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A critical review of animal-based welfare indicators for polar bears (Ursus maritimus) in zoos: Identification and evidence of validity

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Abstract

Captive polar bears (Ursus maritimus) are well-documented as being prone to behavioural disorders and, as a result, their welfare is the cause of increasing concern. There is therefore a need for an evidence-based approach to the assessment of the welfare of this species and identification of valid welfare indicators is the first step towards achieving this. To this end, a critical evaluation of peer-reviewed literature was undertaken. Searches of Web of Science and Scopus took place in May 2020 for publications relevant to the welfare of captive polar bears which met inclusion criteria. Further, validity of extracted indicators was assessed via investigation of evidence of content, construct and criterion validity along with strength of evidence at publication-level. Database searches and snowballing unearthed 46 publications included for review. Identified indicators were sorted into nine behavioural, four physiological (based on physiological or biological sampling) and five physical (based on visual inspection) categories. Among behavioural indicators, the strongest evidence of validity was found for abnormal behaviour. For the physiological indicators, validity was only established for faecal glucocorticoid metabolite concentration. Content validity was assumed for all physical indicators. Generalisability and strength of evidence was generally compromised by low sample sizes and experimental limitations, and only a small number of papers investigated welfare indicators directly, resulting in a paucity of validated indicators. Potential welfare indicators that warrant further validation are highlighted. Overall, this review provides an overview of current valid and promising welfare indicators along with identified gaps in knowledge, relevant for the provision of a methodology for assessing and monitoring welfare of captive polar bears.

Keywords: *animal welfare, behaviour, polar bear, welfare assessment, welfare indicators, zoo welfare*