Table 1. Current studies and methods to assess human-animal-relationships in various animal groups

Method	Description	Species applied to	Context	Results & method comments	References
Methods of Behavioural Assessment (MBA)	Keepers rate animals on behavioural elements using a questionnaire.	Black rhinoceros (*Diceros bicornis*)	Individual behaviour profiles in relation to breeding success.	Ratings by keepers of behaviour attributes can be used as reliable and valid cross-institutional descriptions of individual differences to correlate with environmental variables.	Carlstead et al., 1999a, 1999b
Behavioural scoring	Scoring specific behaviours during HAI events (e.g interactive behaviours during a cue or command from keeper)	Chimpanzee (*Pan troglodytes*)	Effect of positive HAIs on chimpanzee behaviour	Positive behavioural changes were observed when study chimpanzees were provided additional positive human interaction. Levels of abnormal behaviour fell.	Baker, 2004
		Gorilla (*Gorilla gorilla gorilla*)	Effects of increased social interaction with a human on abnormal behaviours	Reduced abnormal and aggressive behaviours following periods of social interactions with human	Pizzutto et al., 2007
		Lowland gorilla (*Gorilla gorilla gorilla*)	Effects of positive reinforcement training and playing from keepers on gorilla behaviours.	Positive changes found with reduced stereotypies and aggressive behaviours, and increased social play- related behaviours.	Carrasco et al., 2009
		Ungulates (12 species)	Behavioural response of ungulates to keeper presence	Visual orientation was the most frequently scored behaviour, differences found in vigilance between female and male ungulates to keeper and visitor presence. Instance of aggression towards keeper required adjusting procedure of human presence to include a physical barrier.	Thompson V. D. 1989
		Sumatran orangutan (*Pongo abelii*), Western Lowland gorilla (*Gorilla gorilla gorilla*)	The effect of familiar and unfamiliar humans on great ape initiated, human directed behaviours.	Behaviour patterns indicated more negative relationship with unfamiliar humans, and positive with familiar humans. Affiliative behaviours classified as "close" (<3m) or "distant" (>3m), where positive relationship expected to be characterized by high levels of "close" behaviours.	Smith, 2014
Distance parameter	Measure spatial parameters and behavioural scoring during HAI event (e.g. distance of animal from keeper performing a cue or command)	Meerkat (*Suricata suricatta*)	Effect of visitors (unregulated and regulated visitor behaviour)	No effects of reduced intensity of visitor behaviour on meerkat behaviour. Distance measuring apparatus used, enclosure design must be considered. Suggest investigating physiological responses in addition to behavioural.	Sherwen et al., 2014
		Sumatran orangutan (*Pongo abelii*), Western Lowland gorilla (*Gorilla gorilla gorilla*)	The effect of familiar and unfamiliar humans on great ape initiated, human directed behaviours.	Behaviour patterns indicated more negative relationship with unfamiliar humans, and positive with familiar humans. Affiliative behaviours classified as "close" (<3m) or "distant" (>3m), where positive relationship expected to be characterized by high levels of "close" behaviours.	Smith, 2014
Response to cues	Measure latency and distance during HAI event (e.g. animal being asked to perform specific behaviour)_	Black rhinoceros (*Diceros bicornis*), Chapman's zebra (*Equus burchellii*), Sulawesi crested macaques (*Macaca nigra*)	Investigate unique keeper-animal dyads in zoos	Significant difference in the animals' latency to appropriately respond after cues and commands from different keepers, indicating unique keeper-animal dyads were formed.	Ward and Melfi, 2015
		African elephant (*Loxodonta africana*), Rothschild giraffes (*Giraffa camelopardalis rothschildi*), Brazillian tapir	Response to familiar and unfamiliar keepers	Animals found to distinguish between un/familiar keepers, more locomotion towards familiar keepers. Further investigation of behavioural and hormonal responses necessary to fully quantify findings.	Martin and Melfi, 2016

		(Tapirus terrestris),			
Qualitative behaviour Assessment (QBA)	QBA uses free-choice profiling in which observers generate their own descriptive vocabularies of how an animal behaves based on observing the whole animal from numerous video clips	Dairy calves (*Bos primigenius*)	Stockperson handling style	Stockpersons who handle calves patiently and calmly during handling have animals with higher levels of friendly and content animals. Suggest QBA valid method to assess handling style.	Ellingsen et al., 2014
		Dairy buffaloes (*Bubalus bubalis*)	Isolation tests with different observers groups	Meaningful association between quantitative and QBA; QBA play valuable role in interpreting animals' state. Good inter-observer agreement between observer groups	Napolitano et al., 2012
		Horses Ponies (*Equus caballus*)	Responsiveness to environmental challenge during an open field test	Appropriate methodology to study horse behavioural responsiveness, provided characterisation of behavioural expression, which were in agreement with quantitative assessments.	Napolitano et al., 2008
Reaction to handling	Behavioural and physiological parameters measured during handling tests. Methods usually involve responses to leading or moving, capture, restraint, and specific handling events such as veterinary procedures.	Rabbits (*Oryctolagus*)	Effect of handling between un/familiar human	Reductions in fearful reactions with increased handling.	Podberscek et al., 1991
		Horses (*Equus caballus*), Donkeys (*Equus asinus*)	Assess the use of HAR methods between horse facilities	Method proved feasible, high observer agreement, good repeatability of tests (at 3-month intervals) in on-farm environment for both species.	Dalla Costa et al., 2015
Voluntary Approach	A test person enters an area and stands stationary, the latency of an animal to approach is recorded (or % for a group of animals within fixed time). An approach behaviour is defined as the animal approaching a stationary human; must be pre-defined.	Dairy goats (*Capra hircus*)	HAR method testing to assess on-farm welfare.	For goats VA test seems to be most suitable option for assessing on-farm welfare. Suggest performing behavioural tests following separation of males and females.	Battini et al., 2016
		Piglets (*Sus domesticus*)	Unfamiliar and familiar human	Suggests early handling changed the way pigs reacted to challenging situations; handled pigs showed less fearful behaviours during handling and novel environment.	De Oliveira et al., 2015
		Horses (*Equus caballus*), Donkeys (*Equus asinus*)	Assess the use of HAR methods between horse facilities	Method proved feasible, high observer agreement, good repeatability of tests (at 3-month intervals) in on-farm environment for both species.	Dalla Costa et al., 2015
Avoidance distance test	The latency of an animal to avoid (e.g. walk away) from an approaching human is recorded in addition to behavioural responses of the animal. The test ends when the animal withdraws and moves away from the human. AD: minimum distance in which an animal will allow moving person to approach.	Horses (*Equus caballus*), Donkeys (*Equus asinus*)	Assess the use of HAR methods between horse facilities	Method proved feasible, high observer agreement, good repeatability of tests (at 3-month intervals) in on-farm environment for both species.	Dalla Costa et al., 2015