

Supplemental Figure 1. Ethogram of behaviors

Category	Behavior	
Proximity	Distant	Outside 2 m of another animal. Distance between animals does not allow 2 animals to touch each other.
	Near	Within 2 m of another animal. Distance between animals allows one or both animals to extend an arm to touch the other.
	Touching	In contact with another animal
Aggressive	Agitated locomotion	Brisk or rapid walking that often occurs with increased vigilance toward event, animal, or object.
	Hit away	Source of apprehension or tension (another animal or object) is hit towards. If this behavior occurs with screaming or fear grimace, it will be recorded as such by using modifiers.
	Display	Vocal or nonvocal behavioral sequence including such elements as drumming, repeated swaying, scratching, and piloerection and often repetitive slapping of the ground, which begins slowly and gradually becomes more vigorous. May or may not be accompanied by a pant-hoot call
	Threat	Includes arm raising, arm waving, wrist shaking, lunging toward, and chasing toward another animal. No physical contact is made.
	Level 1	Brief aggressive episode, a 'hit and run' or a slap in passing
	Level 2	Aggressor stops to fight with victim, but for less than 30 s. May include any of the elements of aggression (slapping, hitting, kicking, scratching, pulling) except biting.
	Level 3	Includes biting along with any other of the elements of aggression. Episode also lasts less than 30 s.
Level 4	Severe aggression, episode lasts longer than 30 seconds, often results in wounding.	
Locomotion	Hang	All of the animal's weight is supported by wire of walls (that is, animal is grasping wire with hands and feet), or the animal is hanging beneath the climbing bars.
	Walk	Moving through space at a calm, steady pace on horizontal surface (may be on ground, plank, or platform). If walking occurs with play face, then it is considered play. Includes walking with food.

	Climb	Animal is climbing from one point to another in normal location (for example, onto a platform, from top of cage, to side of cage). If this behavior occurs with play face, then it is considered play. Includes climbing with food.
	Brachiate	Animal uses arms to swing from one location to another. If this behavior occurs with play face, then it is considered play. Includes brachiating with food.
Submissive	Flee	Moving away from another at full speed. If fleeing occurs with screaming or fear grimace, it will be recorded as such by using modifiers.
	Avoid	Moving away as another animal approaches or moves out of the path of another. Also includes flinching, or slight ducking of the head, or head and shoulders, or momentary retreat movements. If this behavior occurs with a fear grimace or scream, it will be recorded as such by using modifiers.
	Crouch or bob-bow	Lowering of the body by flexing arms and legs until in a horizontal position touching the substrate or vertical repeated movement of the head or head and shoulders in an up and down pattern. If occurs with screaming, fear grimace, or pant-grunt, it will be recorded as such by using modifiers.
	Present	Posture may vary from extreme crouch (that is, all four limbs are folded under such that animal is close to the ground) to smaller degrees of limb flexion. Subordinate may also turn rump towards the other without any flexion of the limbs. If this behavior occurs with screaming, fear grimace, or pant-grunt, will be recorded as such by using modifiers.
	Temper tantrum	Screaming loudly; may include leaping up, flinging arms above head and slapping them onto the ground, hurling self to the ground on face, hugging the cage mesh or an object or tumbling over and over, still screaming. Screaming may end in glottal cramps (gagging sounds).
Affiliative	Groom mutual	Focal animal picking through hair or at skin removing debris with hands or mouth (not pulling) on another chimp, which is concurrently grooming the focal animal.
	Groom given	Focal animal picking through hair or at skin removing debris with hands or mouth (not pulling) on another animal.
	Groom received	Another animal picking through hair or at skin removing debris with hands or mouth (not pulling) on the focal animal.
	Embrace	Ventroventral contact when 2 animals face each other and each puts both arms around the other or contact with both arms of an animal encompassing another from behind.
	Social pant-hoot	Occurs by itself in the context of social excitement. Voiced on both inhalation and exhalation and incorporates a series of 'hoo' sounds that may or may not escalate to an 'ahh' vocalization.

