental enrichment and possibly positive reinforcement training, can effectively reduce the incidence of these behaviors. Exhibit designers should take note that providing bears with a view out of their exhibit and larger land areas are associated with both behavioral and physiological benefits. Finally, certain temperaments are associated with elevated levels of both stereotypic behavior and corticoids. This information may provide a tool for proactively identifying the individuals most likely to develop pacing behaviors and providing appropriately enhanced care before the behavior becomes established.