	Human interaction	Nonaggressive behavior directed toward human when human is not directly interacting with chimp. Includes attempts to play with human, attempts to gain human attention (for example, cage bangs), and attempts to give human inanimate object (for example, twigs, wads, grass).
	Social play	Nonaggressive interactions with another animal, includes rough-and-tumble play, not piloerect, quiet play, 'wrestling'.
	Self-play	Animal may play quietly by itself with hands, fingers and toes, other body parts, including genitals, or an object may be handled and be the focus of play.
	Other affiliative	Focal animal engaged in any affiliative behavior not described elsewhere. May include kissing and hand-to-mouth contact.
Manipulate object (species typical)	Nest	Use of excelsior, paper, or other material to create a nest. May include smoothing material on the floor, tearing material and placing on the floor, and carrying excelsior or paper to another location.
	Tool use	Includes creating and using sticks for fishing or to obtain an out-of-reach object, using excelsior for wadge dipping, and using any other object or material for something other than that which it was intended.
	Explore object	Sensory investigation of an object. Includes handling, touching, moving, smelling, mouthing, listening to, or tasting objects, including part of the caging structure (mesh, bolt, wood structure).
	Use enrichment	Any visual, olfactory, manual, or oral use of enrichment devices, including mirrors, pipe feeders, forage boards, toys, and other enrichment objects.
Abnormal	Regurgitation–reingestion	Deliberate regurgitation and consumption of previously ingested food.
	Coprophagy	Deliberate ingestion of own or other animal's feces.
	Feces smear	Smearing or spreading feces on a surface with hands or mouth.
	Hair pluck	Pulling out own or other's hair from the root in a quick motion, followed by manipulation of the root. Excludes self-grooming.
	Idiosyncratic body manipulation	Repeated or sustained manipulation of own body part, including eye poking, self-patting, self-slapping, self-poking.

Self-directed	Idiosyncratic movement	Repeated movement of body in purposeless manner, including neck twisting, swaying back and forth, head rolling, pacing, and rocking.
	Other abnormal	Any abnormal behavior not described above.
	Groom self	Picking through own hair or at skin removing debris with hands or mouth (not pulling). Includes visual attention directed at body part for inspection of potential grooming site.
	Gentle scratch	Raking one's own hair or skin with fingernails, including mainly movements of hand and fingers. A new instance is scored after a period of 5 s of no scratching.
Other	Rough scratch	Rake one's own hair or skin with fingernails, including large movements of arm. A new instance is scored after a period of 5 s of no scratching.
	Foraging	Manipulating the substrate or food item while intermittently transferring items to the mouth or chewing a food item. Not stationary. Does not include chewing wads of food for long periods of time.
	Eating–drinking	Eating food items, including chow, or drinking water while remaining stationary in sitting position. Does not include chewing on wads of food for long periods of time.
	Inactive rest	Animal is immobile, not engaging in activity, is generally relaxed, and is lying down, leaning, or reclining.
	Inactive alert	Animal is in a sitting, prone, or quadrupedal position, is not exhibiting signs of sleepiness, and is not involved in any active behavior such as locomotion, play, eating, rocking, or grooming. Animal is alert and attention is directed toward people, chimps, inanimate object, or nearby event.
	Out of view Other	Animal is not within sight of observer or behavior is not immediately known. Any behavior that is not included in this ethogram.
Sexual	Copulate	Ventral surface of initiator is in contact with dorsal surface of another animal. Pelvic thrusting is exhibited. May occur with or without penetration.
	Solicit	Animal (generally male) sits facing another individual with thighs rotated laterally. Male often has an erection and may exhibit thrusting motions.
	Mount	Ventral surface of initiator is in contact with dorsal surface of another animal with proper orientation. If thrusting occurs, will be scored as copulate. If behavior occurs with play face, it will be scored as social play.

Genital explore	Visual, oral, or manual inspection of anogenital region. May be other- or self-directed. Does not include self- grooming of the anogenital region, manipulation of the anus to obtain feces, or masturbation.
Masturbate	Using a body part, an object, or a part of the cage to stimulate the subject's own genitals.

Some definitions taken from Hopper, Freeman, and Ross (2016) and AZA Ape Taxon Advisory Group and AZA Animal Welfare Committee (2010).